CSEF

Centre for Studies in Economics and Finance

WORKING PAPER NO. 280

Parents, Television and Cultural Change

Esther Hauk and Giovanni Immordino

April 2011

University of Naples Federico II | University of Salerno | Bocconi University, Milan

CSEF - Centre for Studies in Economics and Finance
DEPARTMENT OF ECONOMICS – UNIVERSITY OF NAPLES
80126 NAPLES - ITALY
Tel. and fax +39 081 675372 – e-mail: csef@unisa.it

WORKING PAPER NO. 280

Parents, Television and Cultural Change

Esther Hauk[*] and Giovanni Immordino[**]

Abstract

This paper develops a model of cultural transmission where television plays a central role for socialization. Parents split their free time between educating their children, which is costly, and watching TV which though entertaining might socialize the children to the wrong trait. The free to air television industry maximizes advertisement revenue. We show that TV watching is increasing in cultural coverage, cost of education, TV's entertainment value and decreasing in the perceived cultural distance between the two traits. A monopolistic television industry captures all TV watching by both groups if the perceived cultural distance between groups is small relative to the TV's entertainment value. Otherwise, more coverage will be given to the most profitable group where profitability increases in group size, advertisement sensitivity and perceived cultural distance. This leads to two possible steady states where one group is larger but both groups survive in the long run. Competition in the media industry might lead to cultural extinction but only if one group is very insensitive to advertisement and not radical enough not to watch TV. We briefly discuss the existing evidence for the empirical predictions of the model.

Keywords: television, socialization, cultural trait dynamics, media coverage.

JEL Classification: Z1; D03; L82.

Acknowledgements: We thank Andrea Prat and Pasquale Schiraldi for useful comments. This research was started when both authors were visiting the economics department of the LSE whom we thank for its hospitality. Hauk acknowledges financial support from CICYT project number ECO2009-12695 and from the government of Catalonia.

* Institute of Economic Analysis, Spanish Research Council (IAE-CSIC) and Barcelona GSE. Campus UAB, 08193 Bellaterra, Spain, e-mail: esther.hauk@iae.csic.es

** University of Salerno and CSEF. Dipartimento di Scienze Economiche e Statistiche, University of Salerno, Via Ponte Don Melillo, 84084 Fisciano (SA), Italy.

Table of contents

1 Introduction

In recent years the study of cultural transmission of preferences has mushroomed.[1] In this literature cultural transmission is conceptualized as resulting from two forces: direct vertical socialization from parents to children and oblique and horizontal socialization by society at large. Although television has become the primary source of socialization in many modern societies (Gerbner et al. (2002)) its role as an oblique socialization mechanism[2] has been ignored in the cultural transmission literature despite the existing evidence that television can change cultural traits and beliefs. Systematic empirical studies have revealed for example that the introduction of cable television changed women's status in rural India (Jensen and Oster, 2009), that television has decreased participation in social organizations in Indonesia (Olken, 2006) and that exposure to soap operas in Brazil has reduced fertility (La Ferrara et al, 2008) and increased divorce rates (Chong and La Ferrara, 2009).

The present paper develops a model of cultural transmission with two different cultural traits where television plays the role of oblique socialization. In our model parents dispose of one unit of free time which they have to split between educating their child which is costly or watching TV. As in Bisin and Verdier (2001) time spent in education determines the probability that education is successful and hence the probability of direct socialization. However, and this is our main innovation, if direct socialization fails, the child is socialized by television. As in socialization analysis (see Gerbner et al. 2002) we assume that the child is affected by the entire system of messages received by the television program. These messages consist of the amount of coverage of each

[1] Bisin and Verdier (2010) provide a comprehensive review of the theoretical and empirical contributions to the literature.

