Mass Media and Public Policy:
Global Evidence from Agricultural Policies

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Abstract

Mass media plays a crucial role in information distribution and thus in the political market and public policy making. Theory predicts that information provided by mass media reflects the media's incentives to provide news to different types of groups in society, and affects these groups' influence in policy-making. We use data on agricultural policy from 67 countries, spanning a wide range of development stages and media markets, to test these predictions. We find that, in line with theoretical hypotheses, public support to agriculture is strongly affected by the mass media. In particular, an increase in the share of informed voters, and a greater role of the private televisions in society is associated with policies which benefit the majority more: it reduces taxation of agriculture in poor countries and reduces subsidization of agriculture in rich countries, *ceteris paribus*. The evidence is also consistent with the hypothesis that increased competition in commercial media reduces transfers to special interest groups and contributes to more efficient public policies.

JEL classification: D72, D83, Q18

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1. Introduction

There is a rapidly growing literature on the economics of the mass media, leading to a series of important new hypotheses and insights in an area which for a long time was neglected by economists (McCluskey and Swinnen, 2008). An important part of this literature concerns the role of mass media in political markets and its effect on public policy-making. Most of this literature on the relationship between mass media and public policy is theoretical. A few empirical studies have tried to assess the effect of media on policy outcomes. Some key findings from this literature suggests that access to mass-media empowers people politically and, as such, increases their benefit from government programs (Strömberg and Snyder, 2008). This influence has been found for different types of government programs and different countries, such as unemployment relief in the United States (Strömberg, 2004b), public food provision and calamity relief in India (Besley and Burgess, 2001, 2002), and educational spending in Uganda and Madagascar (Reinikka and Svensson, 2005; Francken et al., 2009). All of these studies measure the effect within a single country, which has the benefit of keeping many other factors fixed but has the potential disadvantage of having limited variation in policy and media.

Our paper wants to contribute to this empirical literature by analyzing the impact of mass media on policy-making for a specific type of policy across a wide variety of countries and years. We use a new dataset which has been produced by the World Bank which includes measures of agricultural subsidization and taxation for a

much wider set of countries and longer period of time than has been available before (Anderson and Valenzuela, 2008). We use these data as dependent variables.

Agricultural policy (subsidization or taxation) is an excellent policy instrument to study the impact of media on policy choice across a wide variation of countries for both empirical and theoretical reasons. Empirically, agricultural policy is an important policy for governments in both rich and poor countries. In poor countries where agriculture is a very important share of the economy and where food is a major consumption item the importance of agricultural policy as a public policy issue is obvious. However, also in rich countries agricultural policy remains disproportionately important compared to the relatively small share of agriculture in terms of economic output. For example in the EU, the Common Agricultural Policy continues to absorb 40% of the entire EU budget. Another symptom of this continued importance of agricultural policy for rich countries is the stand-off in the current WTO negotiations where disagreements over agricultural policies is now threatening to undermine the entire WTO agreement.

Also from a theoretical perspective agricultural policy is an interesting case. The literature on the political economy of agricultural policy identifies group size (the number of farmers versus the number of food consumers in the economy) as an important causal factor. Group size is argued to play an important role because it affects collective action costs (based on Olson, 1965) and because it affects per capita costs and benefits of agricultural policy, which then affects political outcomes in the presence of voter information costs (based on Downs, 1957), or if political activities are proportional to the size of the potential policy costs and benefits (Swinnen 1994). Recent papers in the media economics literature claim that mass media can play an

important role in public policy, precisely by altering these political economy mechanisms (Stromberg 2001, 2004a; Kuzyk and Mc Cluskey, 2006). In fact, Oberholzer-Gee and Waldfogel (2005) argue that the link between group size and political mobilization depends on the structure of media markets. In a series of influential papers, Strömberg (2001; 2004a) has shown that competition among the mass media leads to the provision of more news/information to large groups such as taxpayers and dispersed consumer interests, altering the trade-off in political competition, and thus influencing public policy. He refers to this outcome as 'mass media-competition-induced political bias'.

The purpose of our paper is to evaluate whether mass media has an impact on the political economy of agricultural policies exploiting taxation and subsidization data from 67 countries, observed from 1975 to 2004. The paper contributes to an emerging literature analyzing whether the diffusion of free and independent media are key ingredients to more efficient public policies. Besley and Burgess (2001, 2002) use a political agency model to show that having a more informed and politically active electorate increases the incentives for a government to be responsive. Prat and Strömberg (2005) show, for Sweden, that people who start watching commercial TV news programs increase their level of political knowledge and their political participation. Overall, this and other evidence support the idea that mass media weakens the power of special interest in lobbies relative to unorganized interests.

The paper also contributes to the literature on the political economy of agricultural policies. While there is an extensive literature, both theoretical and empirical, on what determines agricultural policy-making (see de Gorter and Swinnen

(2002) and Swinnen (2009) for surveys), no study so far has looked at the role of the media in this process. Our paper is the first to do so.

Our analysis, exploiting both the across-countries and time-series variation in the data, indicates that mass media may have a substantive impact on public policy towards agriculture. In the developing world, agricultural taxation is reduced by the presence of mass-media, while in developed countries agricultural support is reduced. A key implication of our results is that by increasing government accountability, competition in the media market will reduce distortions in agricultural policy.

