Raising Protection for Less Diversity? The Side-Effect of Quotas on Foreign Imports

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Abstract:

Many countries implement import restrictions to limit the dominance of foreign exporters. Previous empirical results as well as trade models' predictions suggest that protectionist measures tend to reinforce the preeminence of the most efficient suppliers. Yet, the literature is silent about the impact of protectionist measures on the diversity of foreign imports. In this paper, I analyze the impact of screen quotas on the diversity of foreign movie imports differentiated by their geographical origin. Testing the predictions derived from an heterogenous firms model (with bounded Pareto distribution of productivity) on Brazilian data, I find that an increase in the protection level fosters the concentration of imports, reinforcing the position of the already dominant exporter at the expense of marginal ones.

Keywords: Protectionism, quotas, Diversity of imports.

JEL Classification Numbers: F13, L82.

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1 Introduction

Many countries implement import restrictions not only to support domestic production but also to weaken the position of dominant exporters, that are the two sides of the same coin. This phenomenon is even more spread during times of crisis: more than 100 new local content requirement measures (that are a type of quota, defined as obligations to devote a certain amount of purchases to domestic products) were created or under discussion in the world in the aftermath of the 2008 crisis (Hufbauer and Schott, 2013). The objective of limiting the dominance of top exporters was clear when the EU and the US were reluctant to suppress their textile quotas and confront Chinese competitors in the mid 2000s. The cultural sector is also a good example as the use of protectionist measures as a tool to "protect and promote the diversity of cultural expressions"[1] is widespread. Almost all European countries implement quota in the cultural sector, like France, where national radio stations have to devote 40% of their musical broadcasts to francophone songs. And a growing number of emerging countries are also taking steps to promote their domestic cultural production through the limitation of cultural imports : Brazil for instance has increased the level of its screen quotas in 2011 and again in 2014.

Though there exists an extensive literature about the impact of a quota whether on prices and profit of domestic producers (Crandall, 1984) , on the quality of the domestic production (Feenstra, 1988) or on welfare (Boccard and Wauthy, 2005)[2], none of the existing studies have been interested in its impact on the diversity of foreign imports. I believe that it is another aspect of the consequences of a quota that is noteworthy as protectionist measures are often implemented as a reaction to the penetration (Trefler, 1993; Maggi and Rodriguez-Clare, 2000), or even concentration (Marvasti and Canterbury, 2005), of foreign imports. Therefore, questioning its impact on the composition of foreign imports is relevant. Indeed, a quota toughens the competition for foreign firms in the destination market in a way that may force the marginal exporters to exit favoring the already dominant foreign firms. More specifically, if costs are country-specific then the geographical diversity of imports may suffer from increasing protection which may matter, particularly in the cultural sector. Theoretical trade models predict

[1] This objective is clearly explicited in the UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions (2005) ratified by almost all countries but the United States.

[2] There also exists studies of the impact of quota in the cultural sector on welfare and diversity of domestic production (Francois et Van Ypersele, 2002; Perona, 2010, 2011; Richardson, 2015, 2006) yet it also neglects its impact on the diversity of foreign imports.

that increasing trade costs affects negatively the level of trade flows but also the selection of firms into exports (when this process is considered). A wide range of empirical studies confirm this prediction of negative correlation between tariff and the extensive margin of trade[3] (for the most recent contributions, see Debaere and Mostashari 2010; Crozet and Koenig, 2010 and Lawless, 2010). Yet, there exists no any study about the consequences of a protectionist measure on the diversity of imports.

Our paper aims at contributing to this very topic: instead of looking at the impact of a quota on domestic production, I analyze its impact on the geographical diversity *among* foreign imports when costs are country-specific. Deriving relevant predictions from the Helpman-Melitz-Rubinstein model (2008) that I empirically test using data on Brazilian cinema, I am able to empirically assess the impact of quota variations on the diversity of foreign movie imports in Brazil. Diversity is defined here as the balance among foreign imports: the higher the concentration across origins, the lower the diversity. The cinema sector is a relevant candidate as protectionist measures implemented in that sector are often motivated for promoting diversity[4]. I focus on Brazil in this paper as the country increased its screen quotas in 2011 (presidential decree 7.414) and again, later, in 2014 (presidential decree 8.176)[5]. In addition, the endogeneity problem that may arise is easily addressed in the case of Brazil as the variations of screen quotas are better explained by electoral motives than by concentration level in the cinema sector. It is, to my knowledge, the first study that empirically assess the consequences of a quota, or more generally of a trade barrier, on the diversity of imports.

The empirical results I obtain confirm the fact that increasing protection does reinforce the concentration of imports across origins and especially favors the already dominant exporters. This study evidences the existence of a "side-effect" of protectionist measure: it harms the diversity of foreign imports. Therefore, this paper highlights another dimension for concern that should be taken into consideration when discussing the implementation of protectionist measures.

The paper is organized as follows: the predictions of the model are developed in section 2.

[3]In these studies, the extensive margin is often, if not always, measured at the product-level.

[4]In the case of Brazil, the implementation of screen quotas is officialy linked with cultural diversity concerns as "quotas generate diversity in audiovisual market and are legitimate tools recognized by the international community, through the Convention on the Protection and Promotion of the Diversity of Cultural expressions". This quote is extracted from the website of the Brazilian National Cinema Agency: `http://www.ancine.gov.br/sala-imprensa/noticias/lei-da-tv-paga-ancine-divulga-decis-es-sobre-cinco-pedidos-de-dispensa`. Last accessed: July 2015.

[5]More details on the official website: `http://www.ancine.gov.br/legislacao/decretos`. Last accessed: July 2015

Section 3 describes the data and the empirical strategy while section 4 reports the results of the estimation and section 5 concludes.

2 Model

In order to derive predictions about the impact of raising protection on the variety of imports, I need a model that explicits the process of firm selection into exports and allow the number of exported varieties to vary across countries. Indeed, as highlighted by Hanson and Xiang (2011), the characteristics of the movie industry are better represented using an heterogeneous firms framework: fixed cost matters, studios differentiate their film product and not all the movies produced by one country are exported. Therefore,we rely on an heterogenous firms framework using a truncated Pareto distribution[6] as it is done in Helpman, Melitz and Rubinstein (2008) model, HMR hereafter. Accordingly, I replicate the basic features of their model, using the same notation, that I apply to the cultural good case, and derive from it the relevant predictions to answer our research question: what is the impact of an increase in protection on the geographical diversity of imports?

2.1 HMR setup

Consumers

In a world with J countries, the utility derived from the consumption of a given good is given by the following sub-utility function (in a general homothetic system of preferences with constant income shares) [7] as follows:

$$u_j = \left[\int_{l \in B_j} x_j(l)^\alpha dl \right]^{1/\alpha}$$

where $x_j(l)$ is the consumption of variety l, B_j the set of variety available in country j and α, which is comprised between 0 and 1, determines the elasticity of substitution across varieties $\epsilon = \frac{1}{1-\alpha}$. Consumers maximize their utility under a budgetary constraint with Y_j the expenditure level of j (equal to the income).

