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Introduction

This paper revisits the controversy surrounding the relationship between provision of public goods and size of provider interest group. A roughly equal number of theoretical and empirical papers have suggested that this relationship is either inverse or direct, in a linear or non-linear fashion, or simply non-existent. An alternative claim has recently surfaced, suggesting that this relationship exhibits a U-shaped pattern. Using the data and results of a influential study in agricultural economics, this paper suggests that, over the same sample, the relationship appears instead to be inverse over the whole range of the function. In the process, the paper also shows that the use of more advanced analytical tools offers a substantiation of an implicit, yet theoretically crucial, assumption of the study under review.

Public Goods and Interest Group Size

Starting with Olson (1965), economists and political scientists have given increasing attention to the specificities of public goods. In particular, they have significantly broadened the understanding of the mechanisms through which the two main characteristics of public goods, non-rivalry and non-exclusion in consumption, interact to affect the level of public good provision. Concerns for the dynamic dimensions of this issue have however given raise to a continued controversy: how does the availability of a public good vary when the size of the providing interest group changes? A relative consensus was reached early among scholars on the effect of changing group size on the provision of "exclusive" public goods, which are characterized by perfect non-exclusion and imperfect non-rivalry. Indeed, if the level of individual allocation of a public good is an inverse function of the number of members, a larger group size is doubly detrimental to the overall provision level: the individual cost of non-participation in the acquisition of the public good and the individual benefit both decrease as the number of fellow members increases. As a result, total provision of the good will be inversely and, in general, linearly related to membership size. In contrast, the effect of a change in group size on the level of total provision of "inclusive" public goods, which are non-excludable and non-rival, is theoretically uncertain, as it results from two elements that potentially affect individual members' benefits and costs in opposite directions: the number of beneficiaries, and the size of each member's contribution.

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The literature suggests that these two elements interact in a variety of ways that yield a positive, negative, or indeterminate correlation between group size and total provision of inclusive public goods. In particular, theoretical work by Chamberlin (1974), McGuire (1974), and Andreoni (1988) suggests that the decrease in individual contribution, resulting from free riding considerations, is more than offset by the increase in group size, and that interest groups will provide their members with a larger (but finite) amount of public good when the size of their membership increases. This result is contrary to one of Olson's main conclusions, which implies that this relation is negative with an asymptotic limit, and still awaits empirical investigation. Olson's contention, on the other hand, has received empirical support in Kim and Walker (1984) and van Bastelaer (1995); while Marwell and Ames (1981) found no significant relationship between group size and level of provision.[2]

A compromise of Olson' and Chamberlin/McGuire/Andreoni's theoretical conclusions has recently enjoyed some empirical success.[3] This hypothesis calls for a non-linear, inversed U-shaped relationship between relative group size and total provision of the inclusive public good to the group. The central assertion is that interest groups observe an increase in their level of political influence as their size, relative to that of the other groups, decreases. Below a certain threshold value, however, this political influence starts to recede. Hence, the underlying functional relationship exhibits Chamberlinian characteristics over its increasing range, and conforms to Olson's predictions over its decreasing range.

Several empirical investigations in the political determinants of the pricing of food have granted an important role to the interest group class of explanations. Given the inclusive nature of price mechanisms, and the availability of extensive cross-sectional and times series of price data, the politics of food pricing offer an appropriate arena for an empirical test of the concavity hypothesis. This paper thus reexamines an influential study (Honma and Hayami, 1986) in agricultural economics, and shows that the use of more advanced panel data techniques casts a different light on Honma and Hayami's methodology and central results.

Honma and Hayami's Results

Anderson and Hayami's "The Political Economy of Agricultural Protection" (1986) represented one of the first attempts to provide a model of the political currents which shape food policies, as well as an conceptually consistent empirical test of the interest group approach to these policies in industrial countries. The book's focus on East Asia was instrumental in offering clear empirical support of the author's contention that rapid industrial development carries with it the roots of shifting political and institutional support for agriculture.

