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Mass Media and Public Policy: Global Evidence from Agricultural Policies

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Mass media play a crucial role in information distribution and in the political market and public policy making. Theory predicts that information provided by the mass media reflects the media's incentives to provide news to different groups in society and affects these groups' influence in policy making. We use data on agricultural policy from 69 countries spanning a wide range of development stages and media markets to test these predictions. Our empirical results are consistent with theoretical hypotheses that public support for agriculture is affected by the mass media. In particular, an increase in media (television) diffusion is associated with policies that benefit the majority to a greater extent and is correlated with a reduction in agriculture taxation in poor countries and a reduction in the subsidization of agriculture in rich countries, ceteris paribus. The empirical results are consistent with the hypothesis that increased competition in commercial media reduces transfers to special interest groups and contributes to more efficient public policies. JEL Codes: D72, D83, Q18

There is a rapidly growing body of literature on the economics of the mass media. This literature has led to a series of important new hypotheses and insights in an area that has been long neglected by economists.[1] An important strand 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 the mass media and public policy is theoretical. A few empirical studies have attempted to assess the effect of media on policy outcomes. Some key findings from this literature suggest that access to mass media empowers people politically and, as such, increases the benefits they receive from

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A supplemental appendix to this article is available at http://wber.oxfordjournals.org/.

1. See McCluskey and Swinnen (2010) and Pratt and Strömberg (2011) for reviews.

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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 disaster 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 holding many other factors fixed but has the potential disadvantage of limited variation in policy and media.

Our paper seeks 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 that includes measures of agricultural subsidization and taxation for a much wider set of countries and a longer period of time than has been previously available (Anderson and Valenzuela 2008). We use these data as the 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 food is a major consumption item, the importance of agriculture as a public policy issue is obvious. However, 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 European Union, the Common Agricultural Policy continues to absorb 40 percent of the entire European Union budget. Another symptom of the continued importance of agricultural policy for rich countries is the impasse in the current WTO negotiations, where disagreements over agricultural policies threaten to undermine the entire WTO agreement.

Another empirical factor is the substantial ad hoc and case study evidence that mass media can play an important role in influencing agricultural policy. Several studies have highlighted the important role of mass media in influencing voters and government policy on key recent agricultural and food policies, such as the use of genetically modified organisms (Curtiss et al. 2006; Marks, et al. 2003; Vigani and Olper 2012), policy reactions to food safety crises (Swinnen et al. 2005; Verbeke et al. 2000), and trade disputes (Kuzyk and McCluskey 2006; Swinnen and Francken 2006).

Agricultural policy is also an interesting case from a theoretical perspective. 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 affects the 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 when political activities are proportional to the size of potential policy costs and benefits (Swinnen 1994). Recent papers in the media economics literature claim that the mass media can play an important role in public policy by altering these political economy mechanisms (Stromberg 2001, 2004a; Kuzyk and McCluskey, 2006). 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 outlets 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 the mass media have an impact on the political economy of agricultural policies by exploiting taxation and subsidization data from 69 countries that were observed from 1960 to 2004. The paper also contributes to an emerging body of literature analyzing whether the diffusion of free and independent media are key ingredients in more efficient public policies. Besley and Burgess (2001, 2002) use a political agency model to demonstrate that a more informed and politically active electorate increases the incentives for a government to be responsive. Prat and Strömberg (2005) find for Sweden that people who begin watching commercial television (TV) news programs increase their political knowledge and participation. Overall, this and other evidence (such as Besley and Burgess 2001, 2002; Francken et al. 2009, 2012; Reinikka and Svensson 2005; Strömberg and Snyder 2008) support the notion that the mass media reduce the power of special interest lobbies relative to unorganized interests.

The paper also contributes to the literature on the political economy of agricultural policies. There is extensive literature, both theoretical and empirical, on the determinants of agricultural policy making (see de Gorter and Swinnen 2002; Swinnen 2010; Anderson et al. 2013 for surveys), but no previous study has examined the role of the media in this process. Our paper is the first to do so.

Our analysis, which exploits both cross-country and time-series variation in the data, indicates that the mass media may have a substantive impact on public agricultural policy. In the developing world, agricultural taxation is reduced by the presence of mass media outlets, whereas agricultural support is reduced in developed countries. Our results thus suggest that competition in the media market is associated with a reduction of policy distortions in agricultural markets.

I. Conceptual Framework

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

The Basic Theory

In Strömberg's (2004a) model, mass media outlets affect public policy because they provide the channel through which politicians convey campaign promises to the electorate. Political parties make binding announcements regarding the amount of public money they plan to spend on various government programs. The two parties propose public spending with the objective of maximizing their vote shares within a given budget constraint.

Commercial media[2] are the only channel through which the parties' platforms are announced to the voters. Media firms allocate a certain quantity of information on political platforms and proposed spending levels with the objective of maximizing their audiences (number of readers/viewers), all of which are voters. Voters purchase media products (e.g., newspapers) and adjust their expectations of how much the parties will spend on the basis of information provided by the media. They then vote for one of the parties. The party that wins the election implements the promised spending plan.

Voters value news related to political platforms in the media because it allows them to maximize the benefits they receive from government programs. It is assumed that readers (voters) use the news they receive from the media to decide on private action, which affects the value they realize from a government program. More precise news about future policies makes it more likely that readers will take the correct private actions. For example, early news about changes in agricultural subsidies help farmers to produce the correct crops to realize the full value of these subsidies.

Voters purchase the media product that provides them with the most information on the government programs they value, conditional on other (exogenous) characteristics, such as ideological preferences.

The media maximize expected profits. They have two types of costs: "first copy costs," or the cost of producing one unit of news space, and "reproduction and distribution costs," or the average cost of reproducing and delivering the media product to a certain audience. This cost function is consistent with the notion that there are roughly constant long-run marginal costs in distributing TV and radio news (or in printing and delivering newspapers). The revenue of the media includes the price they can charge for their product plus the price per reader/viewer paid by advertisers. This structure of the media industry implies that different groups receive different media coverage. News items of interest to small groups and groups with limited attractiveness for advertisers receive less coverage.

2. In his theoretical derivations, Stromberg (2004a) refers to the media as "newspapers" but explains that for the purposes of the main points of his analysis, the cost and revenue structures of TV and radio are similar in the relevant aspects.

This bias in the mass media's news coverage translates into policy bias. As media coverage of different issues changes, the efficiency with which politicians can reach different groups with campaign promises also changes. If a party promises a group that receives very little news coverage that it will raise spending, only a small fraction of the voters who would benefit become aware of the promise. Therefore, a spending promise to this group will not win many votes for the party. Consequently, this group of voters will not attract many favorable policies. Instead, promising to raise spending for groups that attract substantial media coverage (for example, because they are large groups or because the groups are more valuable to advertisers) will lead to a stronger voter response and thus to policies that are more favorable to these groups.

Implications for Agricultural Policy

What does this theory imply for the impact of mass media on agricultural policy?[3] The most important stylized fact about agricultural policy is the so-called development paradox, the policy switch from the taxation to the subsidization of agriculture associated with economic development (Anderson and Hayami, 1986; Anderson, 2009). The classic interpretation of this pattern is that when a country becomes richer, farm groups, compared to consumer and taxpayer groups, become more effective in collective action situations as the number of farmers declines and development reduces communication and transportation costs. Both factors reduce organizational costs and free rider problems in collective action situations (Olson, 1965). Moreover, because the per capita cost experienced by the rest of society falls with fewer farmers, the opposition of taxpayers and consumers to (agricultural) subsidies decreases as the number of farmers decreases as a result of 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 citizens.