[6] The use of a *truncated* Pareto instead of the usual unbounded distribution is consistent with the empirical evidence that not all countries may export and the number of profitable exporting firms varies across exporters. Hanson and Xiang (2011) paper did not require this assumption as they focus solely on one exporter (the United States).

[7] As opposed to HMR, I focus solely on movie consumption, therefore I consider a sub-utility function. I assume that a constant income share κ is devoted to the consumption of cultural goods: as income rises, individuals do not increase the portion of their income devoted to cultural goods consistent with both theoretical (Becker, 1965) and empirical evidence (Seaman, 2006). Hence, for simplicity sake, I omit hereafter the scalar κ.

Therefore, the demand for variety l in country j is given by :

$$x_j(l) = \frac{p_j(l)^{-\epsilon} Y_j}{P_j^{1-\epsilon}} \tag{1}$$

with $p_j(l)$ the price of variety l in country j and P_j the ideal price index in j defined as follows:

$$P_j = \left[\int_{l \in B_j} p_j(l)^{1-\epsilon} dl \right]^{1/1-\epsilon} \tag{2}$$

Firms

Each country has N_j firms that each produces a distinct variety, hence there are $\sum_{j=1}^{J} N_j$ varieties in the world. A firm in country j produces one unit of a variety with a cost equal to $c_j a$, where $1/\alpha$ represents the productivity level of the firm and c_j the cost in j that is country-specific. Productivity level $\frac{1}{a}$ is distributed following a truncated Pareto distribution with support $[a_L, a_H]$ and is the same across countries: such that $G(a) = \frac{a^k - a_L^k}{a_H^k - a_L^k}$ with k the shape parameter ($k > \epsilon - 1$). When a firm wants to sell in another country i it has to bear additional costs: f_{ij} a fixed cost for exporting to i and τ_{ij} a bilateral trade cost. τ_{ij} can be decomposed into two components: $\tau_{ij} = \tau_i * d_{ij}$ with the first part representing the ad-valorem tariff imposed in i and d_{ij} a variable trade costs. I apply Hanson and Xiang's definition of costs (2011) that is relevant for the cinema sector: variable trade costs d_{ij} (variable as it depends on the number of copies provided and the length of distribution) include additional fees imposed on foreign movie revenues, "transaction costs in negotiating contracts" between distributors and exhibitors, advertising and film printing expenses. Fixed costs for exporting f_{ij} are incurred from the allocation of the right to distribute a movie in a given country, the cost of setting an international marketing campaign, the editing for a foreign public and adding subtitles to movie dialogues[8].

As monopolistic competition is assumed, I can write the standard markup pricing equation and define the price paid in i for variety l produced in j as follows:

$$p_j(l) = \tau_i d_{ij} \frac{c_j a}{\alpha} \tag{3}$$

[8]It is also possible to add the cultural discount in that cost variable, as in the case of movies the transport cost is likely negligible (especially with the increasing digitization of the sector) yet, cultural differences between countries can induce a cost when watching a foreign movie.

All N_j firms are able to sell in the domestic market, however only a subset can cover the fixed cost of exporting and sell in market i. More precisely, only firms with $a < a_{ij}$ find it profitable to export to i, with a_{ij} the productivity threshold characterizing the least productive firm from j that can export to i that is defined by the zero profit condition:

$$(1-\alpha)\left(\frac{\tau_i d_{ij} c_j a_{ij}}{\alpha P_i}\right)^{1-\epsilon} Y_i = c_j f_{ij} \tag{4}$$

Accordingly, firms from j will not be able to export to i whenever $a > a_{ij}$, and no single firms from j would export to i if $a_{ij} \leq a_L$.

I can now characterize the bilateral trade volumes:

$$V_{ij} = \begin{cases} \int_{a_L}^{a_{ij}} a^{1-\epsilon} dG(a) & \text{for } a_{ij} \leq a_L \\ 0 & \text{otherwise.} \end{cases}$$

Replacing the cumulative distribution function $G(a)$ by the truncated Pareto defined above, I can express V_{ij} as:

$$V_{ij} = \frac{k a_L^{k-\epsilon+1}}{(k-\epsilon+1)(a_H^k - a_L^k)} W_{ij} \tag{5}$$

where

$$W_{ij} = \max\left\{\left(\frac{a_{ij}}{a_L}\right)^{k-\epsilon+1} - 1, 0\right\} \tag{6}$$

2.2 Predictions on the impact of trade barriers on the diversity of imports

Now that the basic features of the model have been exposed, I can derive comparative statistics regarding the impact of increasing protection on the diversity of imports in i. In the case of movie imports, an increase in the screen quotas will induce the distributors to focus on the most profitable varieties, those with lower costs, therefore its impact is comparable to that of a tariff on imports. Following the literature about the comparison of the impact of tariffs and quotas in a monopolistic competition setting with a shared quota (Bhagwati, 1965, Jørgensen and Schröder, 2007), I assume that the effects of a quota are equivalent to that of an ad-valorem

tariff in this model[9] and can be apprehended through the trade cost variable $\tau_i > 1$.

From (5), bilateral trade flows are affected by the quota only through W_{ij}, that is the selection of firms into exports and more precisely through the productivity threshold a_{ij} (6), as follows:

$$a_{ij} = \left(\frac{(1-\alpha)Y_i}{c_j f_{ij}}\right)^{\frac{1}{\epsilon-1}} \frac{\alpha p_i}{d_{ij} c_j \tau_i} \tag{7}$$

In other words, a variation in τ_i influences the number of firms that can break even in market i through a modification in the cutoff a_{ij} affecting the number of varieties that can profitably export to i.

Proposition 1 *An increase in τ_i decreases the threshold value of a_{ij} as proved in (8). As a firm from j can export to i only if $a < a_{ij}$, it implies that the number of varieties exported from j to i will also decrease.*

Proof. As all parameters in (8) are positive, the partial derivative of a_{ij} with respect to τ_i is always negative.

$$\frac{\partial a_{ij}}{\partial \tau_i} = -\frac{\alpha P_i}{c_j d_{ij} \tau_i^2} \left(\frac{(1-\alpha)Y_i}{c_j f_{ij}}\right)^{1/\epsilon-1} < 0 \tag{8}$$

■

Furthermore, from the definition of the productivity cutoff in (7), it appears that firms from origins with higher costs need to have a productivity level higher (and thus a lower a) to be able to export to i, and as productivity a is assumed to be identically (Pareto) distributed across j, they consequently have the lowest proportion of exporting firms.

