

Olper, Alessandro; Swinnen, Johan F. M.

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Alessandro Olper and Johan F.M. Swinnen



Katholieke Universiteit Leuven

LICOS Centre for Institutions and Economic Performance
Huis De Dorlodot
Deberiotstraat 34 – mailbox 3511
B-3000 Leuven
BELGIUM

TEL: +32-(0)16 32 65 98

FAX: +32-(0)16 32 65 99

<http://www.econ.kuleuven.be/licos>

Mass Media and Public Policy: Global Evidence from Agricultural Policies

Alessandro Olper and Johan F.M. Swinnen*

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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 affected by the mass media. In particular, an increase in the media diffusion (TV and radio) 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 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

Keywords: Mass Media; Media Structure; Information; Agricultural Protection; Political Economy

Alessandro Olper, Department of Agricultural and Food Economics,,Università degli Studi di Milano. E-mail: alessandro.olper@unimi.it. Johan Swinnen, LICOS (Centre for Institutions and Economic Performance) and Department of Economics, University of Leuven (KUL): E-mail: jo.swinnen@econ.kuleuven.be. We thank participants at conferences at Leuven (LICOS) and Beijing (IAAE) for useful comments on an earlier version of the paper. The work was supported by the KU Leuven Research Council (OT, EF and Methusalem projects).

Mass Media and Public Policy:

Global Evidence from Agricultural Policies

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 economists¹. 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 from the World Bank which

¹ See McCluskey and Swinnen (2009) for a review.

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 variable.

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 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 in turn 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 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 1970 to 2004. The paper also 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 $N = \sum n_s$ 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, $\sum n_s z_s \leq I$, 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, uninformed 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

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

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 cost function reflect the fact that media firms operate under increasing return to scale, and that the first copy of a product (TV program or newspaper) has high fixed costs, but the additional costs of distributing are 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

$$E(\pi^A) = \sum p_s n_s G_s[\Delta w_s] - c_q \sum q_s^A. \quad (2)$$

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

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

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

$$E(n^L) = \sum_i \rho_s F_s[\Delta u_i] + (1 - \rho_s) F_s[\overline{\Delta u_i}]. \quad (4)$$

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 :

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

In summary, media competition will induce a policy bias towards large groups because the voters in these groups are more informed, since mass media target 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 policy is the so called ‘development paradox’, namely the policy switch from taxation to subsidization of agriculture

associated with economic development (Anderson, 2009). The classic interpretation for this pattern is that, when a country becomes richer, farm groups, compared to consumer and taxpayer groups, become more effective in collective action, because the number of farmer declines and because of the reduction in communication and transportation costs with development. Both factors reduce organizational costs and free rider problems in 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 policy 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 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. Because the agricultural group (the number of farmers) is relatively large in poor countries and relatively small in richer ones, an important implication of the model is that, all other things constant, the effect of media competition on agricultural policy 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 empirical prediction:

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

Hypothesis 1 results from a model where the mass media companies maximize profit. However, in several countries included in our empirical analysis state-controlled media play an important role. The objective function of state-controlled media is likely to be different. For example, Prat and Strömberg (2005) show that a shift from state-control to private-control of TV news increases voter information and political participation. Hence, such 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 state-controlled media is unbiased and/or the bias is randomly distributed across countries or, (ii) the state-controlled media is biased toward government 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 implies that the state media-induced political-bias is zero. Under this assumption, an increase in private media should benefit agricultural groups in poor countries – who are taxed – and urban groups in rich countries – who are also taxed – as these groups are targeted more by profit maximizing media than by state-controlled media.

Under the second assumption, the media controlled by the state is biased towards government preferences. As we explained above, there is an extensive literature showing that, in agricultural policy, government preferences are biased to favor urban consumer interests in poor countries and farmers 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, under both assumptions, our analysis leads to the following empirical prediction:

Hypothesis 2: *An increase in the share of private (state) media will 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 67 developing and developed countries observed from 1970 to 2004. Overall, we have more than 1,600 observations but the panel structure is unbalanced. Specifically, in transition countries the starting year of observation is around 1992.

3.1 Dependent variable

Our dependent variable is a measure of agricultural policy. We use the World Bank indicator of 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 (see Anderson and Valenzuela 2008 for details). 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. One of the key advantages of using rra (instead of nra) as our dependent variable is that, especially in developing countries, an important indirect source of taxation for agriculture is trade protection of the manufacturing sector as part of import-substitution policies. Thus, rra is a more useful indicator in 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 need 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 of radios. More specifically, our media variables are based on the natural logarithm of TV sets and radios per 1000 inhabitants, based on data from the *Arthur S. Banks Cross National Time-Series Data Archive*. The rationale for using these proxies is that, while the share of informed voters, ρ_s , is not observed, we 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 context, another justification for the use of these indicators derive from 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 benefits these voters" (2004, p. 266).