2. Conceptual framework

In this section we first present a theoretical framework based on Strömberg's (2004a) model of mass media and political competition. Then we discuss the main implication of the model in the light of the worldwide characteristics and regularities on agricultural policies. Next, we identify testable hypotheses about the effect of mass media competition on agricultural policy outcomes.

2.1 Theory

Two parties, L and R, make binding announcements about the amount z_s of public money they plan to spend on each of $S > 2$ government programs. The two parties set z_s with the objective to maximize the number of votes. Given $N = \Sigma\, n_s$ the total number of voters, and n_s the voters in group s who benefit from the program s, the assumption is that each voter benefits from exactly one program. Government spending is constrained by the usual budget rule, $\Sigma\, n_s z_s \leq I$, with I the total budget.

Two media firms, A and B, called, for simplicity, newspapers, are the only channel through which the parties' platforms are announced to the voters. The media firms allocate the space quantity, q^A and q^B, on the S spending levels, with the objective of maximizing the number of readers, identical to N voters. Each voter buys only one newspaper, A or B, and, by reading it, will develop some expectations concerning party spending; they will then vote for party L or R (no abstention). The party that wins the election implements the promised expenditure plan.

Voters are assumed to use the media information from newspapers to fully realize the potential gains embedded in the government program. Thus, more precise information on future policies increases the probability that voters will choose the right action. Specifically, voters realize utility $u_i(z_s) = \theta_i\, u(z_s)$ from the program, when information on z_s is known in advance. On the contrary, uniformed voters receive the utility $u_i(z_s) = \theta_i\, u(z_s) - v_s$, where v_s is the (exogenous) utility loss. The parameter θ_i captures the idea that the program can be more valuable to some individuals than to others.

It is assumed that all the voters who use program s have an incentive to read any article they find on z_s, while voters that do not use program s do not read the relevant articles. Thus, the probability that a reader will spot some news in the newspaper, ρ, increases with the space allocated for this news, but at decreasing rate: $\rho'(q_s) > 0$, $\rho''(q_s) < 0$. Next, by denoting the expected utility from a newspaper with news profile q to a reader in group s as $w_s(q_s) = \rho(q_s)\, v_s$, we have $w'_s(q_s) > 0$ and $w''_s(q_s) < 0$.

The reader's newspaper evaluation also depends on other (exogenous) fixed characteristics, like ideology, captured by parameters a_i and b_i. The news profile of

newspapers A and B then give expected utility $w_s\ (q_s^A) + a_i$ and $w_s\ (q_s^B) + b_i$ respectively to the voter i using program s. The voter buys newspaper A when $\Delta w_s = w_s\ (q_s^A) - w_s\ (q_s^B) \geq b_i - a_i$, and newspaper B otherwise. The newspapers assign a probability distribution $G_s\ (\cdot)$, with density $g_s\ (\cdot)$, to the difference $b_i - a_i$. The probability the newspaper attaches to individual i reading newspaper A is $G_s\ (\Delta w_s)$.

The newspapers have the same cost function, with newspaper *A's* expected cost function, C, assumed as the following linear form

$$C\left(q^A, q^B\right) = \underbrace{c_q \sum_s q_s^A +}_{\text{first copy costs}} \quad \underbrace{\sum_s n_s G_s[\Delta w_s] c_s}_{\text{reproduction/distribution costs}}, \tag{1}$$

where c_q is the cost of producing one unit of news space, and c_s is the average cost of reproducing and delivering a newspaper to readers in group s. This costs function summarize the idea of a media firms that operate under increasing return to scale, and is central to the key result of the model. In fact, in the media industry the first copy of a product (TVs program or newspaper) have high fixed costs, differently the additional costs of distributing and delivering it is very small.

Let p_s be the increase in marginal profit from selling an additional newspaper to a voter in group s. This includes the price of the newspaper plus the price per reader in group s paid for by advertisers, minus the average cost of reproducing and delivering a newspaper to a person in group s. The expected profit function of newspaper A is then

$$E\left(\pi^A\right) = \sum p_s n_s G_s\left[\Delta w_s\right] - c_q \sum q_s^A\ . \tag{2}$$

Under this setting, Strömberg (2004a) shows that the Nash Equilibrium in the competition between the two newspapers implies that the ratio $w'_s(q_s^A)/w'_s(q_s^B) = 1$ for all s, and both newspapers set the same news profiles, $q^A = q^B$. For all s, the equilibrium condition is

$$n_s p_s v_s \rho'(q_s^*) = c_q . \qquad (3)$$

Relation (3) defines the equilibrium news profile, q_s*, as a function of several variables. More specifically, q_s* will be higher for groups more valuable for advertising, groups with a higher private value of news and for news that concerns *large* groups.

How do these results affect policy bias in the political market ? Assume that a voter i derives utility $u_i(z_s^L) + l_i$ and $u_i(z_s^R) + r_i$ from the implemented platform of parties L and R, respectively; with l_i and r_i describing preferences for other fixed policies or candidate characteristics. The model assumption is that the voters are unable to resolve a unique political equilibrium spending level, which thus makes media information concerning these spending levels valuable to them. Thus, voter i votes for party L if $\Delta u_i = E_i[u_i(z_s^L) - u_i(z_s^R)] \geq r_i - l_i$, and for party R otherwise. Voters informed about party policy announcements have $\Delta u_i = u_i(z_s^L) - u_i(z_s^R)$, which represents the differences in the party platforms. Instead, for the uninformed voters, $\overline{\Delta u_i}$ remains constant as it is independent from party announcements.