One key prediction of the model is that, ceteris paribus, government transfers such as agricultural protection should be biased toward large groups as an effect of media competition. 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, ceteris paribus, the effect of media competition on agricultural policy should differ in poor versus rich countries. More specifically, we expect that the impact on agricultural protection induced by mass media competition should be positive in poor countries

3. Stromberg's (2004a) basic model has a fixed budget constraint. This assumption is later relaxed (see section 3.2 and footnote 16 of his paper) to allow for government programs, such as taxes and subsidies, which influence the budget itself. Endogenizing the government budget in this extended model does not affect the main results (or our hypotheses).

and negative in rich countries. Thus, we can formulate the following empirical prediction.

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

Another prediction of the model is that, ceteris paribus, government transfers will be biased toward groups that are more attractive to advertisers. Stromberg (2004a) refers to the case of the show *Gunsmoke*, which was cancelled despite its high ratings because its audience was perceived as "too old and too rural" to be of much interest to advertisers.

The implication for agricultural protection is not obvious because "being attractive to advertisers" may apply to many things, including age (young people are more easily influenced by advertisements than older people), income (richer people have more money to spend), and so forth. The latter argument would imply that mass media competition would induce government transfers to be biased toward *relatively* richer groups who have more income to spend and are therefore more attractive to advertisers.

Nevertheless, the implication for agricultural protection is not trivial. The relationship between economic development and the rural-urban income gap is the subject of some debate. Recent papers have argued that this relationship is nonlinear, with a relatively small gap in very poor countries (as incomes in both urban and rural areas are very low), urban incomes rising relative to rural incomes when countries grow, and the income gap narrowing again at high income levels (see Hayami 2007; McMillan and Rodrik, 2011). This nonlinear relationship would also follow if the spread of TV were uneven between urban and rural areas, reflecting the differences in income (demand for TVs). There would be a relatively small gap in very poor countries (as TV distribution in both urban and rural areas is very low) and a rise in urban TV distribution relative to rural TV distribution when countries grow, with the gap in TV distribution narrowing again at high income levels. In either case, this channel would add a nonlinear relationship between average incomes and media effects, with a prourban media bias effect that would be strongest at medium income levels.

However, a problem with using observed (sectoral) income to document this nonlinear relationship between the rural-urban income gap and overall income is that the observed sectoral income levels are obviously affected by the policies themselves. With occasionally very large subsidies or taxes, these policy transfers clearly affect the relative income measures. With transfers going from rural to urban areas in poor countries (and vice versa in rich countries), we would expect the pretransfer rural-urban income ratio to be higher (lower) than that observed in poor (rich) countries. In medium income countries, the transfers are relatively lower; thus, the observed income ratio is closer to the pretransfer ratio.

This situation would imply that the expected "advertiser-value effect" of media competition on agricultural protection should be as follows: small in (very) poor countries, because pretransfer rural and urban incomes are similar, and low and negative in rich and emerging countries, where pretransfer urban incomes are much higher than rural incomes. Thus, we can formulate the following empirical prediction (conditional on an observed nonlinear relationship between the rural-urban income ratio and economic development).

Hypothesis 2 (Advertiser value effect): *Mass media competition-induced political bias will reduce agricultural protection in rich (developed) and emerging countries and will have little effect in poor (developing) countries, ceteris paribus*.

In combination, these two effects imply that the total media effect will increase agricultural protection (or reduce agricultural taxation) in poor countries owing to the group size effect, reduce agricultural protection in emerging countries owing to the advertiser value effect, and more strongly reduce agricultural protection in rich countries owing to the reinforcement of group size and advertiser value effects.

The next sections present the data and empirical strategy used to test the hypotheses.

II. Data and Empirical Specification

We test our predictions on annual observations from a sample of approximately 70 developing and developed countries from all continents. Overall, we employ a panel of more than 2,000 observations, but the panel structure is unbalanced. Specifically, for a few developed countries, the starting year is approximately 1960; for the majority of the sample, the starting year is approximately 1970; and for transition countries, it is approximately 1992. The last year of observations is 2004. Table S.1 (in the supplemental appendix, available at http://wber.oxfordjournals.org/) reports the full list of countries with data and the 1970 and 2002 values of key policy and media variables.

Dependent Variables

Our dependent variables are measures of agricultural protection. As an indicator of agricultural taxation and subsidization, we use the *relative rate of assistance* (*RRA*) to agriculture, taken from the Agricultural Distortions Database from the World Bank (see Anderson and Valenzuela 2008 for details). The *RRA* index is calculated as the ratio between the agricultural and nonagricultural nominal rates of assistance:

$$RRA = \left[(1 + NRA_{ag})/(1 + NRA_{nonag}) - 1\right]$$

where NRA_{ag} is the nominal rate of assistance to agriculture and NRA_{nonag} is the nominal assistance to nonagricultural sectors. The NRA_{ag} measures total transfers to agriculture as a percentage of the undistorted unit value. It is positive when agriculture is subsidized, negative when it is taxed, and zero when net transfers are zero. The NRA_{ag} at the agricultural level is obtained as the weighted average of assistance at the product level using the undistorted value of production as a weight. It includes a wide range of policies, such as the assistance provided by all tariff and nontariff trade measures applied to agricultural products and any domestic price-distorting measures. In addition, the price equivalent of any direct interventions on inputs is included.

One advantage of using *RRA* (instead of *NRA*) as the dependent variable is that, especially in developing countries, an important indirect source of agricultural taxation is trade protection for the manufacturing sector as a component 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 proagricultural bias. However, as a robustness check and to assess whether changes in agricultural policy or industrial protection are important elements in the media-protection relationship, we ran a series of additional regressions using the *NRA* as the dependent variable.

Mass Media Variables

To test our hypotheses, we use the penetration of TV sets as an indicator. More specifically, our variable is the natural logarithm of TV sets per 100 inhabitants, based on data from the Arthur S. Banks Cross National Time-Series Data Archive, supplemented by UNESCO Statistics on TV and data from the International Telecommunication Union (2010).[4]

The rationale for using this proxy is that, although the share of informed voters is not observed, we can observe the share of media users. Because both move together, it is sufficient to examine the levels and changes in the share of media users to test the effect of media bias (see Strömberg 2004b). Moreover, in our specific context, another justification for the use of these indicators is derived from Strömberg's (2004a, p. 266) argument 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 programs that benefits these voters."

4. Both the Arthur Banks and the International Telecommunication Union data are based on data originally collected by UNESCO. These data are collected annually from 1970 onward. From 1960 to 1970, the data were collected every five years. Thus, for that period, we only use data for 1960, 1965, and 1970 without any interpolation. A potential limitation of these data lies in the fact that some countries have a licensing scheme whereby TV sets (or radios) must be registered. Because households may have more than one TV receiver or may not register, the number of licensed receivers may understate the true number of TVs and radios. Our identification strategy exploits the within-country variation in the data (see section 5). As long as the number of licenses and of TVs/radios display similar growth paths, this limitation of the data should not pose a major problem.