[2] In the most standard approach (see e.g. Bisin and Verdier, 2001) the probability to acquire a cultural trait via oblique transmission equals its proportion in the population, hence the influence of a trait through society depends on its size. Saez-Marti and Sjögren (2008) have generalized the oblique cultural transmission function by formalizing merit-guided learning on part of the children by their peers. Other papers have modelled education by schools as additional forms of oblique transmission (see e.g. Hauk and Saez-Marti, 2002).

cultural trait which determines the probability that the child will adopt this trait conditionally on being socialized by television. Hence, while parents enjoy watching television due to its entertainment value, they are aware that television might infect the child with the "wrong" cultural values.[3]

The television industry is free to air and financed by advertisement. While it is not interested in the propagation of cultural values per se, cultural coverage determines the viewing time of the different cultural traits. Hence, the television industry strategically chooses the coverage of each cultural trait in order to maximize its advertisement revenues. The two cultural groups differ in size, in the strive for preserving their trait and in the sensitivity towards advertisement.

We use the model to address the following questions: how much time do parents spend educating their children? And how much time are children left watching television? How does the television industry decide the coverage of the different cultural traits? What is the effect on the evolution of cultural traits over time? Under which conditions will both cultural traits survive in the long-run? How does competition in the television industry affect the long-run preservation of traits?

The answer to these questions depends on how large is the television's entertainment value relative to the importance of keeping one's trait. If the cultural distance between the two groups is small – so that a trait change is not perceived as very costly – and the entertainment value of watching television is large, a monopolistic media industry can choose a coverage mix that totally satisfies both groups which will end up watching television all the time and which will survive in the long-run.

If instead the entertainment value is relatively small and the cultural distance is large, increasing the time one group is watching television implies a decrease in the time the other group

[3]To keep the model tractable, we abstract from other forms of socializations like influence by peers or by the school. This simplification is not important, if the socialization of children occurs at a very young age when the child is mainly under parential influence.

is watching TV. In this case, a monopolistic media industry chooses to capture more TV time from the most profitable group. We show that the profitability of a group – and also its coverage – increases in its size, advertisement sensitivity and cultural radicalness. Moreover, exclusive coverage of one trait is not necessary for the media industry to capture all the free time of that group. Indeed, the optimal coverage is always interior. We show that there are two possible steady states which we refer to as (a) and (b). In steady state (a) trait 1 parents make an education effort, while trait 2 parents who get more coverage watch TV all the time. The size of group 1 is smaller than in steady state (b) where trait 1 parents get more coverage and hence watch TV all the time and trait 2 parents invest in education. If a cultural group is sufficiently insensitive to advertisement only the steady state in which this group invests in education can be reached. For intermediate advertisement sensitivities also the degree of cultural radicalness plays a role and convergence might be totally determined by the initial sizes of the groups. However, the more culturally aggressive is the group, the more likely it is to end up in a steady state in which its size is bigger. In other words, increasing the relative advertisement sensitivity of one group with respect to the other and/or its relative cultural radicalness, increases the probability of moving to a steady state in which this group is larger.

The analysis so far has relied on a monopolistic media industry where the size of the groups will typically change over the transition period to the steady state but both groups survive in the long-run: this totally changes if there is competition. If a group is particularly sensitive to advertisement relatively to the other, then, a competitive media industry will concentrate to cover that group. Instead, for intermediate values of advertisement sensitivity each media firm will cover a different group. Moreover, a decrease in the size of a group or in how radical it is will decrease the probability that the media industry will concentrate to cover that group. This behavior by the media industry will cause more extreme dynamics with respect to the monopolistic case for big differences in the groups' overall profitability (advertisement sensitivity, group size and cultural radicalness) but less extreme dynamics if those differences are small. Specifically, either one group will get totally wiped off the map or there will be no change at all and the steady state will coincide with the initial size of the groups.

Our analysis also produces many testable predictions: i) on the time spent by each cultural group watching television and educating their children; ii) on the coverage of each cultural trait both by the monopolistic and by the competitive media industry; iii) on the dynamics of cultural traits in the presence of a monopolistic or in the presence of a competitive media industry. While some evidence for these predictions will be discussed in the concluding section, a full-fledged empirical investigation is left for future research.