Political parties, in maximizing the chance of re-election, assign a probability distribution F_s to the difference $r_i - l_i$. The probability that individual i votes for party L is $F_s[\Delta u_i]$. Thus, the expected number of voters for party L is given by

$$E\left(n^{L}\right)=\sum_{i}\rho_{s}F_{s}\left[\Delta u_{i}\right]+\left(1-\rho_{s}\right)F_{s}\left[\overline{\Delta u_{i}}\right]. \qquad (4)$$

At equilibrium, parties *L* and *R* equate the ratio between average marginal utility $u'_s(z_s^L)/u'_s(z_s^R)$, for all *s*. It follows that both parties will set the same platform, i.e. $z_s^L = z_s^R = z_s^*$, for all *s*, and for some constant $\lambda > 0$, $n_s\rho(q_s^*)u_s'(z_s^*) = n_s\lambda$.

This equilibrium condition implies that the equilibrium spending levels equate marginal utilities weighted by the share of voters in the group who find news on election platforms. As a corollary, it follows that equilibrium spending on program *s*, z_s^*, is increasing in the share of informed voters, ρ_s, the size of the group, n_s, the revenue per reader in the group, p_s, and the private value of news, v_s:

$$z_s^* = z^*(\rho_s, n_s, p_s, v_s)\,. \qquad (5)$$

In summary, the media competition will induce a policy bias towards large groups because the voters in these groups are more informed, since the mass media targets these groups. It is important to note that the size of the group, n_s, as well as the revenue per reader in the group, p_s, only affect spending via the media market. Put differently, the bias towards large groups is indirect, and only a consequence of media competition.

2.3 Implications for agricultural policy

The most important stylized fact about agricultural protection and support is the so called 'development paradox', namely the taxation-protection switch of agriculture associated with economic development.[1] The classic interpretation for this pattern is that, on moving from developing to industrialized countries, the farm groups, compared to the consumer and taxpayer groups, become more effective in collective action, as a consequence of the smaller farm numbers and the lower communication and transportation costs inherent in industrial development, all factors that reduce organizational costs and free rider problems for collective action (Olson, 1965). Moreover, since the per capita cost on the rest of society falls with less farmers, the opposition of taxpayers and consumers to (agricultural) subsidies decreases as the number of farmers decreases with economic development (Becker, 1983; Swinnen, 1994; Anderson 1995).

The model developed here suggests that the relationship between agricultural protection and economic development will be affected by the introduction of media competition in the political market. Voter preferences and government policies will be affected by how the media industry provides information to the people. The key prediction of the model is that, *ceteris paribus*, government transfers like agricultural protection should, as an effect of media competition, be biased toward *large* groups[2]. Because the agricultural group is relatively large in poor countries and relatively small in richer ones, an important implication of the model is that, all other things constant,

[1] See Anderson (2008) for recent evidence.

[2] Interestingly, this prediction goes exactly in the opposite direction with respect to the traditional political economy model that does not consider the effect of media bias, like the Becker (1983) and the Swinnen (1994) models. In fact, in those models government transfers tend to be biased toward *small* groups, in line with the well known 'paradox of numbers' of Marcur Olson (1965).

the effect of media competition on agricultural protection should be different in poor *vs.* rich countries. More specifically, we expect that the impact on agricultural protection induced by mass media competition should be *positive* in poor countries, and *negative* in rich countries. Thus, we can formulate the following key empirical prediction:

Hypothesis 1: *Mass media-competition-induced political bias should reduce agricultural protection in rich-(developed) countries, but it should increase it in poor-(developing) countries, ceteris paribus*.

The empirical test of the prediction above is the main focus of the next sections of the paper. Nevertheless, the above hypothesis comes from a model where the mass media companies maximize profit, disregarding that the objective function of state *vs.* commercial media could be different. For example, Prat and Strömberg (2005) show that a shift from state-control to private-control of TV news, attract viewers previously undersupplied with information and contribute to increase both voter information and political participation. Hence, also changes in media structure may have important implications for public policy.

We consider two different assumptions about the behavior of state media (Prat and Strömberg, 2005): (*i*) the public media is unbiased and/or the bias is randomly distributed across countries or, (*ii*) the public media reflects the political optimum for the government in the absence of commercial media, as the government control causes the public media to present the governments preferences.

The first assumption, normally used in existing theoretical comparisons between state TV and commercial TV, is based on the idea that the former is managed by a

social planner (see Anderson and Coate, 2005). This translates into a situation where the state media-induced political-bias is zero. Thus, an increase in private media should benefit agricultural groups in poor countries (who are taxed) and urban groups in rich countries (who are taxed), as these groups are the targets of profit maximizing media.