We use two variables to measure state control of media. The first variable measuring the structure of the media market is based on the Djankov et al (2003) media ownership data set, which separate state and private ownership of both newspapers and broadcasting media. From this data set, we use the top five shares of private television (*tvpsc*) 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.

Data on the share of private TVs is limited to 1998-99. Therefore, we restrict our dataset in regressions testing the effect of media structure to a panel starting in 1994, or later. In doing so we are assuming that the media structure remained stable over the observed period. Djankov et al (2003) suggest that this is a reasonable assumption, except for transition economies where many media enterprises were privatized in the 1990s. 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

after the start of transition. Moreover we also control for the status of transition countries through a regional dummy.

The second variable to measure state control of the media which also control for differences in government regulation of private TV, is an index of *press media freedom*. The index is based on data from Freedom House and assumes values equal to 0, 0.5 and 1 for countries that are respectively not-free, partially-free and free.

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 controls, 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 (Anderson, 2009).

Next we tested the robustness of our findings by adding additional control variables to the specifications, like proxies for comparative advantage, and political institutions. The first 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 receive more protection and support. To control for comparative advantage we include

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 the World Bank's *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.

4. Econometric strategy and results

The hypotheses put forward in section 2.3 imply that the relationship between the $media$ variables and rra is conditional upon the level of development. In countries with low $gdppc$, the media variables and rra should be positive related, and when $gdppc$ is high there should be an inverse relationship between these variables. A priori, we do not know at what level of $gdppc$ the relationship changes sign. By using a general specification we can derive the $gdppc$ value of the turning point from the estimated coefficients:

$$rra_{it} = \alpha_0 + \alpha_1 media_{it} + \alpha_2 media_{it} \times gdppc_{it} + \alpha_3 gdppc_{it} + \beta x_{it} + \varepsilon_{it} \quad (6)$$

where rra_{it} measures relative rate of assistance in country i and year t , $media_{it}$ refers to the media variable of interest, and x_{it} is a vector of additional controls. Taking the partial derivative of rra with respect to the media variable we have

$$\frac{\partial rra_{it}}{\partial media_{it}} = \alpha_1 + \alpha_2 gdppc_{it} \quad (7)$$

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

Regarding identification issues, our main concern is omitted variable bias. If the media variables are correlated with unobserved determinants of the protection level, then our estimates will be inconsistent. Note that, *a priori*, the direction of the bias is not predictable. This potential problem is complicated by the fact that one of our media structure variables, *tvps*, is time invariant. For that reason, we decided to estimate first the two hypotheses separately. Specifically, in testing hypothesis 1 we treat differences in media structure as unobserved fixed effects, thus running fixed effects specifications that control for both country and time heterogeneities. This strategy allows also to better understand which part of sample variation – across or within countries – is driving the results. Later we extend the model and also test hypothesis 2.

4.1 The effect of media penetration

Table 2 reports estimation results of different specifications based on model (6) using TV penetration as media variable. Columns (1)-(3) present unconditional regression results. The pooled OLS specification in column (1) yields statistically significant media coefficients for both the linear and the interaction effect. The positive sign for the linear term and the negative sign for the interaction effect are consistent with hypothesis 1, i.e. that the penetration of TV sets increase the *rra* at low levels of

development, but decreases the *rra* at higher levels. The turning point of the relationship is a per capita GDP level of 1,770 US dollars. While it is quite far from the median value, which is about 6,000 US dollars, it lies largely within the range of the sample distribution (see Table 1). In Column (2) we control for global shocks adding time fixed effects. The media coefficients are now less precisely estimated especially with regard to the linear term (p-value = 0.08). Although the estimate is still significant, the time fixed effects model reduces the magnitude of the coefficients, suggesting that the media effect seems especially driven by within country variations in the data. This is largely confirmed by the results in column (3) where we isolate the within country media effect by adding a vector of country fixed effects. Now the media coefficients increase in both (absolute) magnitude and significance level (p-value < 0.01). Moreover, the turning point is now at about 3,800 US dollars, closer to the median value.