Income and Group Size Variables

The hypotheses advanced in section II imply that the relationship between the *media* variable and *RRA* (*NRA*) is conditional on the level of development (income), partially due to group size effects. As an indicator of development (income), we use real per capita GDP in purchasing power parity (*gdppc*) taken from the Penn World Tables.[5] The most direct indicator of (relative) group size is the share of agricultural employment, *emps*, based on FAO data. However, as is well known, both are strongly correlated because the agricultural employment share decreases with economic development. Therefore, *gdppc* is itself an indicator of relative group size.

In our basic specifications, we use *gdppc* as the primary indicator for the conditional effect of media on agricultural protection because the employment share data are of poor quality, which precludes a consistent comparison across countries and over time, especially for developing countries (see Timmer and de Vries 2007 for a discussion). One reason for the poor quality is the differences in national definitions of "agricultural labor." Another reason is that the yearly "observations" in the FAO labor statistics are linear interpolations between census data collected once every decade. We understand that there are also problems with the measurement of *gdppc* because national accounts data are noisy over short time horizons (see Deaton 2005), but we believe the data problems are less important for *gdppc* than for *emps*. However, we perform a series of robustness checks using *emps* as indicator.

Both variables (the level of development and employment share) are also included as control variables because both have been identified as major determinants of agricultural protection outside the media effect.

Other Control Variables

In addition to the variables discussed above, in the empirical specifications, we include controls that are likely to affect the level of agricultural protection, as suggested by previous studies. Standard control variables in studies on the political economy of agricultural policies are indicators of comparative advantage, trade status, terms of trade effects, and political institutions (see Olper 2007; Swinnen 2010; Olper and Raimondi 2012). To control for comparative advantage, we include agricultural land per capita, *landpc*, and the agricultural export share, *exps*, measured as net exports over production. These two variables are based on data from FAO and the World Bank's Agricultural Distortions Database. Because of the possibility that governments set agricultural protection to exploit terms of trade effects, we also control for country size using the log of population, *logpop*. We proxy for political institutions by

5. Specifically, we use the variable *rgdpch* from the Penn World Tables, version 6.3.

TABLE 1. Descriptive Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.	Countries
RRA	12.71	64.63	−94.62	404.87	2,020	69
NRA	20.11	67.19	−93.11	432.72	2,231	69
Log TVs (× 100 inhabitants)	1.89	2.10	−6.91	4.60	2,231	69
GDP per capita (in purchasing power parity)	9,808	10,313	259	45,947	2,231	69
Agricultural employment share	0.38	0.29	0.01	0.92	2,231	69
Land per capita	1.72	3.97	0.04	41.51	2,231	69
Net export share	0.01	0.36	−1.73	1.28	2,087	69
Log population	9.97	1.29	7.21	14.07	2,231	69
Democracy index (Polity2)	3.26	7.13	−9.00	10.00	2,231	69
Government consumption	17.13	9.18	1.38	85.37	2,230	69
Trade to GDP ratio	51.66	31.17	5.00	622.63	2,224	69
Sach-Warner trade policy index	0.61	0.49	0.00	1.00	2,178	69
Economic crisis	0.26	0.44	0.00	1.00	2,231	69

Source: Own calculations based on the data described in the text.

adding the Polity2 index of democracy taken from the Polity IV database (Marshall and Jaeggers 2007).[6]

In addition to these standard control variables, we use a series of covariates to check the robustness of our findings (Olper et al. 2013). They include two different indicators of (aggregated) openness: the ratio of trade to GDP from the Penn World Tables and the Sachs-Warner index of openness as defined by Wacziarg and Welch (2008).[7] We use government consumption to GDP from the Penn World Tables as a proxy for government size. Finally, because economic crises may trigger policy reforms, we add two lags of a crisis variable measured with a dummy equal to one for every year that the real GDP per capita growth rate is negative (zero otherwise). Table 1 presents summary statistics for the variables described above.

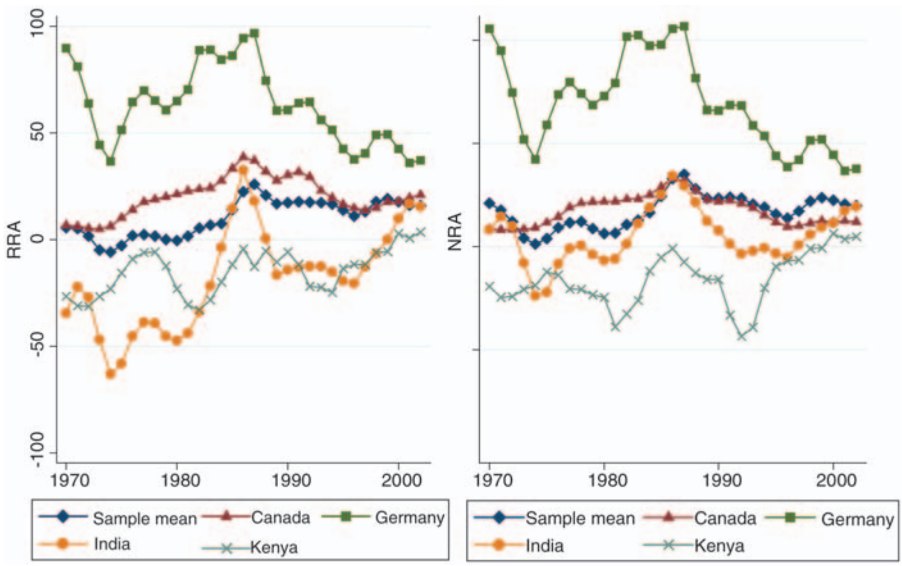
III. DESCRIPTIVE STATISTICS AND ANALYSIS

Figures 1 and 2 present trends in the agricultural policy indicators (*RRA* and *NRA*) and the media variable (number of TVs per 100 inhabitants) for the period from 1970 to 2004 for selected countries. Table S.1 in the online appendix presents the figures for 1970 and 2002 for all countries in the dataset. The

6. The Polity2 index assigns a value ranging from −10 (autocracy) to +10 (democracy) to each country and year, with higher values associated with stronger democracies.

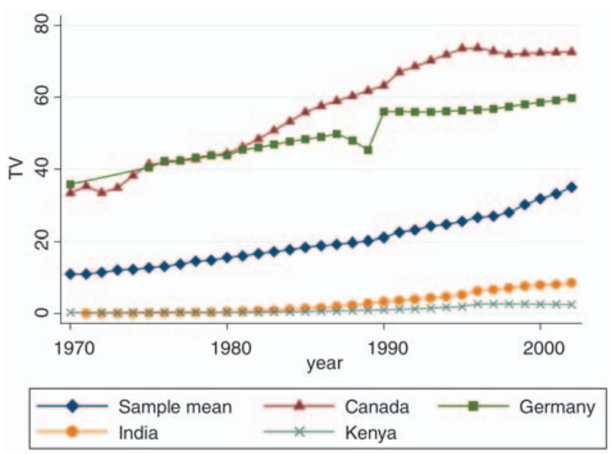
7. Wacziarg and Welch (2008) updated the Sachs and Warner index and exploited its time dimension. The index is equal to one when a country is considered open and zero otherwise. Thus, it captures reforms in the overall trade policy.