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[2] Kim and Walker (1984) have suggested that the results from earlier research papers (Sweeney (1973), Bohm (1972), Smith (1980), Marwell and al. (1978, 1979, 1980) and Scherr and Babb (1975)), which showed no empirical evidence of free-riding behavior in the pursuit of public goods were flawed because they each excluded at least one determining characteristic of public goods.

[3] See, for example, Honma and Hayami (1986) and Lindert (1991).

In Chapter 4 of the book, Honma and Hayami present an analysis of the determinants of the Nominal Protection Coefficient,[4] using observations obtained by pooling data from 15 industrial countries over six years (every fifth year from 1955 to 1980.) The independent variables which are the most relevant for the purpose of this paper are the share of agriculture in the labor force and its squared value (which allows Honma and Hayami to test for the concavity hypothesis), with the expectation of significant estimates that are positive for the former regressor, and negative for the latter. Indices of comparative advantage in agriculture and international terms of trade, and regional dummies act as control variables. Ignoring the regional dummies (whose coefficients are insignificant in Honma and Hayami's results), the regression equation takes the following form:

$$\ln P = \alpha_0 + \alpha_1 \ln C + \alpha_2 \ln S + \alpha_3 (\ln S)^2 + \alpha_4 \ln T + e$$

where P is the nominal (direct) protection coefficient, C is the index of comparative advantage in agriculture, S is the share of farmers in the total labor force, T is an index of international terms of trade, and e is the customary error term. The value below which the political influence of farmer groups declines with their relative size is reached at the point where

$$\frac{\partial\, lnP}{\partial\, lnS} = \alpha_2 + 2\alpha_3\, lnS = 0$$

This threshold value and the estimates of the coefficients produced by Honma and Hayami's ordinary least squares regression, without regional dummies, are presented in Table 1 (Regression 1.)[5]

Over this specific sample, and under OLS, these results support Honma and Hayami's main theoretical hypothesis: the political influence of the farmer groups increases as their relative size decreases, and the latter reaches a global maximum at 6.75 percent of the labor force. Below this percentage, smaller farm groups lose political influence, and the price protection they receive decreases.[6]

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[4] (NPC = (Nominal Direct Protection Rate / 100) + 1.) The development of more precise measures of agricultural protection postdates Honma and Hayami's article by 5 years. Nominal protection rates/coefficients represent the best indicators available at the time the article was written, but they ignore distortions of price incentives that result from the use of economy-wide instruments, such as discretionary exchange rate policies and industrial protection.

[5] Eight alternative combinations of the independent variables are used by Honma and Hayami in their ordinary least squares regressions. For reasons of data availability, and given that the present analysis could be replicated for all other seven specifications, this paper will address the results of Honma and Hayami's regression number 7 (1986, p. 44.)

[6] The F-test statistic for the joint significance of ln S and $(\ln S)^2$ is equal to 21.38, with a P-value of .00002. The joint consideration of these two variables in the regression is thus justified.

However, these results are highly sensitive to changes in some critical parameters, and the following discussion will present how their robustness is affected when an influential variable is introduced, when a more appropriate econometric specification is utilized, and when two countries are withdrawn from the sample.