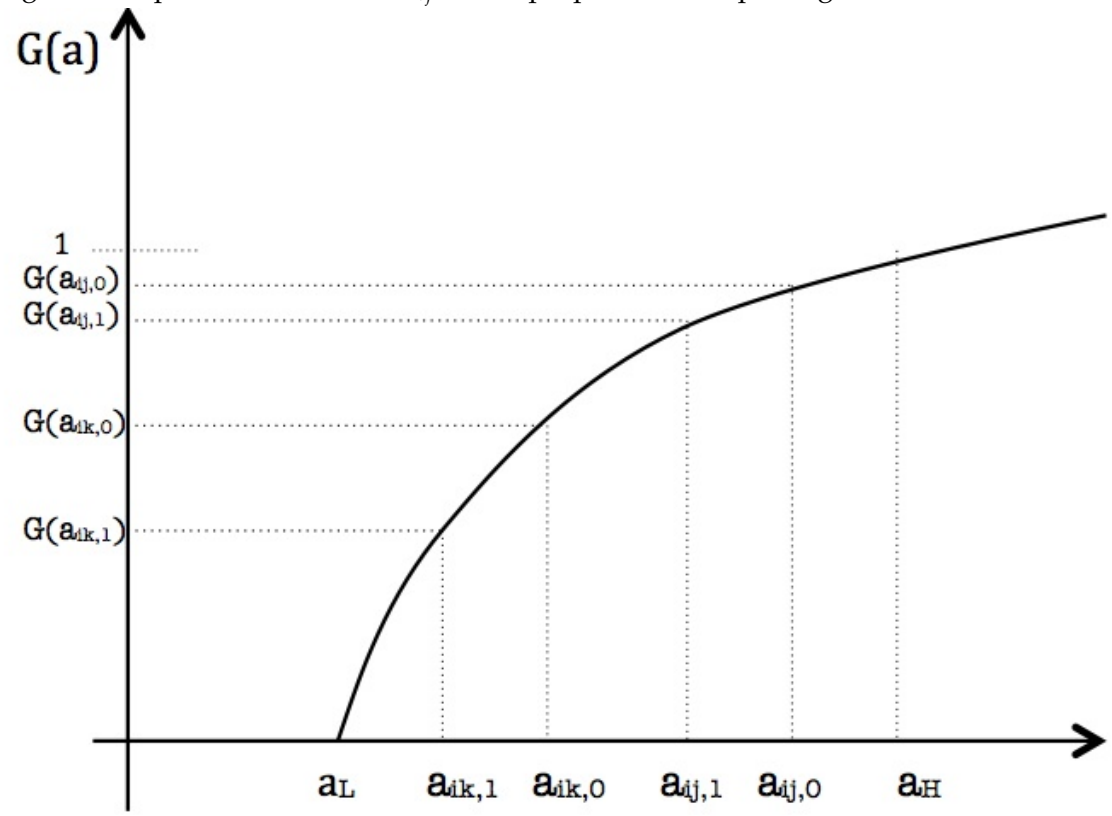
Following the increase in protection of i, the least efficient origins are those that will suffer the greater loss in their share of varieties exported to the destination market as highlighted in Figure 1. As an illustration: j and k are two exporting countries identical in all respect except for their fixed cost of exporting f_{ij} such that $f_{ik} > f_{ij}$, then $a_{ij} > a_{ik}$ (the initial situation is indexed 0). Because of the increase in τ_i (indicated by the index 1), both origins will experience a decrease in the same proportion[10] of their productivity cutoff value a_{ij} that will translate

[9] Indeed, Jørgensen and Schröder (2007) proved that in the case of monopolistic competition, a shared quota (i.e. no one owns the quota and the access to the destination market is competitive, as opposed to a sold quota that is auctioned among exporters) has the same implications in terms of welfare and number of firms to that of an ad-valorem tariff.

[10] Indeed, $\frac{\partial a_{ij}/\partial \tau_i}{a_{ij}} = \frac{\partial a_{ik}/\partial \tau_i}{a_{ik}} = 1 - \frac{1}{\tau_i}$

in a different decrease in the proportion of exporting firms depending on the level of their costs. The higher the level of their initial cost f_{ij}, the higher the proportion of firms becoming unprofitable (whatever the choice of the value of the shape parameter k).

Figure 1: Impact of variation in a_{ij} on the proportion of exporting firms with different costs



G(a) is Pareto distributed on the support $[a_L; a_H]$.
0 *indexes the initial situation (without* τ_i *variation) and* 1 *the situation after the increase in* τ_i. *Origin k is assumed to be less efficient than j, hence* $f_{ik} > f_{ij}$ *and* $a_{ik} < a_{ij}$

Proposition 2 *Depending on the similarity of costs between origins, increasing protection has different impact on the concentration of foreign imports. Two cases are to be distinguished:*

- $\forall j \neq k$, *and* $j \neq i$, *if* $c_j = c_k$, $d_{ij} = dik$ *and* $f_{ij} = f_{ik}$ *then increasing protection should have no impact on the concentration of imports as it would induce a similar decrease in the number of firms across origins that can break even in i.*

- $\forall j \neq k$ *and* $j \neq i$, *if* $c_j \neq c_k$, $d_{ij} \neq dik$ *or* $f_{ij} \neq f_{ik}$ *then increasing protection should increase the concentration of imports at the expense of the less efficient origins.*

Proof.

The partial derivative of the proportion of exporting firms to i is always negative:

$$\frac{\partial G(a_{ij})}{\partial \tau_{ij}} = -\frac{k-1}{a_H^k - a_L^k} \left(\left(\frac{(1-a)Y_i}{f_{ij} c_j^{\epsilon}} \right)^{\frac{1}{\epsilon-1}} \frac{\alpha P_i}{d_{ij}} \right)^k \tau_i^{-k-1} \tag{9}$$

This result shows that whenever the level of protection increases in i, the proportion of firms that can export to i decreases.

Taking the case of two countries that are equally distant to the destination countries (i.e. $d_{ij} = d_{ik}$) but differs in terms of fixed cost of exporting such that $f_{ik} > f_{ij}$: the ratio of their respective partial derivative makes clear that the country with the higher level of cost experiences the higher marginal impact:

$$\frac{\partial G(a_{ij})/\partial \tau_i}{\partial G(a_{ik})/\partial \tau_i} = \left(\frac{f_{ik}}{f_{ij}} \right)^{\frac{k}{\epsilon-1}} > 1$$

Implying that $\frac{\partial G(a_{ij})}{\partial \tau_i} > \frac{\partial G(a_{ik})}{\partial \tau_i}$ and as the partial derivatives are negative as proven in (9), the magnitude of the impact is greater for k: the least efficient country. This result can be extended to the N-country case: then, the magnitude of the impact of τ_i on the proportion of exporting firms is inversely proportional to the level of the cost variable. As we assumed that the fixed cost of producing in the domestic market is null, then there exist an infinite pool of entrants in all origins. So, we can conclude that the decrease in proportion are comparable across origins and therefore, an increase in the protection level induces more concentration across origins of imports.

■

To be completed.

3 Data and Empirical Strategy

3.1 The database

In this paper, I focus on the impact of an increase in the screen quotas in Brazilian cinema between 2009 and 2014 using data provided by the Brazilian National Cinema Agency (ANCINE). The database provides statistics about weekly release of, domestic and foreign, movie titles in Brazilian cinemas and their respective public, screens and receipts. Data about ticket prices, per capita GDP and subsidies granted to the sector are retrieved from the same sources.