Under the second assumption, when the media is controlled by the state, there is bias towards government preferences. In agricultural policy, government preferences are biased to favor urban interest in poor countries and agricultural interests in rich countries. Hence, an increase in the share of commercial media should *reinforce* the effect of hypothesis 1 by increasing the information available and the political participation of (large) groups of voters who, under the mass media state monopoly, had less information. In summary, this leads to the following empirical prediction:

Hypothesis 2: *An increase in the share of private (state) media should be associated with higher (lower) agricultural protection in poor countries, and with lower (higher) protection in rich ones, ceteris paribus*.

3. Data and empirical specification

We test our predictions on a sample of about 67 developing and developed countries observed from 1975 to 2004. Overall, we have more than 1,600 observations but the panel structure is unbalanced, due especially to the partial time coverage of transition countries where, the starting year observation is, for obviously reasons, around the 1992.

3.1 Dependent variable

Our dependent variable is the *relative* rate of assistance (*rra*) to agriculture, calculated as the ratio between the agricultural and non-agricultural nominal rate of assistance: $rra = [(1 + nra_{ag})/(1 + nra_{nonag}) - 1]$, where nra_{ag} is the nominal assistance to agriculture and nra_{nonag} is the nominal assistance to non-agricultural sectors. The nra_{ag} measures the total transfer to agriculture as a percentage of the undistorted unit value. It is positive when agriculture is subsidized, negative when it is taxed and 0 when net transfers are zero (see Anderson and Valenzuela 2008 for calculation details). One of the key advantages of using *rra* (instead of *nra*) as our dependent variable is that, especially in developing countries, an important indirect taxation source for agriculture is the positive protection given to the manufacturing sector as an effect of import-substitution policies. Thus, *rra* is a more useful indicator in undertaking an international comparison of the extent to which a country's policy regime has an anti- or pro-agricultural bias.

3.2 Mass media variables

To test the predictions about the effect of the mass media on agricultural policy we needed data on both the share of informed voters, ρ_s, and on the state *vs.* private structure of the media markets. The share of informed voters, ρ_s, is proxied using two alternative media variables: the penetration of TV sets and Radios. More specifically, our media variables are based on the natural logarithm of TV sets and Radios per 1000 inhabitant, based on data from the *Arthur S. Banks Cross National Time-Series Data Archive*. The rationale for using these proxies comes from the argument that, while the share of informed voters, ρ_s, is not observed, we in fact observe the share of media

users, $r_s(q_s)$, that is increasing in news coverage q_s. Because r_s, ρ_s and q_s move in the same direction, it is sufficient to look at the levels and changes in the share of media users, r_s, to test the effect of media bias (see Strömberg, 2004b). Moreover, in our specific contest, another justification for the use of these indicators derive from the Strömberg's consideration that "the emergence of broadcast media increased the proportion of rural and low-education media consumers as it became less expensive to distribute radio waves than newspapers to remote areas, and as these groups preferred audible and visual entertainment to reading. As politicians could reach rural and low-education voters more efficiently, the model predicts an expansion in programmes that benefit these voters" (2004, p. 266).

The variable characterizing the structure of the media market is based on the Djankov et al (2003) media ownership data set. This paper examines the patterns of media ownership in 97 countries around the world, disentangled from state and private ownership of both newspaper and broadcasting media. From this data set, we use the top five shares of private television (*tvpsh*) under the plausible hypothesis that ownership shapes the information provided to voters and consumers. Of course, as suggested by Djankov et al (2003), ownership is not the only determinant of media content, as in many countries government regulates private media. Thus, our identification assumption is correct only if government regulations do not, in our sample, strongly bias the information coverage of private TVs.

The share of private TVs refers to 1998-99. Thus in regressions testing the effect of media structure the panel start in 1994, or later. In doing so we are assuming that the media structure remains quite stable over the observed period, as suggested by Djankov et al (2003). However, the same authors highlight that timing could be an

issue, especially in transition economies where many media enterprises were privatized during the transition period or have increasing rates of foreign ownership. To reduce this potential source of bias the time coverage for these countries in these additional regressions will start in 1996 or later, thus six years from the initial transition period. Moreover we also control for the status of transition country through a regional dummy.

Finally, to reduce potential bias induced by differences in government control and regulation of private TV, we also use in some regressions an index of *press media freedom*. It assumes values equal to 0, 0.5 and 1 for countries that are respectively not-free, partially-free and free, based on information taken from Freedom House.

3.3 Other variables

In the empirical specifications we include, apart from the mass media variables discussed above, additional controls that are likely to affect the level of agricultural protection, as suggested by previous literature. Specifically, we start with a parsimonious specification where, as structural control, we include only the level of development, *gdppc*, measured by the real per capita GDP in PPP taken from the World Bank, *World Development Indicators*. The inclusion of the level of development allows us to control for the so-called '*development paradox*' – namely the strong positive correlation between agricultural protection and per capita GDP – that represents one of the most important stylized fact about agricultural protection patterns (see Swinnen, 1994; Anderson, 1995). The second key covariate is the share of agricultural employment, *emps*, based on *Food and Agriculture Organization* (FAO) data. The

inclusion of the agricultural employment share acts as a control for the well known idea that small groups normally receive more protection and support.