The Role of Income

The first limitation of Honma and Hayami's study results from the omission of a variable that will later be shown as playing a critical role in an analysis of food price distortions: the level of income per capita. In the introduction and the chapters that precede Honma and Hayami's empirical analysis, editors Anderson and Hayami attribute an important conceptual role to this variable: "the decreasing importance of food prices in household budgets as incomes grow ensures that political pressure from consumers and industrialists for low food prices diminishes with economic growth." (1986, p.3) Moreover, "the income elasticity of demand for food is less than one, and it declines as incomes rise (Engel's Law)." (1986, p.9) Anderson also presents a model of price protection in which the level of government intervention is determined by the interaction of supply and demand forces on a political market for protection policies. In this market, "the supply curve in this market represents the marginal political cost of providing an extra unit of protection to (or less taxation of) an industry, in terms of reduced political support from the groups opposed to such a policy change, while the demand curve represents the marginal return to political leaders in terms of political support from the groups seeking protection." (1986, p.14) Although it is not explicitly stated by Anderson, an increase in income per capita shifts the supply of protection to the right,[7] due again to a decreasing share of an increasing household budget that is applied to food expenditures. Opposition to higher food prices decreases accordingly. Underlying the role of income levels in the determination of the price level for food, Anderson writes that "North America and Australasia . . . are much less likely to have switched policies to favour agriculture, despite the fact that their per capita incomes are higher than East Asia." (1986, p.16) Given the pivotal role that these statements attribute to income per capita, it is surprising that this variable is not included in the econometric analysis of the determinants of the levels of agricultural protection that follows the theoretical introduction.

I suggest that part of the reason for this omission can be found in the unavailability of adequate econometric techniques to handle panel data at the time Honma and Hayami conducted their research. Indeed, adding income per capita as a regressor in Honma and Hayami's OLS regression increases the explanatory power of the specification, but seriously challenges the validity of the underlying model. As Table 1 (Regression 2) indicates, the estimates of the share of farmers in the labor force and its square value become insignificant at the 90 percent level when income per capita is added to the analysis. As the next section will show, however, a different econometric specification might be able to bolster Honma and Hayami's reluctant hypothesis about the role of income in the observed patterns of food price protection.

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[7] More precisely, it decreases the opposition to a rightward shift of the supply of protection.

The Role of the Econometric Specification

The second source of concern about Honma and Hayami's results stems from their exclusive reliance on ordinary least squares (OLS) specifications. Although the data used by Honma and Hayami is available in cross-sectional and time series format, they do not fully utilize the information included in the data, by incompletely accounting for the country-specific effects which, while unobserved, participate in the making of agricultural policies. Had recent development of panel data techniques been available to Honma and Hayami, they could have taken the above effects into consideration by relying on the random effects technique[8] and compute the results presented in Table 1 (Regression 3.)[9]

Under random effects, the presence of GDP per capita as an additional regressor does not interfere with the significance of the group size variables, which are both significant at the 99 percent level, though the income variable itself contributes little to the analysis. These results suggest that, had Honma and Hayami had access to econometric techniques more appropriate to the structure of their data, they would have been able to address the pivotal role of income per capita in the design of food price levels without renouncing their main theoretical assumption about the function of farm group size. However, as the remainder of this paper will show, the composition of the sample used by Honma and Hayami presents problems that the use of more adequate econometric techniques does not seem able to overcome.

The Role of South Korea and Taiwan

The validity of Honma and Hayami's results is more sensitive to a change in the sample used than to the choice of the econometric specification. If their assumptions about the quadratic behavior of the farming population share are correct, they should be expected to hold even when the sample size is reduced. In two countries of the sample, the Republic of Korea and the Republic of China in Taiwan, the share of farmers in the labor force has decreased dramatically over the 1960-80 period (from 58.1 to 27.9 percent in Korea, and from 47.3 to 26.6 percent in Taiwan). Over the same period, the nominal protection of agriculture has increased from -3 to 89 percent in Korea, and from 28 to 83 percent in Taiwan. To examine whether the size of these variations in Korea and Taiwan is driving the results obtained for the whole group of countries, the two countries are withdrawn from the sample and a random effects regression is performed on the resulting sample of 13 countries. As the results in Table 1 (Regression 4) indicate, the

[8] The random effects estimator is a weighted average of the fixed effects estimate (also known as the least squares with dummy variable (LSDV), analysis of covariance (ANCOVA), or "within-units" approach) and the "between groups" estimator (the OLS estimate of the coefficients using country means.)