FIGURE 1. Indicators of Agricultural Policies (*RRA*, *NRA*) in Selected Countries (1970–2004)



Note: Three-year moving averages of both RRA and NRA.
Source: Own calculations based on data from the *Agridistortions* databases (World Bank).

FIGURE 2. Indicators of Mass Media: TVs per 100 Inhabitants in Selected Countries (1970–2004)



Source: Own calculations based on the data described in the text.

figures reveal that there is substantive variation in all indicators both over time and between countries.

Figure 1 illustrates the stylized fact that *RRA* and *NRA* are higher in rich countries (Canada and Germany) than in poor countries (India and Kenya).

Support for farmers was particularly high in Germany, with an *RRA* between 50 percent and 100 percent for much of the period. The level of taxation faced by farmers was particularly severe in India before 1980, with *RRA* figures of approximately 50 percent. Figure 1 also shows that the variation in *NRA* and *RRA* between countries has declined over time, with agricultural taxation declining (*RRA* increasing) in poor countries and agricultural subsidies for agriculture falling (*RRA* decreasing) in rich countries. On average, the *RRA* for the full sample increased from approximately 0 percent in the 1970s to approximately 20 percent in the 1980s, subsequently declining to approximately 10 percent in 2000 (the *NRA* values differ, but the patterns are similar).

Figure 2 illustrates the differences in TV penetration across countries and over time. The number of TVs increased everywhere over time, but, not surprisingly, the numbers are much higher in rich countries than in poor ones. The number of TVs increased from approximately 35 per 100 inhabitants in 1970 to approximately 60 in Germany and 75 in Canada by 2000. In the poor countries, the number of TVs was nearly zero until the mid-1980s. It remains very low in Kenya. The increase is somewhat more rapid in India, reaching approximately 10 per 100 inhabitants in 2000.

A comparison of figures 1 and 2 suggests a different relationship between agricultural policies and the spread of mass media in rich and poor countries: for poor countries (such as Kenya), the *RRA* increased over the 1970–2004 period, and mass media also grew. In contrast, for rich countries (such as Germany), the *RRA* declined, whereas mass media continued to grow.

To further analyze this relationship between mass media and agricultural policies, table 2 reports simple pair-wise correlations between the media variable and the agricultural protection indicators for different levels of development (organized as percentiles of per capita GDP). The pair-wise correlations

TABLE 2. Correlation Coefficients between TV Penetration and Agricultural Protection Indicators by Percentile of per Capita GDP

	TV vs. Agricultural protection	
Percentiles of gdppc	*RRA*	*NRA*
<5%	0.228	0.245
<10%	0.292	0.249
<25%	0.290	0.205
<50%	0.406	0.360
>50%	0.102	0.044
>75%	−0.352	−0.391
>90%	−0.624	−0.612
>95%	−0.656	−0.629

Note: The percentiles of *gdppc* refer to two different samples due to data availability for *RRA* and *NRA*. The samples have the following median values of *gdppc*: USD 5,949.5 for the *RRA* sample and USD 5,356.6 for the *NRA* sample.

Source: Own calculations based on the data described in the text.

are consistent with the suggestions from figures 1 and 2. The correlation coefficient is approximately +0.30 for percentiles below the median (<50 percent). For per capita GDP values above the 75th percentile, the correlation becomes negative, and increasingly so, reaching a value below −0.60 at the 95th percentile. These correlations are consistent with hypotheses 1 and 2: there is a different relationship between agricultural policies and the spread of mass media in rich and poor countries. For poor countries, the spread of mass media is associated with an increase in *RRA* (*NRA*), whereas in rich countries, the growth of mass media is associated with a decline in *RRA* (*NRA*).

Of course, these are merely descriptive statistics. For a more formal analysis, we now turn to an econometric analysis.

IV. Econometric Strategy and Identification Issues

Our hypotheses suggest that in countries with low *gdppc*, the media variables, and *RRA* should be positively 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 at the turning point, if any, from the estimated coefficients:

$$RRA_{it} = \alpha_0 + \alpha_1 m_{it-1} + \alpha_2(m_{it-1} \times gdppc_{it-1}) + \alpha_3 gdppc_{it-1} + \beta x_{it-1} + \varepsilon_{it} \qquad (1)$$

where RRA_{it} measures the relative rate of assistance in country i and year t, $m_{it\text{-}1}$ refers to the one-year lagged media variable, and $x_{it\text{-}1}$ is a vector of additional controls. Taking the partial derivative of *RRA* with respect to the media variable, we obtain

$$\frac{\partial RRA}{\partial m} = \alpha_1 + \alpha_2 gdppc.$$

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

Regarding identification, our main concern is omitted variable bias. If the media variables are correlated with unobserved determinants of the protection level, our estimates will be inconsistent. Note that, a priori, the direction of the bias is not predictable. Therefore, our basic specification always includes a set of country (η_i) and year fixed effects (ϑ_t):

$$RRA_{it} = \alpha_1 m_{it-1} + \alpha_2(m_{it-1} \times gdppc_{it-1}) + \alpha_3 gdppc_{it-1} + \beta x_{it-1} + \eta_i + \vartheta_t + \varepsilon_{it}. \qquad (2)$$

However, this approach does not allow us to properly isolate the causal effect of increased mass media consumption for two main reasons. First, country fixed effects do not control for unobservable, country-specific, time-varying factors correlated with both the media and agricultural protection. Second, potential measurement errors in the *gdppc* indicator may introduce further endogeneity problems (Deaton 2005). Indeed, the correlation between *gdppc* and the media variables may bias the estimated media coefficients (and the interaction term between the media and *gdppc*), a problem exacerbated by the fixed effects transformation (Wooldridge 2002). Thus, to make our identification assumption more credible, we adopt two additional strategies.

First, given our specific concern regarding (omitted) time-varying factors correlated with both media variables and protection, in addition to the time dummies, we include continent-year interaction effects to control for changes over time that affect countries within a region similarly.[8] In addition, as discussed in the data section, beyond the traditional determinants of agricultural protection that have been found relevant in previous studies, we include several other covariates, such as indicators of trade openness, trade policy reforms, government consumption, and economic crises, to increase the similarity between the countries.