In columns (4)-(6), to account for the impact of other variables and for omitted variable bias, we report regressions that control for standard protection covariates. The main objective here is to assess the robustness of our finding, as well as to explore (potential) channels through which our media variable exerts its effect on protection. Regression (4) adds the share of agricultural workers. Its estimated coefficient is, as expected, negatively and significant. Most importantly the media coefficient and its interaction term retains significance at the 1% level, with only a slight (absolute) reduction in magnitude. In regression (5) we control for comparative advantage using land per capita and the agricultural net export share. Consistent with previous studies, comparative advantage variables have a significantly negative effect. The coefficients of the media variables remain significant at 1% level. Finally, in regression (6) we

control for democratic institutions. Controlling for democracy is important, as a potential explanation for the above results may be that our media variables are capturing the effect of (omitted) political institutions that are themselves important determinants of policy outcomes. The Polity2 index of democracy is positive and strongly significant (p-value = 0.002). This evidence is 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.

In Table 3, columns (1)-(3), present unconditional regression results for radio penetration. In these regressions there are fewer observations as the time coverage for radios is somewhat lower than for TV, and we lost the observations for two countries. Yet, the findings for radios are similar. Radio penetration significantly increases protection in countries with a low level of development, approximately below 6,000 US dollars, but it reduces protection when per capita GDP is above this level. Thus, these results are consistent with our hypothesis. While the precision of the estimates in some regressions for radio penetration is lower than for TV regressions, the significance is still high and the magnitude of the effect is higher for the linear term, suggesting that radio could be more important in affecting agricultural policy especially in the poor countries where TVs may not be widely available in rural areas.

Next, columns (4)-(6) of Table (3) include additional controls. For all the regressions the radio penetration linear term has a positive effect on protection, and its interaction with per capita GDP is negative. When comparative advantage and other controls are added to the specification, the media interaction effect retains its significant

level, but the linear term does not. However, in almost all specifications the estimated media coefficients are jointly significant at the usual critical levels (Wald test).

In Table 4, as a further check for robustness, we present results of a dynamic version of equation (6), estimating autoregressive specifications that control for persistency in agricultural protection.² As expected, the estimated media coefficients for both TV and radio are substantially smaller than before, as the protection dynamics is now largely captured by the lagged dependent variable, showing that actual protection is a strong predictor of future protection. However, what is more interesting is that the effect of the media variables is still very significant and the turning point increases substantially, to around 5,000 US dollars, which is close to the sample median value.

Quantitatively, the estimated marginal impact of our media variables on protection, based on the estimated coefficients from columns (2) and (4) of Table (4), ranges from about 2.2 for the poorest country in 1970, to -18 for the richest country in 2004, and are quite similar for TV and radio. Since the standard deviation of the (log) TV and radio penetration is about 1.72 and 1.05, respectively, the estimates imply that a one-standard-deviation increase in our media variables would affect the protection level for a typical country by a magnitude of around 17 percent for TV and 14 percent for radio (negatively for rich countries and positively for poor ones). Thus our media effect is not only statistically significant but also relevant from a policy point of view.

As a final check, Table (5) presents additional specifications by splitting the sample between ‘poor’ and ‘rich’ countries. Thus, in these regressions our media

² 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.

variables are introduced linearly. Each column reports two different media coefficients, obtained from *two* identical regressions for TV and radio, respectively, with usual controls like specifications (6) of Tables (2) and (3). Columns (1)-(3) present results for the ‘poor’ country samples, and columns (4)-(6) for the ‘rich’ country samples, with different GDP *per capita* levels used to separate the ‘rich’ from the ‘poor’ countries (4000, 6000, and 8000 \$/capita, respectively).

These additional results are broadly in line with our hypothesis. Indeed, across the different samples, both TV and radio penetration have always positive coefficients in the ‘poor’ country regressions, and negative coefficients in the ‘rich’ country regressions, confirming that the effect of media variables on agricultural policy is conditional on the level of development. Interestingly, the radio penetration coefficients are higher in magnitude and significant only in ‘poor’ country regressions, and the opposite is the case for TV penetration, where the coefficients are higher and significant only in ‘rich’ country regressions. These findings are consistent with the argument that radio as source of news, is more important in poor countries, while in rich countries TV matters most.

Summarizing, the evidence presented above on the effect of mass media-competition-induce political bias on agricultural policy gives strong overall support to our hypothesis 1. The share of informed voters, here proxied by the TV and radio penetration, positively affects agricultural protection in ‘poor’ developing countries, and has a negative effect on protection in countries with higher development levels. In the ‘low’ income country sample the average level of protection is negative. Therefore these results also indicate that mass media induce overall reduction of agriculture policy distortions (with distortions measured as the absolute deviation from free trade).