In addition to ANCINE dataset, I gathered data about the movie production per year of countries that have exported at least once to Brazil during the sample period relying on data provided by the Internet Movie Database, the Motion Picture Association of America, the European Audiovisual Observatory and the UNESCO Institute for Statistics. These figures allow me to compute a concentration index of movie production across exporting countries to Brazil in order to take into account the level of competition across the different origins.

In the following, foreign movies are split among 4 geographical origins: the USA, Europe, Latin America and the Rest of the World. We prefer that definition of geographical area so as to minimize mismeasurment bias that might arise in the presence of coproduction between countries. Indeed, in ANCINE dataset, one movie has one single origin (the main producer) and does not allow to take into account the possible existence of simultaneous countries of origin. And as they often arise between neighboring countries, considering country-level origin of movies could lead to an erroneous picture, so we gather together neighboring countries that are also culturally similar.

Table 6 in Appendix provides the summary statistics of all the variables used in the analysis.

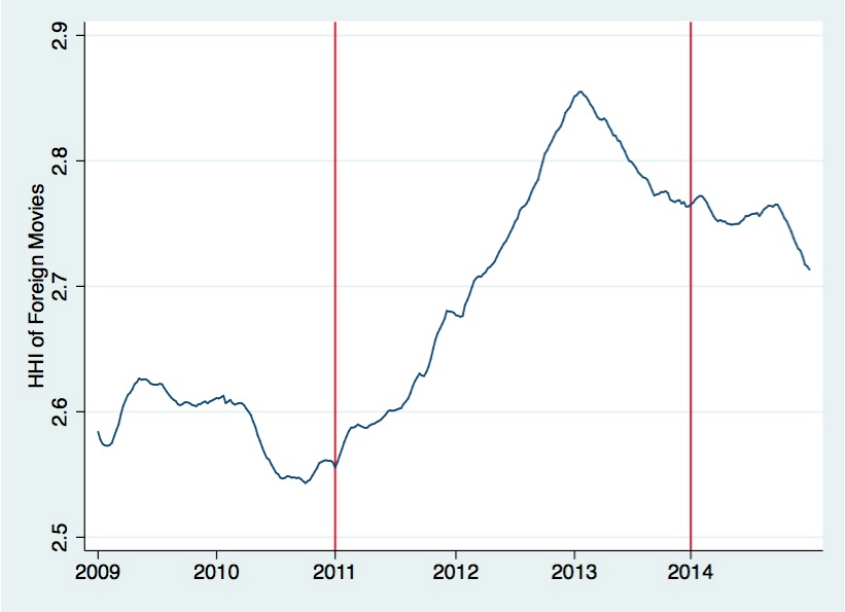
3.2 Descriptive Statistics

In 2014, Brazilian movies represented 24% of titles released in Brazilian cinemas and 12% of total ticket sold, while American movies accounted for 38% of titles released and 82% of total tickets sold. Other origins gathered around 6% of the Brazilian public the same year (European movies: 5%, Latin American: 0,4% and Rest of the World: 1%).

Figure 2 presents the evolution of the concentration of foreign movie titles across origins using the HHI concentration index weighted by the evolution of the concentration of world

production. The graph clearly shows the increase of the concentration index from 2011 and the halting in the decrease of the index from 2014[11], thus questioning the impact of the increase in protection on the concentration of foreign movie imports.

Figure 2: Evolution of the concentration of foreign movie titles across origins



The HHI index is weighted by world production concentration index.
For reading convenience, data are plotted using yearly moving average

3.3 Screen quotas in Brazil

Every December, the presidential office releases a decree setting the minimum number of domestic movies that cinemas[12] have to implement during the following year. These decrees that define the screen quotas (SQ) specify the minimum number of days during which a cinema has to screen domestic movies but also the minimum number of different titles. Table 1 presents the evolution of the SQ in Brazil from 2009 (implementation of the decree released in 2008) to 2014. For instance, a complex with 2 screens had to show at least 2 different Brazilian movies for at least 70 days during the year 2009. The quota has been modified twice during the sample period: in 2011 and in 2014. In 2011, only the minimum number of different domestic titles that has to be screened was increased while in 2014, the minimum number of days was

[11] Yet, note that because I use yearly moving average, the very beginning and the very end of the graph are not fully representative.

[12] Cinemas are defined as the theaters that operate regularly and have a composite movie programming using either digital technology and/or 33mm and also collect ticket for the public. Screens with sporadic broadcasts, pornographic programming or screening DVDs or Blurays are not considered as cinemas. Informations about screens are collected by ANCINE, the national cinema agency, through Internet sites and telephone contacts with exhibitors, municipalities and culture departments. Source: ANCINE, 2013

also increased but only for the complexes having more than 8 screens (around 28% of total screens in Brazil). Therefore, I focus on the first component of the SQ measure: namely, the minimum number of different titles that has to be screened.

Right after the launching of the 2014 presidential decree, some exhibitors stood up against the increase in the quotas expressing their fears of such changes, they challenged the constitutionality of the screen quotas at the Supreme Court in order to get its removal[13]. Eventually, the Supreme Court confirmed their validity to support the Brazilian cinematographic production[14]. As a matter of fact, cinemas that do not comply with the quotas are subject to a fine equal to 5% of the average of their daily gross box office revenue, calculated the year of infringement, multiplied by the number of days of noncompliance[15]. In 2011, 133 fines were imposed to Brazilian cinemas that did not cope with the new legislation, as opposed to only 52 in 2010. Altogether, these elements prove the binding nature of the new legislation.

Table 1: Screen quotas implemented in Brazil

		2009, 2010		2011, 2012, 2013		2014	
Screen per complex	% screens	Days	Nb of titles	Days	Nb of titles	Days	Nb of titles
1	8,22%	28	2	28	3	28	3
2	8,59%	70	2	70	4	70	4
3	6,83%	126	3	126	5	126	5
4	10,75%	196	4	196	6	196	6
5	14,00%	280	5	280	7	280	8
6	14,12%	378	6	378	8	378	9
7	8,63%	441	7	441	9	441	11
8	11,35%	448	8	448	10	480	12
9	4,03%	468	9	468	11	531	14
10	5,60%	490	10	490	12	560	15
11	2,88%	506	11	506	13	583	17
12	2,24%	516	11	516	14	600	18
13	0,97%	533	11	533	14	624	20
15	1,12%	570	11	570	14	675	23
18	0,67%	630	11	630	14	756	24

The "% screens" column indicates the percentage of screens (in 2013) that belonged to a complex having n screens. The "days" column represents the minimum number of days during which a complex has to screen domestic movies. The "Nb of titles" column explicits the minimum number of different domestic titles that has to be screened. Source: `Ancine.gov.br`.

Assuming that overall time constraints in Brazilian cinemas remain unchanged, screen quotas are equivalent to a quota for foreign movies: as the number of screens devoted to domestic movies increase, it decreases for imported movies. This crucial assumption is violated

[13]Source:`http://oglobo.globo.com/opiniao/o-espelho-partido-11952301`. Last accessed: July 2015.