Second, to directly address measurement error problems and other forms of endogeneity, we also employ dynamic panel methods. Specifically, we use the system generalized methods of moment (SYS-GMM), developed by Arellano and Bover (1995) and Blundell and Bond (1998). By estimating a system of equations in first differences and levels and employing instruments, this approach should allow for consistent estimations even in the presence of measurement errors and other forms of endogeneity (see Bond et al. 2001). Our SYS-GMM dynamic panel model has the following specification:

$$\begin{aligned}\Delta RRA_{it} = {} & a_1 \Delta RRA_{it-1} + a_2 \Delta m_{it-1} + a_3 \Delta(m_{it-1} \times gdppc_{it-1}) + a_4 \Delta gdppc_{it-1} + \\ & + b' \Delta x_{it-1} + \vartheta_t + \upsilon_{it}\end{aligned} \tag{3a}$$

$$\begin{aligned}RRA_{it} = {} & a_0 + a_1 RRA_{it-1} + a_2\, m_{it-1} + a_3(m_{it-1} \times gdppc_{it-1}) + a_4 gdppc_{it-1} + \\ & + b' x_{it-1} + \vartheta_t + \upsilon_{it}\end{aligned} \tag{3b}$$

where Δ denotes first differences, that is, $\Delta y_{it} = y_{it} - y_{it\text{-}1}$, $RRA_{it\text{-}1}$ is the lagged dependent variable and υ_{it} is a disturbance term. In estimating the system of equations (3a)–(3b), the (endogenous) lagged dependent variable is instrumented by its $t-2$, $t-3$, and longer lags, using the lagged levels for the first-

8. These interaction effects capture any regional differences in the agricultural protection dynamic. We also tested a second specification in which we included continent-specific polynomial terms over time, and the results were qualitatively and quantitatively similar.

differences equation (3a) and the lagged differences for the level equation (3b). Similarly, to address endogeneity in other explanatory variables (such as the media variable and its interaction with *gdppc*), they can be instrumented by their respective $t-2$, $t-3$, and longer lags. The validity of a particular assumption can then be tested using standard generalized methods of moment tests of overidentifying restrictions. In summary, the SYS-GMM specification should allow for greater flexibility, improved control for omitted time-varying factors through the lagged dependent variable and, finally, greater consistency even in the presence of endogenous regressors. However, it is important to stress that this estimator does not resolve endogeneity problems due to omitted variables with persistent effects, such as when the TV trend is correlated with the *RRA* (*NRA*) trend, as a result of an omitted (possibly time-invariant) variable.

V. Regression results

This section presents the results of our econometric analyses. We present first the results of the static model and afterward the dynamic panel results. We evaluate the robustness of the results by testing whether the results are sensitive to country and time coverage and to the use of different indicators for key variables.

Static Model

Table 3 reports the static fixed effects results of different specifications based on equation (2), with columns (1)–(4) using *RRA* and (5)–(6) using *NRA* as the dependent variable. In every regression, the standard errors are corrected for heteroskedasticity and autocorrelation of unknown form and are clustered within countries.

The results in column 1 show that the simple fixed effects specification, without controls apart from *gdppc*, yields statistically significant coefficients (p-value < 0.01) for both the linear effect and the interaction effect of TV penetration with *gdppc*. The positive sign for the linear term and the negative sign for the interaction effect are consistent with hypotheses 1 and 2. The penetration of TV is associated with a higher *RRA* at low levels of development but with a lower *RRA* at higher levels. In regression (1), the turning point for the relationship is a per capita GDP level of USD 6,013. This number is virtually identical to the sample median value, which is equal to USD 5,949.

Columns (2) and (3) report regressions that control for the standard agricultural protection covariates (agricultural employment share, comparative advantage, country size, and the quality of democracy) and additional variables, such as trade openness, government consumption to GDP, and crises indicators.

In column (4), we add a set of continent-year interaction effects to control for differences in regional protection dynamics. The different specifications

TABLE 3. Effect of TV Penetration on Agricultural Protection

Dependent variable Variables	*RRA* (1)	*RRA* (2)	*RRA* (3)	*RRA* (4)	*NRA* (5)	*NRA* (6)
Log TV	**8.839**	**6.912**	**8.358**	**8.131**	**9.433**	**8.025**
	(0.005)	*(0.012)*	*(0.003)*	*(0.004)*	*(0.004)*	*(0.014)*
*Log TV * GDP per capita*	**−0.147**	**−0.122**	**−0.138**	**−0.125**	**−0.177**	**−0.148**
(× 100)	*(0.006)*	*(0.006)*	*(0.004)*	*(0.003)*	*(0.001)*	*(0.001)*
GDP per capita	0.007	0.006	0.008	0.008	0.010	0.009
	(0.018)	*(0.024)*	*(0.008)*	*(0.010)*	*(0.009)*	*(0.013)*
Employment share		−1.200	−1.054	−0.909	−1.426	−1.247
		(0.050)	*(0.081)*	*(0.163)*	*(0.015)*	*(0.037)*
Land per capita		−1.622	−2.033	−1.712	−3.076	−2.905
		(0.137)	*(0.069)*	*(0.223)*	*(0.047)*	*(0.085)*
Export share		−10.885	−9.133	−8.974	−15.993	−12.964
		(0.264)	*(0.354)*	*(0.476)*	*(0.134)*	*(0.335)*
Log population		−0.071	−0.132	0.159	−0.096	−0.059
		(0.765)	*(0.574)*	*(0.629)*	*(0.733)*	*(0.848)*
Polity2 (democracy index)		0.951	0.926	0.831	1.314	1.224
		(0.002)	*(0.001)*	*(0.004)*	*(0.001)*	*(0.001)*
Government consumption			0.537	0.630	0.176	0.320
			(0.217)	*(0.137)*	*(0.726)*	*(0.544)*
Trade to GDP			0.014	−0.038	−0.007	−0.029
			(0.772)	*(0.510)*	*(0.884)*	*(0.607)*
Sachs-Warner trade policy index			20.975	17.553	18.127	16.444
			(0.000)	*(0.001)*	*(0.000)*	*(0.001)*
Lagged_1 crisis			−0.090	0.847	0.382	1.185
			(0.956)	*(0.601)*	*(0.815)*	*(0.463)*
Lagged_2 crisis			1.007	2.072	0.780	1.871
			(0.427)	*(0.121)*	*(0.536)*	*(0.166)*
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Continental-years interaction effects	No	No	No	Yes	No	Yes
Observations	2,025	1,996	1,935	1,935	2,001	2,001
Countries	69	69	67	67	69	69
Adj. R^2	0.857	0.865	0.871	0.880	0.858	0.866
Critical GDP per capita	**6,013**	**5,666**	**6,057**	**6,504**	**5,330**	**5,422**

Note: OLS regressions; *p*-values based on robust standard errors clustered by countries in parentheses; all controls entered with one year lagged; continental (Asia, Africa, Latin America) and year interaction effects included as indicated (see text).

Source: Own calculations based on the data described in the text.

yield consistent results both in terms of coefficients and the significance of the media variables.

Columns (5) and (6) report the results of regressions analogous to columns (3) and (4) but using the nominal rate of assistance (*NRA*) as the dependent variable instead of *RRA*. The estimated media coefficients are very similar, and the results are thus robust to using different indicators of agricultural support.

To put the estimates into perspective, we illustrate the size of the media effects using the Philippines and Taiwan as examples. These two countries have average per capita GDP values in the period covered by the analysis of USD 1,854 and USD 9,987, respectively, which are significantly lower and higher than the critical turning point of the estimated relationship. Using the estimated coefficients of the full model (column (4)), a 10 percent increase in the share of households with TVs would be associated with a 4.8 percent increase in agricultural protection in the Philippines, but the same increase would reduce the Taiwan' agricultural protection by 6.4 percent.[9] This finding suggests that if there is a causal affect, its magnitude could be substantial.

In a working paper version of this article (Olper and Swinnen 2012), we presented similar regressions using radio penetration as media variable. When using radio penetration as an indicator, the patterns of the results are similar to those obtained using TV, but the significance levels of the media variables are lower and less robust. More specifically, including additional controls, the radio penetration linear term is positively and significantly correlated with protection, but the interaction term with per capita GDP, while still negative, is no longer statistically significant. A possible interpretation of these results is that radio is a more important news source in poor countries, whereas TV matters most in emerging and rich countries.