Next we tested the robustness of our finding by adding to the specifications other controls like proxies for comparative advantage, and political institutions. Specifically, to control for comparative advantage we include the agricultural land per capita, *landpc*, and the agricultural export share, *exps*, measured as net-export over production. These two variable are based on data from FAO and World Bank *Agricultural Distortions* database. Finally, we proxy for political institutions by adding the Polity2 index of democracy taken from the Polity IV data base. This index assigns a value ranging from -10 (autocracy) to +10 (democracy) to each country and year, with higher values associated with better democracies. Table 1 shows summary statistics of the variables used in the empirical section of the paper.

4. Econometric strategy and results

The hypotheses put forward in section (2.3) emphasize that the relationship between *media* variables and agricultural protection is conditional upon the level of development. In countries with low *gdppc*, media variables and agricultural protection should be positive related, but when the *gdppc* is high there should be an inverse relationship between these two variables. A priori, we do not know at what level of *gdppc* the relationship changes sign. The following general specification takes care of this issue allowing the data to tell us, endogenously, the exact *gdppc* value of the turning point:

$$rra_{it} = \alpha_0 + \alpha_1 media_{it} + \alpha_2 media_{it} \times gdppc_{it} + \alpha_3 gdppc_{it} + \mathbf{X_{it}}\boldsymbol{\beta} + \varepsilon_{it} \qquad (6)$$

where rra_{it} is our indicator of relative agricultural protection in country *i* and year *t*, $media_{it}$ refers to the media variable of interest, and **X** is a vector of additional controls. Taking the partial derivative of *rra* with respect to the media variable we have

$$\frac{\partial rra_{it}}{\partial media_{it}} = \alpha_1 + \alpha_2 gdppc_{it} \tag{7}$$

Given our hypotheses we expect that $\alpha_1 > 0$ and $\alpha_2 < 0$, such that $\alpha_1 + \alpha_2\ gdppc$ is positive or negative as *gdppc* is higher or lower *gdppc** with $gdppc^* = \alpha_1/-\alpha_2$ the critical turning point level of development at which our media-protection relationship change sign. Note that, a key requirement for the prediction to hold is that *gdppc** should lie within the range of values of *gdppc* in the dataset, namely $gdppc^{MAX} > gdppc^* > gdppc^{MIN}$.

Regarding identification issues, our main concern is omitted variable bias. Indeed, if media variables are correlated with unobserved determinants of protection level, then our estimates will be inconsistent. Note that, *a priori*, the direction of the bias is not predictable. This potential issue is complicated by the fact that our media structure variable, *tvps*, is time invariant. For that reason, we decide to start estimating separately the two hypotheses. Specifically, in testing the hypothesis 1 we treats differences in media structure as unobserved fixed effects, thus running fixed effects specifications that control for both country and time heterogeneities. This strategy allow also to better understand which kind of sample variation – across or within countries – are driving the media-development-protection-effect hypothesis. However in a final section we propose an extension taking care also of our hypothesis 2, by testing the effect of media structure on agricultural protection.

4.1 The effect of media penetration

Table 2, reports estimates of (6) without any additional control other than the media variable, per capita GDP, and the interaction term between them. Columns (1)–(4), use as media variable TVs penetration, while columns (5)–(8) Radios penetration. The pooled OLS specification in column (1) yields statistically significant media coefficients for both the linear and the interaction effect. A positive sign on the linear term and a negative one on the interaction effect means that the penetration of TV sets increase protection at low level of development, but decrease it when a certain amount of economic development is reach, a results totally consistent with our prediction. The critical turning point of the media-development-protection relationship is a per capita GDP of 1,770 US dollars. Thus, while it is quite far from the median value, equal to about 6,000 US dollars, it lies largely within the range of the distribution (see Table 1). In Column (2) we control for global shocks adding time fixed effects. The media coefficients are now less precise estimated especially with regard to the linear term (p-value = 0.08). Although the estimate is still significant, the time fixed effects model reduce both the magnitude of the coefficients and the critical turning point, suggesting that the media effect seems especially driven by within country variation in the data. This is largely confirmed in column (3) where we isolate the within media effect adding a vector of country fixed effects. Now the media coefficients increase in both (absolute) magnitude and significant level (p-value < 0.01) and, moreover, the critical turning point (about 3800) is now more close to the median value.

In column (4) to check for robustness, we display results of a dynamic version of the equation (6), estimating autoregressive specifications that control for persistency

in agricultural protection.[3] As expected the magnitude of media coefficients shrink substantially as the protection dynamic is now largely captured by the lagged dependent variable, showing that actual protection is a strong predictor of future protection. However what is interesting here is that the significant level of media variables is still very high (p-value < 0.01) and the critical turning point increase substantially, been now very close to the median value.

In columns (5)–(8) of Table 2 we repeat the same exercise for Radios penetration. In these regressions we lost some observations as the country and time coverage for Radios is lower than for TVs. Overall, the findings for Radios are similar: Radios penetration significantly increase protection in countries with a level of development, approximately, below 6,000 US dollars, but it reduce protection when per capita GDP is above this critical level. Thus, this patterns are strongly consistent with our hypothesis, with the only qualification that for Radios penetration the precision of the estimate in some regressions is lower than for TV regressions, but still remarkable high.