4.2 The role of the media structure

As discussed in Section 2.3, 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 use a similar empirical strategy as before but because of data restrictions on our explanatory variable, we need to make some adjustments. First, we cannot use country fixed effects as our key media structure variable – the share of private TVs, *tvps*h – is time invariant. Instead we substitute country fixed effects by regional fixed effects (specifically using regional indicators for Latin America, Africa, Asia and transition countries). Second, since the media structure proxy is only available for one year (1998-1999), and for fewer countries (58 instead 67), we use a shorter panel dataset, starting in 1994.

To see how these adjustments affect the basic results, column (2) of Table 6 shows the estimation results of the same regression model as that of column (6) in Table 2, but now using regional instead of country fixed effects and on a reduced panel, with data restricted to the 1994-2004 period. For comparability purpose, in column (1) we also reports the regression (6) of Table 2. A comparison of the two sets of results shows that these adjustments (a shorter panel and regional instead of country fixed effects) do not affect the main results. The estimated media coefficients are comparable: we only observe a reduction in the significance level of the linear term of TV penetration.

We can now proceed to the main focus of our analysis, which is the impact of the change in the media structure from state to private. Column (3) presents the first main regression results: the key media variables are the share of private TV, *tvpsh*, and its interaction effect with *per capita* GDP. Both the linear and the interaction effect are strongly significant (p-value < 0.01) and with their expected signs. The share of private TV affects protection positively at low levels of development, but negatively at higher levels. Hence, these results are consistent with our hypothesis 2 that an increase in the share of private media is associated with higher agricultural protection in poor countries, and with lower protection in rich countries.

A fundamental question is whether the share of private TV and its interaction effect, are capturing an independent effect of the media structure on agricultural protection or, differently, if they are simply a proxy for the (omitted) effect induced by the media penetration. This should be a concern since the share of private TV is positively correlated with the penetration of TV sets ($r = 0.40$).

To address this potential source of bias, in column (4) we add to the regression also TV penetration and its interaction effect. Their estimated coefficients are positive for the linear term and negative for the interaction term, and have an order of magnitude close to those of regression (2). Most interesting, however, is the fact that the estimated coefficients of private TV share and its interaction term are virtually unaffected, suggesting that these variables are capturing an independent effect of the media structure on agricultural protection.

Columns (5) and (6) report regression results by adding an additional structural media variable, the index of *media freedom* to proxy for differences in government regulation of TV. This could be important because the share of private media is not the

only determinant of media content, as in many countries governments regulate the media industry. Its estimated coefficient is negative in both regressions but never significant. More importantly our media variables are unaffected by the addition of this new variable.

As a further check, Columns (7) and (8) present results of two separate regressions, using the estimated turning point of per capita GDP from column (6), equal to about 8,700 US dollar, as the break point between ‘poor’ and ‘rich’ countries³. Thus, in these regressions our media variables are introduced linearly. The results are that the estimated private media share coefficient in the ‘poor’ country regression is significant positive, while it is negative and significant in the ‘rich’ country regression. Thus, the results of this piecewise-linear regressions confirm that the share of private TV have an independent and significant effect on agricultural protection, and that the effect is conditional on the level of development.

In summary, our regression analyses provide empirical support for both hypothesis 1 and 2.

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

³ Note that the results are robust to the changes of critical GDP per capita. For example, using the critical value obtained from the TV penetration coefficients, equal to about 4,200 US dollar, or the average between the two, the results are similar.

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. Moreover, our theoretical analysis further predicts that a growing share of private media will reinforce these results: it will reduce taxation of farmers in ‘poor’ countries and subsidization in ‘rich’ countries.

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 TV and radio penetration, as well as by the structure of the mass media market. 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 also 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
<i>Relative rate of assistance</i>	-1.30	404.87	-94.62	63.69	1627	67
<i>Log TVs (x 1000 inhabitants)</i>	2.82	4.60	-4.51	1.72	1627	67
<i>Log Radios (x 1000 inhabitants)</i>	3.30	5.35	-0.06	1.06	1355	65
<i>TV private share</i>	0.45	1.00	0.00	0.32	58	58
<i>Media freedom</i>	0.50	1.00	0.00	0.41	1388	67
<i>GDP per capita (PPP)</i>	6031	35327	480	9298	1627	67
<i>Agricultural employment share</i>	0.25	0.89	0.01	0.28	1627	67
<i>Land per capita</i>	0.61	35.02	0.04	3.87	1627	67
<i>Net export share</i>	0.02	1.28	-1.73	0.36	1599	67
<i>Democracy index (Polity2)</i>	8.00	10.00	-9.00	6.88	1627	67

Notes: See text for variables description.