Dynamic Panel Model

As discussed in section IV, the results obtained from the (static) fixed effects model may still suffer from endogeneity bias, particularly as a result of measurement errors. To account for this problem, table 4 reports the results of dynamic panel estimates that control for persistency in agricultural protection. To avoid problems resulting from the use of an excessive number of instruments in the SYS-GMM estimator, the specification only controls for the standard covariates (as in column (2) of table 3).[10]

Columns (1) and (2) report the results using ordinary least squares (OLS) and least squares with dummy variables. The OLS and least squares with dummy variables results serve as benchmarks for the evaluation of the SYS-GMM specification and should be upward and downward biased compared to the SYS-GMM, respectively. In the SYS-GMM estimates, the media variables and *per-capita* GDP are treated as endogenous variables and instrumented with their $t-2$ and higher lagged values. The SYS-GMM results for *RRA* and *NRA* are presented in columns (3) and (4). As expected, the magnitude of the coefficient on lagged *RRA* is above the estimated least squares with dummy variables value and below the estimated OLS value (and similar for

9. Both elasticities are evaluated at the mean value of the *RRA* distribution, equal to 12.7 percent.

10. Note that this does not substantially affect our results because the autoregressive term largely absorbs these omitted terms (see Roodman, 2009).

TABLE 4. TV Penetration and Agricultural Protection: Dynamic Panel Model

Dependent variable Estimation method Variables	*RRA* OLS (1)	*RRA* LSDV (2)	*RRA* SYS-GMM (3)	*NRA* SYS-GMM (4)
Lagged RRA (NRA)	0.9104	0.7407	0.8309	0.8183
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
Log TV	**0.838**	**2.058**	**2.956**	**3.218**
	(0.006)	*(0.020)*	*(0.010)*	*(0.017)*
*Log TV * GDP per capita (× 100)*	**−0.028**	**−0.037**	**−0.078**	**−0.092**
	(0.002)	*(0.006)*	*(0.000)*	*(0.000)*
GDP per capita	0.0014	0.0018	0.0037	0.0043
	(0.002)	*(0.028)*	*(0.000)*	*(0.000)*
Employment share	0.024	−0.195	0.145	0.181
	(0.396)	*(0.230)*	*(0.090)*	*(0.066)*
Land per capita	−0.248	−0.481	−0.459	−0.518
	(0.001)	*(0.133)*	*(0.000)*	*(0.002)*
Export share	−3.124	−1.153	−5.394	−7.618
	(0.001)	*(0.799)*	*(0.001)*	*(0.000)*
Log population	−0.022	0.261	−0.040	−0.049
	(0.411)	*(0.715)*	*(0.476)*	*(0.456)*
Polity2 (democracy index)	0.123	0.337	0.190	0.236
	(0.023)	*(0.001)*	*(0.023)*	*(0.008)*
Time fixed effects	Yes	Yes	Yes	Yes
AR2 test (*p*-value)			0.03	0.08
AR3 test (*p*-value)			0.25	0.34
Hansen (*p*-value)			0.39	0.65
Diff-in-Hansen (*p*-value)			0.65	0.43
Instruments			82	82
Observations	1,984	1,984	1,984	2,058
Countries	69	69	69	69
R^2	0.94	0.94		
Critical GDP per capita	**2,992**	**5,563**	**3,790**	**3,498**

Note: *p*-values based on robust standard errors clustered by countries in parentheses; SYS-GMM based on xtabond2 in Stata, with instruments structured with lag (3) for *RRA* (*NRA*), and lag (2) for the media variables and *gdppc*; Additional instruments used for the level equation are the $t - 3$ first difference of the *RRA* (*NRA*) and the $t - 2$ first difference for media variables and *gdppc*; the collapse option is also used to control for instrument proliferation. LSDV represents least squares with dummy variables.

Source: Own calculations based on the data described in the text.

NRA). Moreover, neither the basic Hansen test of overidentifying restrictions nor the Difference-in-Hansen test, related to the additional instruments used by the level equation, detects any problem with instrumental validity. These observations all suggest that our instruments are valid and informative and the SYS-GMM estimator is consistent.

The estimated coefficients of TV penetration presented in columns (3) and (4) are significant and consistent with hypotheses 1 and 2 in the SYS-GMM regressions. These estimated coefficients measure short-term correlations. To compare them with the static results, one should use the long-run correlations, which can be obtained by dividing the estimated coefficients by one minus the autoregressive coefficient. We obtain values equal to 17.46 for the linear term and −0.0046 for the interaction with income level and similar values for the *NRA* specification. Thus, the magnitudes of the estimated (long-run) media correlations in the dynamic SYS-GMM model are (in absolute value) approximately two times higher than those of the static model (see columns (3) and (5) of table 3). This result is consistent with the presence of attenuation bias due to measurement errors in the variables. This problem is exacerbated in the fixed effect specification but is efficiently accounted for in the generalized methods of moment approach (see Wooldridge, 2002, p. 313).[11]

Further Robustness Tests

We performed a series of additional robustness tests to further check our results, testing whether the results are sensitive to country and time coverage and to the use of different indicators for the group size effect and development.

Columns (1)–(4) of table 5 report sensitivity analyses for the media-protection relationship with different ranges of countries and periods. One problem with our results may be that both the structural adjustment programs of the 1980s and the beginning of the GATT Uruguay Round in the mid-1980s caused an effect that interfered with our media-protection relationship: a reduction in agricultural taxation in developing countries and a reduction in agricultural protection in developed countries. Columns (1) and (2) examine this possibility by running the model using only observations before and after 1985, respectively. Although the magnitude of the estimated relationship is different in both periods (approximately three times larger in magnitude after 1985),[12] the relationship is also estimated with high precision for years before 1985, suggesting that the abovementioned confounding effects do not drive the results.

Another possibility is that our nonlinear media-protection relationship is driven by some group of sensitive observations related to a particular group of poor or rich countries. To check this possibility, in columns (3) and (4), we excluded from the regressions observations for countries with a *gdppc* lower than USD 1,000 and higher than USD 25,000, respectively.[13] The results remain consistent and significant, although the sizes of the coefficients change somewhat. Dropping observations for the poorest countries increases the magnitude

11. Note that when comparing the SYS-GMM and the static fixed effects results, at least in terms of the magnitude of the media effect, these may also differ because the two models differ not only in terms of the estimator used but also in terms of the covariates included.

12. One likely reason for this difference is that the expansion of TVs in developing and emerging countries did not begin before the early 1980s.

13. Note that the results are fairly robust to the use of other *gdppc* thresholds. For example, by excluding observations with *gdppc* values below USD 5,000 or higher than USD 20,000 and thus working with approximately half of the sample, the media-protection relationship is still statistically significant.