Quantitatively, the estimated marginal impact of our media variables on protection, based on the estimated coefficients from columns (4) and (8), ranges from 2.7 (4.01) for the poorest country in 1975, to –18.3 (–22.7) for the richest country in 2004, for TVs sets and Radios, respectively. Since the standard deviation of the (log) TVs and Radios penetration is about 1.72 and 1.05, the estimates imply that a one-standard-deviation increase in our media variables would affect the typical country's protection level on impact by a magnitude of around 18 percent for TVs and 14 percent

[3] Note that, although the joint presence of fixed effects and the lagged protection level could yield inconsistent estimates, our large time period (22 years for the average countries) strongly reduces this potential source of bias.

for Radios (negatively for rich countries and positively for poor ones). Thus our media effect is not only statistically significant but also relevant from an economic point of view.

4.2 Conditional effect results

The empirical literature has considered numerous variables to explain cross-country differences in agricultural protection. Thus in Table 3 we report regressions that control for standard protection covariates. The main objective here is to asses the robustness of our finding, as well as to explore (potential) channels through which our media variable exert its effect on protection.

In Column (1) we control for the share of agricultural workers and the media variable considered is TVs penetration. Its estimated coefficient is, as expected, negatively and significant. Most importantly the media coefficient and its interaction term retains significance at the 1% level, suffering only a slight (absolute) reduction in magnitude (compare column 3 of Table 2). In column (2) we control for comparative advantage using land per capita and the agricultural net export share. In line with previous works, comparative advantage variables enter with significantly negative coefficients. The coefficients on media variables remain significantly at 1% level, however now especially the linear term suffer a reduction of about 11% and, as a result, the critical turning point shrink some what.

In columns (3) and (4) we control for democratic institutions and policy persistence, respectively. Controlling for democracy appears important here, as a potential reason for the above results is that our media variables are capturing the effect of (omitted) political institutions that are themselves important determinants of policy

outcomes (see Persson and Tabellini, 2003). The Polity2 index of democracy is positive and strongly significant (p-value = 0.002). This evidence are consistent with other studies who find that democratization have a causal positive effect on agricultural protection (see Olper and Raimondi, 2009). Important for our analysis, the inclusion of the democracy index has only a minor effect on the media coefficients. A similar pattern emerge controlling for persistency in protection with the only qualification that now the coefficient of relative size of the agricultural group shrink substantially and is insignificant. Finally, in column (5), we control for the degree of media freedom to reduce the potential bias induced by differences in government control and regulation of the mass media. The media freedom coefficient is positive but insignificant and, if any, increase some what the absolute magnitude and significance level of the media coefficients.[4]

Next, column (6)-(10) repeat the same battery of regressions using as media variable Radios penetration. The overall results are similar, in the sense that once again the mass media linear term exert a positive effect on protection, and its interaction with per capita GDP turn out to be negative. However, the regression results when Radios is used as media variable are weaker. Indeed, once comparative advantage and other controls are added to the specification, only the media interaction effect retains its significant level, while the linear term do not. Note however that in almost all specifications the estimated media coefficients are jointly significant at usual critical level (Wald test).

[4] Note that the increase in the absolute magnitude of the media coefficients in regression (5) (as well as in regression (10)) is partially due to the reduction of the overall observations of the sample.

Summarizing, the evidence discussed above on the effect of the mass media-competition-induce political bias on agricultural protection gives a strong overall support to our argument. The share of informed voters, here proxied by the TVs and Radios penetration, positively affect agricultural protection in 'poor' developing countries, and have a negative effect on protection in countries with higher development levels. In the 'low' income countries sample the average level of protection is negative. Therefore these results also indicate that mass media induce an overall reduction of agriculture policy distortions. Finally, the results also suggest that the media bias exerted by TVs on agricultural protection significantly dominate that of Radios.

4.2 Extension: the role of the media structure

The above evidence comes from a model where mass media companies maximize profit. However, many countries in our dataset have also state controlled media. Thus, understanding how the media owner structure affects the mass media-protection relationship (our hypothesis 2), represents a natural extension of the analysis. We test this additional prediction following exactly the same strategy than before, with the only differences that now the country fixed effect (when included) are substituted by regional fixed effects. Moreover as our proxy for the share of private Television, *tvpsh*, is measured around 1998-1999, we are forced to work with a shorten panel starting in 1994.

Columns (1) of table (4), reports unconditional pooled regressions. Both the linear and the interaction effect are significant and with their expected signs. The share of private TVs affects protection positively for per capita GDP below 7,451 US dollar,

and negatively for per capita GDP above this critical level. The inclusion of time (Column 2) and regional (column 3) fixed effects, leave the results totally unaffected. A similar pattern emerges when we add *all* the other standard covariates to the specification.

Next, a fundamental question is now to understand if the share of private TVs and its interaction effect with per capita GDP, are capturing an independent effect of the media structure on agricultural protection or, differently, they are simply proxy for the (omitted) effect induced by the media penetration. Indeed, the share of private TVs present a positive correlation (r = 0.40) with the penetration of TV sets.

To address this potential source of bias, in column (5) we add to the regression also this last variable and its interaction effect with per capita GDP. Their estimated coefficients are positive for the linear term and negative for the interaction term, although barely significant,[5] and have an order of magnitude virtually identical to the fixed effects regression reported in Table 3 (see column (3)). Most interesting, however, is the fact that the estimated coefficients of private TVs share and its interaction term are virtually unaffected, suggesting that these variables are capturing an independent effect of the media structure on agricultural protection.