The remainder of the paper is organized as follows. Section 2 discusses the related literature and motivates our main modelling assumptions. In section 3 we present the model. Section 4 solves for the parent's optimal time allocation between education and watching television. Section 5 derives the coverage of cultural traits with a monopoly industry. Section 6 solves for the dynamics. Section 7 extends the model and the results to a competitive media industry. Section 8 discusses the empirical predictions and concludes. All proofs not following immediately from the main text are relegated to the appendix.

2 Related literature and motivating evidence

Our model is based on three crucial assumptions: (i) television can lead to cultural changes, (ii) the influence of TV is bigger the more time children spend watching TV (iii) parents are aware of this possibility and act accordingly. In what follows we provide some motivating evidence for these assumptions. Empirical evidence by economists on assumption (i) was already briefly mentioned in the introduction. We will expand on it in Section 2.2. First, we will talk about insights from communication scientists.

2.1 The communication science literature

Communication scientists have long been studying how television affects culture (see e.g. Shanahan and Morgan, 1999) and have emphasized that the central role of television in our society makes it the primary channel of mainstreaming our culture (Gerbner et al, 2002). They labeled their field of studies "Cultivation Theory" because exposure to television over time cultivates viewers' perceptions of reality. They argue that "Television is the source of the most broadly shared images and messages in history...Television cultivates from infancy the very predispositions and preferences that used to be acquired from other primary sources ... The repetitive pattern of television's mass-produced messages and images forms the mainstream of a common symbolic environment" (Gerbner et al. (1986) p. 17 – 18). One of the central hypothesis in cultivation research coincides with our assumption (ii), namely that heavy TV viewers are more likely to be socialized by television than light viewers. This hypothesis was successfully tested by Gerbner already in 1968 for three categories of TV viewers in the US: light viewers (less than 2 hours a day), medium viewers (2–4 hours a day) and heavy viewers (more than 4 hours a day). At the same time Gerbner established the Cultural Indicators Research Project to document trends in television content and how these changes affect viewers' perceptions of the world.

The effect of TV imports has also been studied. For the Philippines Tan et al. (1987) showed that heavy viewers of American television evidenced non-traditional values, more like those shown by the television programs than the traditional values of their Philippine homeland. Viewers in Australia had different views of Australian life if they watched more American television (Pingree and Hawkins, 1981). Tan and Suarchavarat (1988) provide evidence that the Thai people are becoming more vindictive and are abandoning the traditional forgiveness derived from Buddhism because of Chinese and Japanese television influences.

The above evidence suggests that TV can lead to cultural change and that its influence is stronger for heavier viewers. But are parents aware of this? One of the most extreme examples of parents worrying that their culture might be destroyed by television is found in Granzberg et al.'s (1977) study of the Cree culture: The people who are most traditional in Cree society refuse to have TV in their homes or feel it necessary to destroy a newly bought TV, or at least refuse to allow their children to watch scary programs. The Cree clearly fear that their culture might be destroyed by television and they care sufficiently that their only strategy is complete avoidance.

2.2 The economic literature on TV and cultural change

In more recent years, also economists have documented that the messages received by television may affect a large spectrum of beliefs and behaviors. Gentzkow and Shapiro (2004) find that being exposed to television programs in the Islamic world has an effect on the way people judge the west. Della Vigna and Kaplan (2007) show that Fox News Channel has an important role in explaining votes in the US. Dahl and Della Vigna (forthcoming) study the effect that violent movies have on US crime rates. Other papers by economists address the role of television on socioeconomic outcomes in developing countries. La Ferrara et al. (2008) study the effects of television on fertility choices in Brazil and find that women living in areas covered by the Globo signal have significantly lower fertility.[4] Chong and La Ferrara (2009) find that the share of women who are separated or divorced increases significantly after the Globo signal becomes available. Jensen and Oster (2009) using data on five Indian states show that the entry of cable TV led to increases in subjective measures of female autonomy and declines in pregnancy rates. Finally, Olken (2006) studies the effect of radio and television on social capital in Indonesia and finds that increased signal reception, which leads to more time watching television and listening to the radio, is associated with less participation in social organizations and with lower self-reported trust.