TABLE 5. Robustness Checks: SYS-GMM Regressions over Different Samples

Dependent variable Interaction with Variables	*RRA* *gdppc* (1)	*RRA* *gdppc* (2)	*RRA* *gdppc* (3)	*RRA* *gdppc* (4)	*RRA* *gdppc* (5)	*RRA* *emp* (6)	*NRA* *emp* (7)
Lagged RRA (NRA)	0.893	0.796	0.838	0.877	0.799	0.909	0.895
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Log TV	**1.478**	**6.313**	**3.604**	**1.966**	**2.073**	−2.306	**− 3.094**
	(0.025)	*(0.011)*	*(0.050)*	*(0.004)*	*(0.016)*	*(0.104)*	*(0.028)*
*Log TV * GDP per capita (or emps)*	**0.029**	**0.093**	**0.088**	**0.038**	**0.084**	**3.996**	**5.277**
	(0.001)	*(0.005)*	*(0.000)*	*(0.002)*	*(0.001)*	*(0.011)*	*(0.001)*
GDP per capita	0.0014	0.0044	0.0041	0.0018	0.0039	0.0022	0.0032
	(0.002)	*(0.004)*	*(0.000)*	*(0.005)*	*(0.001)*	*(0.027)*	*(0.002)*
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR2 test (*p*-value)	0.35	0.01	0.04	0.04	0.07	0.03	0.08
AR3 test (*p*-value)	0.10	0.27	0.25	0.25	0.61	0.37	0.52
Hansen (*p*-value)	0.96	0.22	0.92	0.30	0.91	0.10	0.02
Instruments	69	70	76	79	84	69	69
Observations	834	1,206	1,720	1,698	1,785	1,984	2,058
Countries	55	68	63	69	63	69	69
Sample	$<$1985	$>$1985	gdppc $>$ USD 1,000	gdppc $<$ USD 25,000	Richer/poorest excluded	All	All
Critical GDP per capita (emps)	**5,097**	**6,788**	**4,096**	**5,173**	**2,468**	**(0.58)**	**(0.59)**

Notes: Each column reports a regression for a specific countries/years sample with characteristics indicated at the bottom of the table: $<$ ($>$) 1985 means that the regression is run for data before or after 1985; *gdppc* $>$ 1,000 ($<$ 25,000) means that the regression considered only countries/years data with *gdppc* higher (lower) than 1,000 (25,000) international U.S. dollars; richer/poorest excluded are excluding the three richest and poorest countries from the regression (namely, the United States, Norway, and Switzerland and Mozambique, Ethiopia, and Zimbabwe). The *p*-values in parentheses are based on robust standard errors clustered by countries; SYS-GMM is based on xtabond2 in Stata, with instruments structured with lag (3) for *RRA* and lag (2) for media variables and *gdppc* (*emps*); additional instruments used for the level equation are the $t - 3$ first difference of the *RRA* and the $t - 2$ first difference for media variables and *gdppc*; the collapse option is used to control for instrument proliferation. Additional controls included in every regression are *emps*, *landpc*, *exps, log(pop)*, and *Polity*2, all lagged one year, and year fixed effects.

Source: Own calculations based on the data described in the text.

of the estimated relationship; dropping observations for the richest countries reduces the estimated effects compared to the benchmark SYS-GMM regression in Column (3) of table 4. These results are consistent with hypothesis 2 (advertiser value effect), suggesting that farmers in the poorest developing countries may be too poor to attract advertisers and media coverage. The findings may also be consistent with an unbalanced increase in media diffusion between rural and urban areas. If rural areas have some lag in media penetration compared to urban areas, the media protection relationship will be weaker in the poorest countries.

In column (5), we simultaneously exclude observations for the three richest (the United States, Norway, and Switzerland) and the three poorest countries (Mozambique, Ethiopia, and Zimbabwe) from the regression. Once again, the results are very robust.

Columns (6) and (7) of table 5 present an additional robustness check using the agricultural employment share (*emps*) to interact with the media effect. For both *RRA* and *NRA*, all key variables have signs consistent with our hypotheses. Although the regression results with *emps* are less stable than those with *gdppc* (likely as a result of severe measurement errors in the *emps* variable), the key conclusions are robust to a change in the structural variable.[14]

Finally, as discussed in the conceptual framework section, there may be additional nonlinearity in the relationship between media coverage and policies resulting from a nonlinear relationship between economic growth and the rural-urban income gap and the relative urban-rural gap in TV distribution, which would affect the value of both groups to advertisers and thus the channel through which the mass media affect agricultural protection. To test for this, we added an additional interaction effect between TV and the square of *gdppc* to the model specifications. In some specifications, this additional media interaction term is significant and negative, consistent with the hypothesis. However, the results are less robust than those without the additional nonlinear term. These results are presented in Olper and Swinnen (2012).

VI. Conclusions

This paper provides evidence of the relationship between mass media competition and agricultural protection for a large group of countries. Strömberg's (2004a) theory predicts that information provided by the mass media, reflecting

14. There are well-known problems with the agricultural employment data, which are generally linear interpolations between a few observations (often one per decade) and suffer from serious measurement errors (see Timmer and de Vries, 2007). The model specification tests reported at the bottom of the table indicate a well-specified SYS-GMM model for the *RRA* regression but not for the *NRA* regression, where the Hansen test rejects the null of the validity of the additional overidentifying restrictions. However, the autocorrelation tests indicate that the model is well specified. Considering the strong measurement errors in the employment data and that Hansen tests have weak power, such results are unsurprising.

the media's incentives to provide news to different groups in society, affects government policy making and who benefits from government policies. The theory predicts that mass media competition will induce a policy bias toward large groups and groups that are more valuable to advertisers; these groups are more informed because the mass media target them.

We apply this theory to agricultural policy. This results in the hypotheses that (*a*) given the changing role of the agricultural sector due to economic development, the impact of mass media competition on agricultural policy will differ between poor and rich countries, ceteris paribus, and (*b*) this effect is contrary to the so-called development paradox of agricultural policies. Thus, the traditional change in agricultural policy from taxation to subsidization that is associated with economic development will be smoothed in the presence of mass media competition. We hypothesize that this is due to a combination of the group size effect, with larger groups being more attractive to the media, and the advertiser value effect, with richer groups being more attractive audiences for the media.

We use data on agricultural policy from 69 countries spanning a wide range of development stages and media markets to test these predictions. Our empirical results are consistent with the theoretical hypotheses. We find a significant and robust correlation between public support for agriculture and TV penetration, which is conditional on the structure of the economy. In particular, an increase in media penetration is correlated with policies that benefit the majority to a greater extent; it is correlated with a reduction in agricultural taxation in poor countries and a reduction in agricultural subsidies in rich countries, ceteris paribus.

These results are robust to the use of different indicators of agricultural policies, different media variables and different control variables and estimation techniques.

REFERENCES

Anderson, K. 1995. "Lobbying Incentives and the Pattern of Protection in Rich and Poor Countries." *Economic Development and Cultural Change* 43(2): 401–23.

——— 2009. "Five Decades of Distortions to Agricultural Incentives." In K. Anderson, ed., *Distortions to Agricultural Incentives*, 3–64. Washington, DC: The World Bank.

Anderson, K., and Y. Hayami. 1986. *The Political Economy of Agricultural Protection*. Sydney, Australia: Allen and Unwin.

Anderson, K., and E. Valenzuela. 2008. "Estimates of Distortions to Agricultural Incentives, 1955 to 2007." Washington, DC: The World Bank.

Anderson, K., G. Rausser, and J. Swinnen. Forthcoming. "Political Economy of Public Policies: Insights from Distortions to Agricultural and Food Markets." *Journal of Economic Literature*.