[14]Source:`http://www.stf.jus.br/portal/cms/verNoticiaDetalhe.asp?idConteudo=261888`. Last accessed: July 2015.

[15]Source: `http://www.planalto.gov.br/ccivil_03/mpv/2228-1.htm`

if cinemas manage to bypass the legislation by programming domestic content at unusual timing, like very early in the morning. This concern is already addressed by the legislation as domestic movies screened before 1 pm are not taken into account to fill the quota and domestic movies that are classified as parental control-free have to be screened between 1 pm and 8 pm to be included in the quota filling. Hence, overall time constraints are likely to remain constant across periods, therefore, SQ implemented in Brazil can be interpreted as an import quota. As an illustration, Figure 4 in Appendix shows the increase in the number of screens devoted to Brazilian movies during the sample period.

3.4 Empirical specification

3.4.1 The baseline equation

Following the predictions derived in Section 2, I estimate the following equation:

$$HHI_{wt} = \alpha SQ_t + \beta HHI_t^{world} + \gamma GDPc_t + \theta Total_{wt} + \lambda_w + \epsilon_{wt} \tag{10}$$

w and t correspond to time dimensions, respectively week and year. The dependent variable is a Herfindhal-Hirschman concentration index of the foreign titles launched in Brazilian cinemas and it is calculated as follows:

$$HHI_{wt} = \sum_{j,i \neq j} \left(\frac{x_{jwt}}{X_{wt}} \right)^2$$

Where j is the origin variety: US, European, Latin American or Rest of the World; the set J does not comprise the domestic origin i. x_{jwt} is the number of titles launched from origin j during the week w of year t and X_{wt} is the total number of foreign movie imported in Brazil at week w of year t such that $X_{wt} = \sum_{j,i \neq j}^{J} x_{jwt}$.

SQ is the variable of interest that is measured as the minimum number of domestic films that legally have to be screened in Brazilian cinemas: as the quota tightens, this variable increases. As the size of the quota varies with the size of the complexes (the larger complexes have to show more local movies per screens), I calculate the SQ as the average of the minimum number of local movies that has to be screened weighted by the share of screens that are concerned by the related quota. It is calculated as follows:

$$SQ_t = \sum_k s_{kt} sq_{kt}$$

Where k is the type of complex, differentiated by the number of screens. s_{kt} represents the share of screens that belongs to complex of type k at time t. For instance, in 2010, screens from 5 screens-complexes represented 12,2 % of total screens in Brazil (i.e. $s_{5,2010} = 0,122$). sq_{kt} is the minimum number of local titles that has to be shown in screens at k-type complex during the year t. I also use alternatives measure of SQ variable in the Appendix (Table 7): the unweighted average, the minimum number of domestic films that have to be screened in the largest Brazilian movie theaters or through the use of a categorical variable.

From the theoretical predictions derived in section 2, the concentration of movies across exporters depends on their relative costs that translates into a different share in world production: as the more efficient should produce the greater number of movies. Therefore, I incorporate in the regression the HHI^{world} variable that represents the Herfindhal Hirschmann index applied to the production of all the countries that have exported movies to Brazil at least once between 2009 and 2014. To construct this index, I gathered data from various sources, namely the Internet Movie Database[16], the Motion Picture Association of America[17], Unesco Institute of Statistics database[18] and the European Audiovisual Observatory (Focus, 2013).

In addition to these variables, I add as covariates the GDP per capita ($GDPc$) in thousands US dollars to control for budget constraint changes, the total number of titles released each week and a week fixed effects to reduce the influence of the seasonality on the dependent variable (as movies are released on a weekly basis, weekly fixed effects are the most appropriate).

3.4.2 The econometric method

Because the dependent variable is a proportion (comprised between 0 and 1), the standard OLS approach is inappropriate. Indeed, this approach neither address the non linearity of the effects and the resulting hetereoskedasticity of the residuals, nor allow for predictions comprised within the bounds of the dependent variable. Therefore, I follow Papke and Wooldridge (1996) who defined the fractional logit model as a solution for the estimation of a model with a fraction as a dependent variable. This approach consists in the estimation of a Bernoulli quasi likelihood method using a logistic distribution. Henceforth, I present the results using the fractional logit GLM method.

[16]IMDB database is available at `http://www.imdb.com/country/`.

[17]Report from the MPAA about American production is available at `http://www.mpaa.org/wp-content/uploads/2015/03/MPAA-Theatrical-Market-Statistics-2014.pdf`.

[18]UIS database: `http://data.uis.unesco.org/`. Last update: September 2013.

3.4.3 The endogeneity issue

Another concern is the possible endogeneity of the quota. Indeed, the quota might have been increased in part because the authorities feared the high concentration of movie sales on foreign movies. This fear is supported by Marvasti et Canterbury (2005) who evidenced that the implementation of import restrictions in the audiovisual sector is endogenous to the total amount of movies imported from the United States. If the variable of interest is endogeneous, I expect that changes in the SQ are explained by an increase in the concentration of movie title across foreign origins (which is our dependent variable). To check for this possibility, I analyze whether the modification of SQ are due to short term evolution in HHI titles: I perform in Table 2 a test of parallel trends with and without SQ changes. I include a dummy variable equal to one the X-months preceding the implementation of the SQ changes, and multiply it by a categorical variable that takes the value 0 for the years without SQ variation and equal to 1 (2) for 2011 (2014) in order to capture pre-treatment period trend. If the variable is significant, I cannot reject the hypothesis that the implementation of SQ modification is due to short-term changes in the concentration level. On the contrary, if the trend variable is not statistically significant, then I can conclude that the trend 1 (2/3/4) month(s) before the SQ changes is not different from the same weeks during the years without SQ variations and hence could not explain the timing of the modification of the quotas.

The corresponding results suggest that the timing of the SQ modifications are not driven by the evolution of concentration level across foreign titles released in Brazilian cinemas. From this, reverse causality does not appear as an issue[19]. However, endogeneity can still arise in the presence of omitted variables. For instance, a technological shock in a foreign country like the beginning of mass production of 3D movies may trigger a fear from the domestic producers, that will ask for more protection, while local consumers will be more attracted by these new varieties, essentially produced in the US, and thus result in a downward bias of the coefficient. As an illustration, Brazil recorded an increase of more than 140% in the number of 3D screens in 2010 compared to the previous year while recognizing that the Brazilian production "has not adopted the technology" and should therefore "expect a reduction in the national cinema market share" (ANCINE, 2010 p52). In order to eliminate any suspicions regarding omitted variable bias, I propose an instrumentation strategy to test whether the results obtained are

[19]Implementing the same method but replacing the concentration index of titles by the concentration index of tickets sales (across origins) yields the same results. Results are available upon request.