[9] A full exploitation of the temporal dimension of the data is also limited by the nature of the time series, which is composed of observations taken every fifth year from 1960 to 1980. Not only does this decision result in relatively short time series, it also disregards the important yearly variations in the protection rates. Five-year averages, while resulting in the same sample size, capture more appropriately the variations of pricing policies and of their determinants over time, since these policies result from political influences that last for more than one year.

robustness of Honma and Hayami's results is adversely affected by this reduction in the sample size.

While the estimates for the comparative advantage in agriculture and international terms of trade are only marginally affected by the removal of Korea and Taiwan from the sample, the coefficient for the share of farmers in the labor force turns insignificant at the 90 percent level. Adding income per capita to the regression equation does not affect this result, although the coefficient of the additional variable is not significant. As Table 1 (Regression 5) reveals, running the same regression, without including the square term, offers significant support for a relationship between relative group size and level of protection that is negative over the whole range of farm group size.

Conclusion

This paper has shown that, although the hypothesis of non-monotonic decline of political influence of interest groups has significant theoretical appeal, it does not find empirical support in the area of food pricing policies over a fifteen country, twenty year sample. In particular, the paper shows that in a trend-setting empirical study on food prices in industrial countries, Honma and Hayami are prevented by econometric tools available at the time from reporting an important result, the critical role of income per capita, which would have been supported over their sample by the use of panel data analysis techniques. The paper also suggest that the presence of two significant outliers in the sample are driving the outcome of Honma and Hayami's empirical analysis and that, deprived of these outliers, the sample does not support the empirical validity of concavity hypothesis. New research on more longitudinally diverse samples[10] suggests that if such a concavity is a feature of the provision of price protection as a public good, even the most recent techniques of panel data regression fail to reveal it.

[10] See van Bastelaer (1996) for a cross-sectional and time series test of the validity of the interest group approach, using a sample that includes 31 developing and industrial countries over 25 years. Results offer strong support for a linear role of interest group size in the determination of food prices.

TABLE 1: Results of OLS and random effects regression of the nominal protection coefficient for 15 industrial countries

	Regression 1: OLS, 15 industrial countries (Honma and Hayami's regression 7)	Regression 2: OLS, 15 industrial countries (GDP per capita added to initial specification)	Regression 3: Random effects, 15 industrial countries	Regression 4: Random effects, 13 industrial countries (Korea and Taiwan excluded)	Regression 5: Random effects, 13 industrial countries (Korea and Taiwan excluded, no squared value of the farm group size)
Constant term	2.47* (1.90)	2.29* (1.85)	2.19*** (2.78)	2.33*** (3.46)	2.60*** (3.80)
ln C	-.11*** (-10.30)	-.12*** (-11.17)	-.12*** (-7.13)	-.10*** (-5.04)	-.11*** (-5.24)
ln S	.45*** (3.50)	.18 (1.17)	.50*** (3.87)	.21 (1.59)	-.05* (1.84)
$(\ln S)^2$	-.12*** (-4.62)	-.04 (-1.04)	-.12*** (-3.52)	-.06** (-2.00)	
ln T	-.50* (-1.74)	-.48* (-1.75)	-.49*** (-2.85)	-.42*** (-2.90)	-.42*** (-2.79)
ln G		.18*** (2.84)	.09 (1.20)		
Adjusted R^2	.62	.65	.49	.22	.20
Threshold value (%)	6.75	(10.39)	8.38	(5.77)	n.a.
F-test	n.a.	n.a.	8.21 (.00)	15.32 (.00)	14.32 (.00)
Hausman test	n.a.	n.a.	5.12 (.40)	1.36 (.85)	0.17 (.98)
Number of observations	75	75	75	65	65

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%).

Note: C = index of comparative advantage in agriculture;
S = share of farmers in the total labor force;
T = index of international terms of trade;
G = gross domestic product per capita.

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