As a further check on the results, Column (6) and (7) run two separate regressions, using the estimated critical GDP per capita (8,721) of column (5) as the break point between 'poor' (GDP per capita below 8,721) and 'rich' (GDP per capita above 8,721) countries. Thus in these regressions our media variables are introduced

[5] There are two good reasons for the lost of significance of this effect. First, as show before the hypothesis 1 hold especially within countries, a dimension largely lost in the short panel of table 4; second there are obviously some collinearity between TVs penetration and the share of private TVs. Indeed, if we run the same regression omitting the TVs private share variables, then the TVs penetration coefficients turn out to be significant at 5 percent level.

linearly. The results are that the estimated media coefficients in the 'poor' country regression are significant positive, while they are negative and significant in the 'rich' country regression. Thus, this piecewise-linear form tells as a similar story to that found in the representation that includes interaction between media variables and per capita GDP, confirming that the share of private TVs have an independent and significant effect on agricultural protection, giving an overall support to our prediction.

Summarizing, keeping in mind data limitations that preclude less parsimonious specifications, this section gives support the notion that agricultural protection is affected by both the share of informed voters and the share of private television, but not in a linear fashion. Both these media variables tend to increase protection (or reduce taxation) in poor countries but strongly reduce it in rich ones, and, thus, reduce distortions in all countries.

5. Concluding remarks

This paper provides evidence on the relationship between mass media competition and agricultural protection for a large group of countries. Strömberg's (2004a) theory predicts that information provided by mass media reflects the media's incentives to provide news to different groups in society, affecting the groups' influence in policy-making. As a consequence mass media competition will induce a policy bias towards large groups because these groups are more informed voters as the mass media target them.

We apply this theory to agricultural policy. This results in the hypotheses that (a) the impact of mass media competition on agricultural policy will be conditional to the level of development, and (b) that this effect is opposite to the so called

'development paradox' of agricultural policies. Thus, the traditional switch of agricultural policy from taxation to subsidization which is associated with economic development will be smoothed in the presence of mass media competition.

We use data on agricultural policy from about 67 countries, spanning a wide range of development stages and media markets, to test these predictions. In line with the theoretical hypotheses, we find that public support to agriculture is strongly affected by TVs and Radios penetration, as well as by the structure of the mass media markets. In particular, an increase in the share of informed voters, proxy by media penetration, and a greater role of the private mass media in society is associated with policies which benefit the majority more: it reduces taxation of agriculture in poor countries and reduces subsidization of agriculture in rich countries, *ceteris paribus*.

This evidence is consistent with the idea that increased competition in commercial media reduces transfers to special interest groups and contributes to more efficient public policies, as a better informed electorate increases government accountability.

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Table 1.
Descriptive statistics

	Median	Max.	Min.	Std. Dev.	Obs.	Countries
Relative rate of assistance	-1.302	404.874	-94.620	63.692	1627	67
Log TVs (x 1000 inhabitants)	2.823	4.603	-4.510	1.715	1627	67
Log Radios (x 1000 inhabitants)	3.297	5.350	-0.062	1.057	1355	65
TV private share	0.448	1.000	0.000	0.315	58	58
Media freedom	0.500	1.000	0.000	0.413	1388	67
GDP per capita (PPP)	6031	35327	480	9298	1627	67
Agricultural employment share	0.245	0.886	0.015	0.280	1627	67
Land per capita	0.614	35.024	0.040	3.872	1627	67
Net export share	0.021	1.276	-1.730	0.361	1599	67
Democracy index (Polity2)	8.000	10.000	-9.000	6.877	1627	67

Notes: See text for variables description.

Table 2.
Effect of media penetration on agricultural protection: Unconditional regression results

Dependent variable	*- Agricultural Relative Rate of Assistance -*							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Television sets				Radio	
Media	**4.567**	**3.924**	**6.686**	**2.992**	**10.767**	10.566	**14.135**	**4.279**
	(0.015)	*(0.083)*	*(0.001)*	*(0.000)*	*(0.065)*	*(0.105)*	*(0.008)*	*(0.043)*
*Media * GDP per capita*	**-0.0026**	**-0.0028**	**-0.0018**	**-0.0006**	**-0.0017**	**-0.0017**	**-0.0020**	**-0.0008**
	(0.002)	*(0.003)*	*(0.000)*	*(0.002)*	*(0.005)*	*(0.004)*	*(0.001)*	*(0.001)*
GDP per capita	0.0147	0.0156	0.0068	0.0022	0.0120	0.0122	0.0105	0.0040
	(0.000)	*(0.000)*	*(0.008)*	*(0.016)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.003)*
Lagged protection				0.6876				0.6602
				(0.000)				*(0.000)*
Time fixed effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	1627	1627	1627	1609	1355	1355	1355	1339
Countries	67	67	67	67	65	65	65	65
Adj R square	0.474	0.477	0.865	0.931	0.482	0.483	0.874	0.932
Critcal GDP per capita	**1770**	**1411**	**3805**	**5107**	**6371**	**6143**	**6953**	**5212**

Notes: In parentheses p-value based on standard errors robust to heteroschedasticity and autocorrelation of unknown form..