[4] Globo is a network that had a virtual monopoly on telenovelas in Brasil.

3 The model

We consider a society with overlapping generations and an infinitely lived media industry. Each generation is assumed to have size 1 and is made up by two possible cultural traits: a fraction n of individuals has trait 1 and a fraction $1-n$ of individuals has trait 2. All individuals live for two periods: when young they acquire their preferences; when old they have a child and have to decide how to split their time between educating their child and watching television. The media industry which for the time being is assumed to be a monopoly maximizes its revenue from advertisement and has to decide the coverage of each cultural trait.

We normalize the individuals' amount of time to 1 and denote by t_i the amount of time devoted by a parent of trait i to the education of his child. We will refer to t_i as the parent's education effort which contributes to determine the probability that their own cultural trait is transmitted to the child. Parents have a preference for their own cultural trait, that is, $V^{ii} > V^{ij}$ where V^{ii} and V^{ij} are the value a parent of trait i gives to his child having trait i and j respectively. While education increases the probability that the child is of the same cultural trait than the parent, it is a costly activity and its cost is given by $c(t_i) = \frac{1}{2}ct_i^2$. The remainder of the time $1-t_i$, is dedicated to watching TV. We assume that individuals get entertainment value β from watching TV.[5] However, the danger of watching television is that the child might get 'infected' by the cultural values transmitted by the television program leading to a trait change. In other words, if direct socialization fails, the child is socialized by the TV.[6] Hence, watching TV can lead to a trait change, the probability of which depends on the coverage of the different traits in TV. Let

[5] Children watch TV mainly at home. It is reasonable to assume that parental TV time is similar to child TV time and that this activity is often synchronized within the household. Indeed, Cardoso et al. (2010) reveal the widespread influence of parental time use on the child's time use: in the three countries analyzed (France, Germany and Italy) both the mother's and the father's share of time spent watching TV has a positive impact on the share of time the youngster allocates to that activity.

[6] This is our main innovation over Bisin and Verdier (2001) where there is no role for media and if education fails a child randomly meets a member of the adult society and adopts his preferences.

q_i denote the coverage of trait i and let $q_1 + q_2 = 1$. Then, $(1 - t_i)q_i$ is the probability that a child who has not been successfully educated by his parent still acquires his parent's trait by watching TV while $(1 - t_i)(1 - q_i)$ is the probability of a trait change. The parent's maximization problem is therefore given by

$$\max_{t_i}(1 - t_i)\beta + t_i V^{ii} + (1 - t_i)q_i V^{ii} + (1 - t_i)(1 - q_i)V^{ij} - \frac{1}{2}ct_i^2. \tag{1}$$

The media industry decides the coverage of each cultural trait to maximize its revenue from advertisement which is given by

$$\pi = \max_q \gamma_1 n (1 - t_1^*) + \gamma_2(1 - n)(1 - t_2^*),$$

where γ_i is the advertisement revenue of the media industry per unit of time spent by group i watching television which we will refer to as group i's advertisement sensitivity. Let $\gamma_1 = \gamma$ and $\gamma_2 = \alpha\gamma$ with $\alpha > 0$. Hence, α describes the profitability of a member of group 1 relative to a member of group 2. For $\alpha < 1$ advertisement to group 2 is less profitable than to group 1, while the opposite holds for $\alpha > 1$. Under this characterization the media industry maximizes

$$\pi = \max_q \gamma \left[n (1 - t_1^*) + \alpha(1 - n)(1 - t_2^*)\right]. \tag{2}$$