Table 2.
Effect of TV penetration on agricultural protection

Variables	Dependent variable					
	- Agricultural Relative Rate of Assistance -					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Log TV</i>	4.567 (0.015)	3.924 (0.083)	6.686 (0.001)	6.438 (0.001)	5.682 (0.009)	5.481 (0.011)
<i>Log TV * GDP per capita</i>	-0.0026 (0.002)	-0.0028 (0.003)	-0.0018 (0.000)	-0.0012 (0.005)	-0.0014 (0.003)	-0.0013 (0.004)
<i>GDP per capita</i>	0.0147 (0.000)	0.0156 (0.000)	0.0068 (0.008)	0.0052 (0.020)	0.0060 (0.013)	0.0059 (0.013)
<i>Employment share</i>				-1.5792 (0.003)	-1.4938 (0.006)	-1.3967 (0.006)
<i>Land per capita</i>					-2.499 (0.040)	-2.373 (0.042)
<i>Export share</i>					-0.2957 (0.000)	-0.2968 (0.000)
<i>Polity2 (democracy index)</i>						0.7983 (0.002)
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	1627	1627	1627	1627	1599	1599
Countries	67	67	67	67	67	67
Adj R square	0.474	0.477	0.865	0.868	0.873	0.875
Critical GDP per capita	1770	1411	3805	5196	4064	4177

Notes: In parentheses p-values based on standard errors robust to heteroschedasticity and autocorrelation. (See text).

Table 3.
Effect of radio penetration on agricultural protection

Variables	Dependent variable					
	- Agricultural Relative Rate of Assistance -					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Log Radios</i>	10.767 (0.065)	10.566 (0.105)	14.135 (0.008)	8.103 (0.061)	6.564 (0.146)	6.845 (0.126)
<i>Log Radios * GDP per capita</i>	-0.0017 (0.005)	-0.0017 (0.004)	-0.0020 (0.001)	-0.0014 (0.023)	-0.0012 (0.048)	-0.0013 (0.037)
<i>GDP per capita</i>	0.0120 (0.000)	0.0122 (0.000)	0.0105 (0.001)	0.0076 (0.016)	0.0070 (0.028)	0.0076 (0.018)
<i>Employment share</i>				-1.6447 (0.006)	-1.5721 (0.010)	-1.3991 (0.011)
<i>Land per capita</i>					-0.732 (0.551)	-0.685 (0.568)
<i>Export share</i>					-0.3765 (0.000)	-0.3798 (0.000)
<i>Polity2 (democracy index)</i>						0.8308 (0.003)
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	1355	1355	1355	1355	1327	1327
Countries	65	65	65	65	65	65
Adj R square	0.482	0.483	0.874	0.877	0.882	0.884
Critical GDP per capita	6371	6143	6953	5804	5412	5381

Notes: In parentheses p-values based on standard errors robust to heteroschedasticity and autocorrelation. (See text).

Table 4.
Effect of mass media penetration on agricultural protection: Dynamic panel model

Variables	Dependent variable - <i>Agricultural Relative Rate of Assistance</i> -			
	(1)	(2)	(3)	(4)
	<u>Television sets</u>		<u>Radios</u>	
<i>Media</i>	2.992 (0.000)	2.423 (0.006)	4.279 (0.043)	2.457 (0.242)
<i>Media * GDP per capita</i>	-0.0006 (0.002)	-0.0006 (0.005)	-0.0008 (0.001)	-0.0006 (0.016)
<i>GDP per capita</i>	0.0022 (0.016)	0.0023 (0.014)	0.0040 (0.003)	0.0034 (0.011)
<i>Employment share</i>		-0.2767 (0.113)		-0.2880 (0.166)
<i>Land per capita</i>		-1.357 (0.004)		-0.585 (0.241)
<i>Export share</i>		-0.1702 (0.001)		-0.2308 (0.000)
<i>Polity2 (democracy index)</i>		0.3194 (0.010)		0.3555 (0.011)
<i>Lagged RRA</i>	0.6876 (0.000)	0.6673 (0.000)	0.6602 (0.000)	0.6367 (0.000)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Observations	1609	1581	1339	1311
Countries	67	67	65	65
Adj R square	0.931	0.934	0.932	0.934
Critical GDP per capita	5107	4350	5212	4001

Notes: In parentheses p-values based on standard errors robust to heteroschedasticity and autocorrelation. (See text).