Table 2: Test of the parallel trend assumption

Estimation technique: Fractional Logit GLM				
Dependent variable: HHI titles				
Period pre-decree	1 month	2 months	3 months	4 months
	(1)	(2)	(3)	(4)
HHI_t^{world}	-0.183***	-0.187***	-0.177***	-0.176***
	(0.0505)	(0.0503)	(0.0494)	(0.0502)
$GDPc_t$	-0.0594***	-0.0592***	-0.0616***	-0.0607***
	(0.0114)	(0.0120)	(0.0122)	(0.0133)
$Total\ titles_{wt}$	0.000317	0.000311	0.000295	0.000312
	(0.000225)	(0.000224)	(0.000230)	(0.000236)
$Trend\ pre\ 2011_{wt}$	0.00827	-0.000507	-0.000395	0.00262
	(0.0152)	(0.00866)	(0.00726)	(0.00636)
$Trend\ pre\ 2014_{wt}$	-0.000189	-0.00650	0.00209	0.00386
	(0.00434)	(0.00431)	(0.00521)	(0.00470)
Constant	0.784***	0.785***	0.795***	0.788***
Observations	313	313	313	313
Week FE	Y	Y	Y	Y

Robust clustered standard errors (week level) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

robust to the correction of a potential bias.

3.4.4 The instrumentation strategy

A closer look at the data reveals that changes in the protection level coincides with presidential elections that are held every four years. Indeed, the outgoing president Lula issued the decree 7.414, increasing the number of Brazilian that has to be screened, as one of his last government policies before delivering the office to his successor Dilma Roussef in 2011. The last year of her first mandate, Dilma Roussef issued the decree 8.176 that tightened even more the existing screen quotas to be implemented in 2014. The same year, and three months before the general election (and her eventual reelection), Dilma Roussef launched a 2,3 billion reales package for the cinema and TV industry. Interestingly, this set of measures was interpreted by some commentators as "a calculated play for Brazils creative classes, not all of whom may back her re-election"[20]. The holding of very large meetings dedicated to Brazilian intellectuals and artists corroborates the fact that the cultural sector has been an important target during the election campaign. Indeed, these meetings, highly publicized in the medias, were respectively held during the last week of each election campaigns in 2014 and 2010, according to

[20]This comment is extracted from an article published in Variety: `http://variety.com/2014/film/global/brazils-dilma-roussef-announces-540-million-government-package-for-film-and-tv-1201257177/`

the *Journal do Brasil*. During the latest one, Dilma Rousseff pledged that her government will "put culture as a part of [her] economic strategy"[21]. Therefore, the existence of a correlation between election dates and increase in the protection of the audiovisual industry is a plausible assumption.

Accordingly, I propose two instruments for explaining SQ changes that are not directly correlated with the concentration level of foreign movie titles: the date of presidential elections held in Brazil and the distance to the next presidential term. The link between political decisions and elections date has already been emphasized in the literature (for seminal contributions see: Hibbs, 1997 and Nordhaus, 1975) and Afonso, Gruner et Kolerus (2010) explicitly used the distance to elections as an instrument for government decisions where economic growth is the dependent variable. I follow this strand of the literature and use the distance to the next presidential term as an instrument explaining the variation in SQ, that should satisfy the exclusion restriction as the date of the election is not correlated with the concentration of movie titles in Brazilian cinema. The variable "Distance to next term" takes the value 0 the year a new presidential term begins, 1 the preceding year and 2 for 2 years before. From Table 3, the two instruments are significantly correlated with the endogenous variable, in other words, the closer the beginning of the next presidential mandate, the higher the probability that the SQ will be modified[22].

Before turning to the interpretation of the instrumentation results, I have to discuss the econometric strategy applied. Due to computational constraints, using instrumental variables with GLM method is arduous. As a consequence, I follow the literature and linearize the dependent variable using the *arcsin* transformation (Sokal et Rohlf, 1981, Snedecor et Cochran, 1989) and then apply the usual two-stage least squares (2SLS) procedure using the transformed dependent variable, defined as follows:

$$\widehat{\text{HHI}_{wt}^{titles}} = \arcsin\sqrt{\text{HHI}_{wt}^{titles}}$$

[21] Translated by the author from portuguese "Vamos colocar a Cultura dentro da nossa estratgia de crescimento econmico" in `http://www.jb.com.br/eleicoes-2014/noticias/2014/09/15/artistas-e-intelectuais-fazem-ato-em-apoio-a-reeleicao-de-dilma-rousseff/`

[22] One could fear that elections impact concentration level in the cinema sector (thus violating the exclusion restriction) through different channels such as consumption support measures, yet I believe that it is not the case as the parallel trends test in Table 2 revealed that the concentration patterns in Brazilian cinemas was not different the weeks preceding the elections compared to the same weeks without any election scheduled.

4 Results

4.1 Baseline results

I present in Table 3 the results of the estimation of equation (10). In the first column, I use the standard OLS approach and apply the fractional logit GLM method in column (2). Finally, I implement the instrumentation strategy in the last two columns: in column (3) the date of election is the instrument variable and in column (4) I use the distance to the next presidential term as an instrument.

Table 3: Baseline results

Estimation technique	OLS	GLM	IV 2SLS	IV 2SLS
Dependent variables:	HHI titles	HHI titles	$\widehat{\text{HHI}^{titles}}$	$\widehat{\text{HHI}^{titles}}$
	(1)	(2)	(3)	(4)
SQ_t	0.0146**	0.0146***	0.0325***	0.0211***
	(0.00585)	(0.0053)	(0.00896)	(0.00730)
HHI_t^{world}	-0.297***	-0.2997***	-0.450***	-0.357***
	(0.0690)	(-0.0623)	(0.0896)	(0.0800)
$GDPc_t$	-0.133***	-0.1321***	-0.221***	-0.165***
	(0.0281)	(-0.0254)	(0.0410)	(0.0334)
Total $titles_{wt}$	0.000327	0.00033	0.000361	0.000340
	(0.000245)	(-0.0002)	(0.000251)	(0.000250)
Constant	1.132***	2.607***	1.840***	1.575***
	(0.131)	(0.489)	(0.192)	(0.154)
First stage results for SQ_t				
$Elections_t$			0.548***	
			(0.038)	
Distance to next $term_t$				-0.312***
				(0.010)
Observations	313	313	313	313
R-squared	0.540		0.528	0.539
DWH test			7.32**	4.22***
F-Statistics 1st stage			235.94	593.99
Cragg Donald Weak IV			251.95	1087.02
DF-GLS stat	4.441	4.441	4.431	4.431
Week FE	Y	Y	Y	Y

Average marginal effects are reported –Robust clustered standard errors (week level) in parentheses
In column (3), the instrument is the variable *Elections* equal to one the years a presidential election was held in Brazil and in column (4) it is the distance to the next presidential term.
*** p<0.01, ** p<0.05, * p<0.1

From Table 3, it appears that raising protection has a significant and positive impact on the concentration of movie titles across origins in Brazilian cinemas. Indeed, a one unit increase in the (weighted average) SQ is correlated with a 2 percentage point increase in the Herfindahl-Hirschmann index of movie titles. Put differently, an increase of one standard deviation in the

screen quota increases the HHI concentration index by 0,73 standard deviation. Theses results are relatively stable across estimation methods.

Note that the coefficients obtained using GLM or instrumental variables methods are not statistically different from one another, suggesting that endogeneity is not an issue[23]. Therefore, column (2) is my preferred specification.