Arellano, M., and O. Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models." *Journal of Econometrics* 68: 29–51.

Becker, G. S. 1983. "A Theory of Competition among Pressure Groups for Political Influence." *Quarterly Journal of Economics* 98: 371–400.

Besley, T., and R. Burgess. 2001. "Political Agency, Government Responsiveness and the Role of the Media." *European Economic Review* 45: 629–40.

———. 2002. "The Political Economy of Government Responsiveness: Theory and Evidence from India." *The Quarterly Journal of Economics* 117(4): 1415–51.

Blundell, R. W., and S. R. Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Model." *Journal of Econometrics* 87: 115–43.

Bond, S., A. Hoeffler, and J. Temple. 2001. "GMM Estimation of Empirical Growth Model." CEPR Discussion Papers 3048. Center for Economic and Policy Research, Washington, DC.

Curtis, K., J.J. McCluskey, and J. Swinnen. 2008. "Differences in Global Risk Perceptions of Biotechnology and the Political Economy of the Media." *International Journal of Global Environmental Issues* 8 (1/2): 77–89.

Deaton, A. 2005. "Measuring Poverty in a Growing World (or Measuring Growth in a Poor World)."*Review of Economics and Statistics* 87 (1):1–19.

De Gorter, H., and J. Swinnen. 2002. "Political Economy of Agricultural Policy." In B. Gardner, and G. Rausser, eds., *Handbook of Agricultural Economics*, Vol. 2B, 1893–1943. Amsterdam, The Netherlands: Elsevier.

Downs, A. 1957. *An Economic Theory of Democracy*. New York: Harper and Row.

Francken, N., B. Minten, and J. Swinnen. 2009. "Media, Monitoring, and Capture of Public Funds: Evidence from Madagascar." *World Development* 37 (1): 242–55.

———. 2012. "The Political Economy of Relief Aid Allocation: Evidence from Madagascar." *World Development* 40 (3): 486–500.

Hayami, Y. 2007. "An Emerging Agricultural Problem in High-Performing Asian Economies." Policy Research Working Paper 4312. The World Bank, Washington, DC.

International Telecommunication Union (ITU). 2010. *World Telecommunication Indicators 2009*. Geneva, Switzerland: ITU. http://www.itu.int/.

Kuzyk, P., and J.J. McCluskey. 2006. "The Political Economy of the Media: Coverage of the U.S.-Canadian Lumber Trade Dispute." *World Economy* 29 (5): 637–54.

McMillan, M.S., and D. Rodrik. 2011. *Globalization, Structural Change and Productivity Growth*. NBER Working Paper 17143. National Bureau of Economic Research, Cambridge, MA.

Marks, L. A., N. Kalaitzandonakes, and S. S. Vickner. 2003. "Evaluating Consumer Response to GM Foods: Some Methodological Considerations." *Current Agriculture, Food & Resource Issues* 4: 80–94.

Marshall, M. G., and K. Jaggers. 2007. *Polity IV Project: Dataset Users' Manual*. Arlington, VA: Polity IV Project.

McCluskey, J., and J. Swinnen. 2010. "Media Economics and the Political Economy of Information." In D. Coen, W. Grant, and G. Wilson, eds., *The Oxford Handbook of Business and Government*, 643–62. Oxford: Oxford University Press.

Oberholzer-Gee, R., and J. Waldfogel. 2005. "Strengh in Numbers: Group Size and Political Mobilization." *Journal of Law and Economics* 48: 73–91.

Olper, A. 2007. "Land Inequality, Government Ideology and Agricultural Protection." *Food Policy* 32: 67–83.

Olper, A., J. Falkowski, and J. Swinnen. Forthcoming. "Political Reforms and Public Policies: Evidence from Agricultural Protection." *World Bank Economic Review*. doi:10.1093/wber/lht003.

Olper, A., and V. Raimondi. Forthcoming. "Electoral Rules, Forms of Government and Redistributive Policy: Evidence from Agriculture and Food Policies." *Journal of Comparative Economics*. doi:10.1016/j.jce.2012.03.002.

Olper, A., and J. Swinnen. 2012. "Mass Media and Public Policy: Global Evidence from Agricultural Policies." LICOS Discussion Paper 320. LICOS Centre for Institutions and Economic Performance, Leuven, Belgium.

Olson, M. Jr. 1965. *The Logic of Collective Action. Public Goods and the Theory of Groups*. Cambridge, MA: Harvard University Press.

Prat, A., and D. Strömberg. 2005. "Commercial Television and Voter Information." CEPR Discussion Papers 4989. Center for Economic and Policy Research, Washington, DC.

———. 2011. "The Political Economy of Mass Media." CEPR Discussion Papers 8246. Center for Economic and Policy Research, Washington, DC.

Reinikka, R., and J. Svensson. 2005. "Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda." *European Economic Review* 3 (2–3): 259–67.

Roodman, D. 2009. "A Note on the Theme of Too Many Instruments." *Oxford Bulletin of Economics and Statistics* 71 (1): 135–58.

Strömberg, D. 2001. "Mass Media and Public Policy." *European Economic Review* 45: 652–63.

——— 2004a. "Mass Media Competition, Political Competition, and Public Policy." *Review of Economic Studies* 71: 265–84.

——— 2004b. "Radio's Impact on Public Spending." *Quarterly Journal of Economics* 119: 189–221.

Strömberg, D., and J.M. Snyder. 2008. "The Media's Influence on Public Policy Decisions." In R. Islam, ed., *Information and Public Choice. From Media Markets to Policy Making*, 17–31. Washington, DC: The World Bank.

Swinnen, J. 1994. "A Positive Theory of Agricultural Protection." *American Journal of Agricultural Economics* 76 (1): 1–14.

——— 2010. "The Political Economy of Agricultural Distortions: The Literature to Date." In K. Anderson, ed., *Political Economy of Distortions to Agricultural Incentives*, 81–104. Cambridge, UK: Cambridge University Press.

Swinnen, J., and N. Francken. 2006. "Summits, Riots, and Media Attention: The Political Economy of Information on Trade and Globalization." *The World Economy* 29 (5): 637–54.

Swinnen, J., J. McCluskey, and N. Francken. 2005. "Food Safety, the Media, and the Information Market." *Agricultural Economics* 32 (1): 175–88.

Timmer, M. P., and G. J. de Vries. 2007. *A Cross-Country Database for Sectoral Employment and Productivity in Asia and Latin America, 1950-2005*. Groningen, The Netherlands: Groningen Growth and Development Centre Research Memorandum, GD-98, University of Groningen.

Verbeke, W., R.W. Ward, and J. Viaene. 2000. "Probit Analysis of Fresh Meat Consumption in Belgium: Exploring BSE and Television Communication Impact." *Agribusiness* 16: 215–34.

Vigani, M., and A. Olper. 2012. "GMO Standards, Endogenous Policy and the Market for Information." LICOS Discussion Paper No. 306/2012. LICOS Centre for Institutions and Economic Performance, Leuven, Belgium.

Wacziarg, R., and K.H. Welch. 2008. "Trade Liberalization and Growth: New Evidence." *The World Bank Economic Review* 22 (2): 187–231.

Wooldridge, J. M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.