Table 5.
Effect of mass media penetration on agricultural protection: Additional results

Dependent variable	- Agricultural Relative Rate of Assistance -					
	(1)	(2)	(3)	(4)	(5)	(6)
Media variable coefficients						
<i>Log TV</i>	1.401 (0.473)	1.427 (0.744)	1.440 (0.459)	-3.546 (0.473)	-13.357 (0.017)	-17.088 (0.015)
<i>Log Radios</i>	5.673 (0.086)	5.615 (0.067)	6.727 (0.016)	-5.974 (0.538)	-12.914 (0.304)	-4.190 (0.767)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	<i>gdppc</i> < 4000	<i>gdppc</i> < 6000	<i>gdppc</i> < 8000	<i>gdppc</i> > 4000	<i>gdppc</i> > 6000	<i>gdppc</i> > 8000
Nr. Obs.	678, 589	788, 686	900, 772	921, 738	811, 641	699, 555
Adj R square	0.56, 0.58	0.63, 0.65	0.68, 0.70	0.88, 0.88	0.88, 0.88	0.87, 0.88

Notes: In parentheses p-values based on standard errors robust to heteroschedasticity and autocorrelation. Each column reports the results of two different regressions, one for TV and one for radio, respectively. The controls are: *gdppc*, *emps*, *landpc*, *exps*, and *Polity2*. The figures related to the number of observations and Adj R square, refer to TV and radio regression, respectively. (See text).

Table 6.
Effect of media structure on agricultural protection

Variables	Dependent variable		- Agricultural Relative Rate of Assistance -					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>log TV</i>	5.481 (0.011)	5.911 (0.104)		6.015 (0.086)		6.065 (0.085)	7.154 (0.006)	-41.731 (0.095)
<i>log TV * GDP per capita</i>	-0.0013 (0.004)	-0.0024 (0.022)		-0.0014 (0.128)		-0.0014 (0.127)		
<i>GDP per capita</i>	0.0059 (0.013)	0.0137 (0.004)	0.0050 (0.000)	0.0113 (0.007)	0.0050 (0.000)	0.0114 (0.007)	0.0000 (0.984)	0.0059 (0.004)
<i>Employment share</i>	-1.3967 (0.006)	0.2378 (0.486)	-0.0742 (0.736)	0.2114 (0.492)	-0.0745 (0.729)	0.2099 (0.491)	-0.1462 (0.445)	0.0239 (0.246)
<i>Land per capita</i>	-2.373 (0.042)	-2.464 (0.000)	-1.458 (0.022)	-1.472 (0.022)	-1.458 (0.021)	-1.467 (0.022)	-6.908 (0.003)	-1.100 (0.074)
<i>Export share</i>	-0.2968 (0.000)	-0.2864 (0.001)	-0.2958 (0.000)	-0.3070 (0.000)	-0.2960 (0.000)	-0.3084 (0.000)	-0.0967 (0.024)	-0.3697 (0.000)
<i>Polity2 (democracy index)</i>	0.7983 (0.002)	0.0884 (0.890)	0.1172 (0.810)	-0.0143 (0.981)	0.1272 (0.840)	0.0819 (0.911)	0.7417 (0.120)	-12.300 (0.117)
<i>TV private share (tvps)</i>			33.318 (0.004)	34.257 (0.006)	33.344 (0.005)	34.445 (0.006)	17.355 (0.006)	-61.466 (0.030)
<i>tvps * GDP per capita</i>			-0.0044 (0.000)	-0.0039 (0.001)	-0.0044 (0.000)	-0.0040 (0.001)		
<i>Media freedom</i>					-0.2917 (0.978)	-2.8379 (0.801)	-2.6160 (0.587)	22.5908 (0.649)
Sample	1970-2004	1994-2004	1994-2004	1994-2004	1994-2004	1994-2004	gdppc < 8,700	gdppc > 8,700
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country (regional) fixed effects	Yes	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)
Observations	1599	546	600	546	600	546	284	262
Countries	67	58	58	58	58	58	33	32
Adj R square	0.880	0.528	0.552	0.565	0.552	0.564	0.474	0.481
Critical GDP per capita	4177	2421	7564	8721	7566	8720		

Notes: In parentheses p-values based on standard errors robust to heteroschedasticity and autocorrelation. (See text).