Table 3.
Effect of media penetration on agricultural protection: Conditional regression results

Dependent variable	*- Agricultural Relative Rate of Assistance -*									
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Television sets					Radio		
Media	**6.438**	**5.682**	**5.481**	**2.423**	**3.697**	**8.103**	6.564	6.845	2.457	3.486
	(0.001)	*(0.009)*	*(0.011)*	*(0.006)*	*(0.002)*	*(0.061)*	*(0.146)*	*(0.126)*	*(0.242)*	*(0.191)*
*Media * GDP per capita*	**-0.0012**	**-0.0014**	**-0.0013**	**-0.0006**	**-0.0009**	**-0.0014**	**-0.0012**	**-0.0013**	**-0.0006**	**-0.0010**
	(0.005)	*(0.003)*	*(0.004)*	*(0.005)*	*(0.001)*	*(0.023)*	*(0.048)*	*(0.037)*	*(0.016)*	*(0.034)*
GDP per capita	0.0052	0.0060	0.0059	0.0023	0.0035	0.0076	0.0070	0.0076	0.0034	0.0048
	(0.020)	*(0.013)*	*(0.013)*	*(0.014)*	*(0.006)*	*(0.016)*	*(0.028)*	*(0.018)*	*(0.011)*	*(0.034)*
Employment share	-1.5792	-1.4938	-1.3967	-0.2767	-0.1832	-1.6447	-1.5721	-1.3991	-0.2880	-0.1959
	(0.003)	*(0.006)*	*(0.006)*	*(0.113)*	*(0.470)*	*(0.006)*	*(0.010)*	*(0.011)*	*(0.166)*	*(0.535)*
Land per capita		-2.499	-2.373	-1.357	-1.982		-0.732	-0.685	-0.585	-0.882
		(0.040)	*(0.042)*	*(0.004)*	*(0.018)*		*(0.551)*	*(0.568)*	*(0.241)*	*(0.353)*
Export share		-0.2957	-0.2968	-0.1702	-0.2129		-0.3765	-0.3798	-0.2308	-0.2927
		(0.000)	*(0.000)*	*(0.001)*	*(0.000)*		*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Polity2 (democracy index)			0.7983	0.3194	0.3435			0.8308	0.3555	0.4376
			(0.002)	*(0.010)*	*(0.036)*			*(0.003)*	*(0.011)*	*(0.031)*
Lagged RRA				0.667	0.645				0.637	0.615
				(0.000)	*(0.000)*				*(0.000)*	*(0.000)*
Media freedom					0.311					0.919
					(0.888)					*(0.730)*
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1627	1599	1599	1581	1355	1355	1327	1327	1311	1086
Countries	67	66	66	66	66	65	64	64	64	64
Adj R square	0.868	0.873	0.875	0.934	0.930	0.877	0.882	0.884	0.934	0.929
Critcal GDP per capita	**5196**	**4064**	**4177**	**4350**	**4230**	**5804**	**5412**	**5381**	**4001**	**3639**

Notes: In parentheses p-value based on standard errors robust to heteroschedasticity and autocorrelation of unknown form.

Table 4.
Effect of TV private share on agricultural protection: Pooled regression results

Dependent variable	*- Agricultural Relative Rate of Assistance -*						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TVs private share (tvps)	**37.562**	**37.413**	**32.718**	**33.318**	**34.257**	**16.880**	**-67.086**
	(0.000)	*(0.000)*	*(0.006)*	*(0.004)*	*(0.006)*	*(0.030)*	*(0.010)*
*tvps * GDP per capita*	**-0.0050**	**-0.0050**	**-0.0048**	**-0.0044**	**-0.0039**		
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*		
GDP per capita	0.0054	0.0054	0.0052	0.0050	0.0113	-0.0001	0.0059
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.007)*	*(0.944)*	*(0.003)*
Employment share				-0.0742	0.2114	-0.1557	2.5017
				(0.736)	*(0.492)*	*(0.409)*	*(0.215)*
Land per capita				-1.458	-1.472	-6.860	-1.043
				(0.022)	*(0.022)*	*(0.004)*	*(0.083)*
Export share				-0.2958	-0.3070	-0.0938	-0.3753
				(0.000)	*(0.000)*	*(0.030)*	*(0.000)*
Polity2 (democracy index)				0.1172	-0.0143	0.6667	-11.4930
				(0.810)	*(0.981)*	*(0.142)*	*(0.120)*
log (TVs)					**6.015**	**7.079**	**-37.918**
					(0.086)	*(0.006)*	*(0.092)*
*log (TVs) * GDP per capita*					-0.0014		
					(0.128)		
Sample	Full	Full	Full	Full	Full	gdppc < 8,721	gdppc > 8,721
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effects	No	No	Yes	Yes	Yes	Yes	Yes
Observations	605	605	605	600	546	284	262
Countries	58	58	58	58	58	33	32
Adj R square	0.479	0.482	0.490	0.553	0.565	0.460	0.481
Critcal GDP per capita	**7451**	**7423**	**6765**	**7564**	**8721**		

Notes: In parentheses p-value based on standard errors robust to heteroschedasticity and autocorrelation of unknown form. Regressions (3)-(5) include regional fixed effects for Latin American, African, Asian and transition countries.