The application of the Dickey Fuller test, using the generalized least squares (DF-GLS) method proposed by Elliott, Rothenberg, and Stock (1996), allows to reject the hypothesis that the dependent variable is non stationary (at the 1% confidence level) calculated with the optimal number of lag set at 14. Therefore, the risk of obtaining spurious correlation due to the non stationarity of the variables is unlikely.

In appendix, I run the same regressions using alternative specifications of the screen quotas (Table 7) and also an alternative concentration index, namely a Theil index (Table 8) : in both cases, the results obtained are similar to those in Table 3.

4.2 Augmented baseline results

In Table 4, I depart from the baseline regression in Table 3-column (2) and incorporate additional covariates that might be relevant to explain the concentration of foreign movie titles. Namely, I introduce the total value of subsidies attributed to the sector (in thousand of reales), a variable indicating the holding of a movie festival during week w and the evolution of ticket prices.

The significance and the magnitude of the variable of interest hardly vary with these additional covariates. Nevertheless, it appears that the support to domestic production is correlated with an increase in the dependent variable that might be explained as the impact of trade cost: by favoring local production, subsidies toughen the competition for foreign exporters.

[23]The absence of an effect on the coefficient of the instrumentation strategy can not be attributed to a weak instrument problem as the Cragg Donald statistics is well above the Stock-Yogo (2005) critical value (16.38) with both instruments (columns 3 and 4), thus both IV have sufficient explanatory power to allow for inference.

Table 4: Results with additional controls

Estimation technique : Fractional logit GLM				
Dependent variable : HHI titles				
	(1)	(2)	(3)	(4)
SQ_t	0.0174***	0.0145***	0.0136***	0.0202***
	(0.00554)	(0.00524)	(0.00549)	(0.00607)
HHI_t^{world}	-0.329***	-0.299***	-0.345***	-0.263***
	(0.0652)	(0.0616)	(0.0673)	(0.0660)
$GDPc_t$	-0.172***	-0.132***	-0.146***	-0.167***
	(0.0272)	(0.0253)	(0.0258)	(0.0269)
Total $titles_{wt}$	0.000515**	0.000323	0.000385*	0.000494**
	(0.00021)	(0.00023)	(0.00022)	(0.00021)
$Subsidies_t$	0.000287***			0.000415***
	(8.17e-05)			(0.00011)
$Festivals_{wt}$		0.00665		0.00611
		(0.0261)		(0.0248)
Ticket $price_t$			0.00420	-0.00724*
			(0.00318)	(0.00401)
Observations	313	313	313	313
Week FE	Y	Y	Y	Y

Robust clustered standard errors (week level) in parentheses –The instrument is the variable *Distance to next term*.
*** p<0.01, ** p<0.05, * p<0.1

4.3 SQ variations and the share of each variety

According to the previous results, the tightening of the SQ is correlated with increasing concentration, implying that some varieties, or geographical origins, gain from increasing protection at the expense of others. In this section, I identify which origin is positively impacted by the quotas implemented in Brazil through the regression of each share separately on the same set of independent variables.

Table 5: Title concentration across origins

Estimation technique : Fractional logit GLM				
Dependent variable:	US share	EU share	AL share	RoW share
	(1)	(2)	(3)	(4)
SQ_t	0.0442***	-0.0464***	0.00818***	-0.00141**
	(0.0746)	(0.0111)	(0.00238)	(0.00677)
US $share_t^{world}$	0.177			
	(0.305)			
EU $share_t^{world}$		0.313***		
		(0.0937)		
AL $share_t^{world}$			1.099**	
			(0.533)	
Other $share_t^{world}$				0.361***
				(0.0731)
$GDPc_t$	-0.363***	0.326***	0.00122***	0.0511*
	(0.0491)	(0.0523)	(0.0145)	(0.0294)
Total $titles_{wt}$	0.00098***	-0.00117***	0.00028	-0.000168
	(0.000362)	(0.000289)	(0.000149)	(0.000151)
Observations	313	313	313	313

Robust clustered standard errors (week level) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

As expected from the theoretical predictions, the US share is the most favored origin with an increase of 4.42 percentage point following a 1 percentage point increase in the quotas while European and the Rest of the World are negatively impacted by the quotas. In addition, the share of Latin American movies appear to be also slightly improved by the quota with a 0.8 percentage point increase. This result might be explained in part by the fact that Brazil's neighboring countries benefit from a lower cultural discount that might help them survive in the market[24].

[24]In an alternative regression, I incorporated the number of coproduction with each origin (available on ANCINE website) to test whether the results were driven by a rise in the number of coproduction, yet the corresponding variable was not statistically significant and the coefficient associated to the SQ hardly varied for each origin.

5 Concluding Remarks

In this paper, I argue that increasing protection affects negatively the diversity of foreign imports through a survival of the fittest mechanism. Indeed, implementing import restraints stiffens the competition for foreign firms by requiring a higher level of productivity to profitably export to the destination market. Therefore, varieties from origins facing higher costs are more likely to become unprofitable. As a consequence, raising protection may reinforce the dominant exporters which can be the exact opposite of the declared objective of the protectionist measure.

I empirically test these predictions on the case of quotas implemented in the cinema sector in Brazil. The results I obtain evidence the significant and positive impact of increasing protection on the level of concentration of foreign movie imports. As expected, this increase in concentration benefits the already dominant exporter, namely the American firms, at the expense of marginal exporters and this result is robust to instrumentation and alternative specifications. This study provides robust evidence of the existence of an unexplored effect of increasing protection: it harms the diversity of foreign imports and therefore highlights another dimension that should be taken into account when implementing such measures.

6 Appendix

6.1 Descriptive statistics

Table 6: Descriptive statistics

Variables	Mean	Std. Dev.	Minimum	Maximum
Share of foreign titles in Brazil	0.761	0.051	0.636	0.893
Share of EU titles in foreign imports	0.372	0.053	0.218	0.5
Share of US titles in foreign imports	0.507	0.0643	0.341	0.663
Share of LA titles in foreign imports	0.052	0.028	0	0.150
Share of RoW titles in foreign imports	0.067	0.027	0.0128	0.213
HHI index for foreign titles	0.412	0.036	0.318	0.524
Theil index for foreign titles	0.356	0.078	0.145	0.573
GDP per capita	5583.46	207.33	5271.14	5823.04
HHI index for world production	0.405	0.036	0.375	0.482
Share of US production	0.154	0.0123	0.140	0.169
Share of RoW production	0.569	0.045	0.529	0.663
Share of EU production	0.226	0.039	0.140	0.254
Share of LA production	0.051	0.004	0.046	0.057
Ticket price	10.563	1.359	8.61	12.57
Subsidies	73.218	27.245	26.354	106.622
SQ weighted average	7.269	1.268	5.62	9.19
SQ max	14.665	4.384	11	24
SQ unweighted average	11.267	2.533	8.75	16.35

Author's calculation. "Ticket prices" and "Subsidies" are respectively provided in R$ and millions of R$. "LA" refers to Latin American. "RoW" refers to the Rest of the World origin.

Figure 3: Shares by geographical origin in 2014

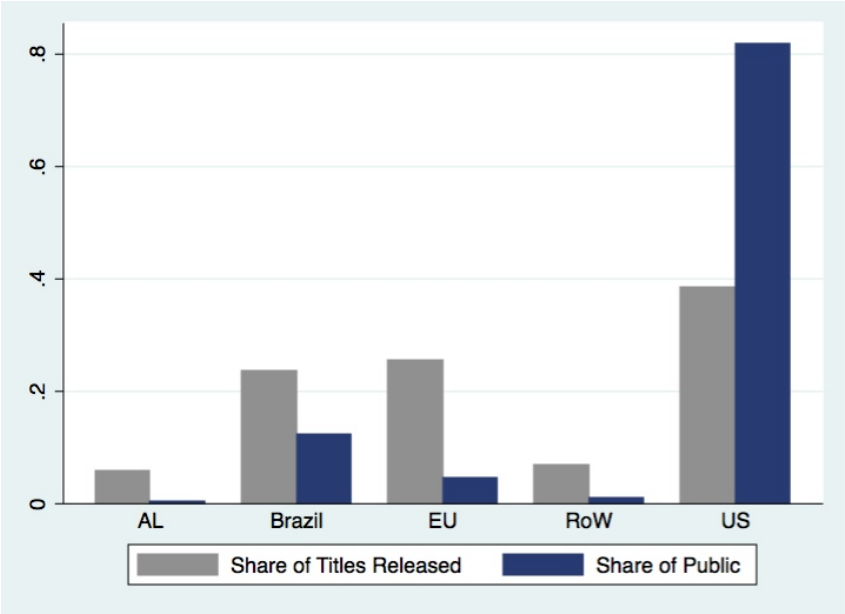
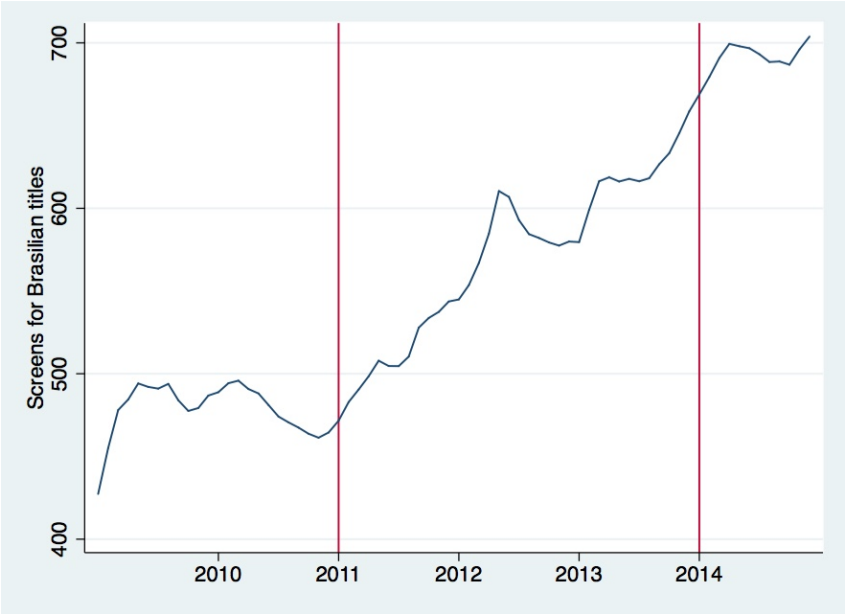


Figure 4: Evolution of screens devoted to Brazilian titles



Author's calculation from ANCINE database. Use of moving average.

6.2 Using alternative measures of the SQ variable

In Table 7, I confront the robustness of the results obtained to the testing of alternative specification of the SQ variable. In the first column, I use the unweighted average SQ, in the second column, I use the maximum value of SQ for each modification in the legislation and in the third column I consider the SQ as a categorical variable that take value from 1 to 3 according to the different phase of the SQ during the sample period. In the three cases, the results confirm the existence of a positive and significant correlation between increasing protection and the level of imports concentration.

Table 7: Baseline results using an alternative SQ variable

Estimation technique : Fractional logit GLM			
Dependent variables: HHI titles			
SQ variable	Unweighted av.	Maximum	Categorical
SQ_t	0.00472***	0.00262**	0.0196**
	(0.00211)	(0.00121)	(0.00820)
HHI_t^{world}	-0.412***	-0.455***	-0.323***
	(0.110)	(0.132)	(0.0734)
$GDPc_t$	-0.0806***	-0.0688***	-0.104***
	(0.0125)	(0.0108)	(0.0189)
Total $titles_{wt}$	0.000305	0.000303	0.00031
	(0.000221)	(0.000222)	(0.000221)
Observations	313	313	313
Week FE	Y	Y	Y

Robust clustered standard errors (week level) in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.3 Using alternative concentration indices

In Table 8, I replace the HHI dependent variable by an alternative measure: the Theil index that is computed as follows:

$$T_w = \frac{1}{J}\sum_{j=1}^{J} \frac{x_{j,w}}{\mu_w} ln\left(\frac{x_{j,w}}{J}\right) \text{ where } \mu_w = \frac{\sum_{j=1}^{J} x_{j,w}}{J}$$

With J the number of geographical origins (namely 4), $x_{j,w}$ the number of titles released from origin i during the week w and μ_w the average title launched in week w.

The results obtained are remarkably similar to the previous ones: a one standard deviation in the SQ variable is correlated with a 0.70 standard deviation increase in the Theil index.

Table 8: Results using the Theil index

Estimation technique	OLS	GLM	IV 2SLS	IV 2SLS
Dependent variables	Theil titles	Theil titles	$\widehat{\text{Theil titles}}$	$\widehat{\text{Theil titles}}$
	(1)	(2)	(3)	(4)
SQ_t	0.0265**	0.025*	0.0662***	0.0462***
	(0.0124)	(0.0126)	(0.0201)	(0.0176)
HHI_t^{world}	-0.897***	-0.939***	-1.301***	-1.136***
	(0.149)	(0.155)	(0.219)	(0.176)
$GDPc_t$	-0.241***	-0.227***	-0.438***	-0.340***
	(0.0644)	(0.0654)	(0.0941)	(0.0771)
Total titles_{wt}	5.17e-05	0.0000547	0.000120	8.3e-05
	(0.000535)	(0.000368)	(0.00057)	(0.00057)
Constant	1.869***	5.814***	3.117***	2.653***
	(0.300)	(1.344)	(0.450)	(0.353)
First stage results for SQ_t				
Elections_t			0.552***	
			(0.039)	
$\text{Distance to next term}_t$				-0.311***
				(0.0105)
Observations	310	310	310	310
R-squared	0.535		0.527	0.537
DWH test			7.18***	7.32***
F-Statistics 1st stage			229.74	579.9
Cragg Donald Weak IV			201.29	880.32
Week FE	Y	Y	Y	Y

Average marginal effects are reported –Robust clustered standard errors (week level) in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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