The precise sequence of events unfolds as follows: in an arbitrary period t the media industry chooses the coverage of the cultural traits in society (content of programs); each member of the old generation (adult) has a child (the new generation) that needs to be socialized because children are born without any well-defined preferences. Each adult decides how to split his/her time between educating the child and watching television. These choices together with the media coverage of the traits determine the transmission of cultural values and lead to the socialization of the young generation. Payoffs both for individuals and for the media industry are realized. In period $t + 1$ children born at t become adults and replace the old generation that dies. The same sequence follows with the only difference that the size of the cultural groups might have changed.

To characterize the equilibrium of this game, we first identify the parent's optimal education effort choice and the related time devoted to watching television. Then, we describe the coverage of each cultural trait by the media industry. Finally, we characterize the steady states of the economy.

4 Education or watching TV?

To identify the optimal education effort choice and the related time devoted to watch television, parents maximize (1) leading to education choice[7]

$$t_i^* = \max\left[\frac{\Delta V_i(1-q_i)-\beta}{c}, 0\right],$$

where $\Delta V_i = V^{ii} - V^{ij}$ describes the importance for a group i parent to preserve his/her cultural trait. To insure that the education effort is always smaller or equal to 1, i.e., $t_i^* \leq 1$, we assume $c \geq \Delta V_i - \beta$.[8] Moreover, education effort is zero for $\frac{\Delta V_i(1-q_i)-\beta}{c} \leq 0$, hence for any coverage $q_i \geq \overline{q_i} = 1 - \frac{\beta}{\Delta V_i}$ we have $t_i^* = 0$. Therefore, to make the problem interesting, we also assume that $\beta \leq \Delta V_i$ so that education is not zero for all possible q_i. We can then rewrite the optimal education effort as

$$t_i^* = \begin{cases} \frac{\Delta V_i(1-q_i)-\beta}{c} \text{ if } q_i < \overline{q_i} = 1 - \frac{\beta}{\Delta V_i} \\ 0 \text{ if } q_i \geq \overline{q_i} = 1 - \frac{\beta}{\Delta V_i}, \end{cases} \quad (3)$$

and summarize the parametric restrictions in the following assumption.

Assumption 1 $c \geq \Delta V_i - \beta \geq 0$.

To simplify notation we define $q_1 = q$ and $q_2 = 1 - q$. Also define $\Delta V_1 = \Delta V$ and $\Delta V_2 = \theta \Delta V$, where the parameter θ measures how important it is to keep the own cultural trait for one group

[7]It is immediate to see that the second-order condition for a maximum is satisfied.

[8]The case $c < \Delta V_i - \beta$ is trivial from a theoretical point of view. It implies no TV time for any $q \neq 1$ and hence no trait change but also no TV coverage. However, empirically this case is interesting and we will come back to it later.

with respect to the other group. Without loss of generality we assume that it is relatively more important for group 1 to keep its own trait than for group 2. Hence, we restrict our analysis to $0 < \theta \leq 1$.[9] Under this specification the optimal education efforts for both groups are

$$t_1^* = \begin{cases} \frac{\Delta V(1-q)-\beta}{c} \text{ if } q < 1 - \frac{\beta}{\Delta V} \\ 0 \text{ if } q \geq 1 - \frac{\beta}{\Delta V}, \end{cases} \quad (4)$$

and

$$t_2^* = \begin{cases} \frac{\theta \Delta V q-\beta}{c} \text{ if } q > \frac{\beta}{\theta \Delta V} \\ 0 \text{ if } q \leq \frac{\beta}{\theta \Delta V}. \end{cases} \quad (5)$$

The above expressions illustrate how parents free-ride on trait transmission by television. A high coverage of one's own trait, increasing the probability of keeping the trait, always implies zero education effort. Observe that

$$t_1^* = 0 \text{ and } t_2^* > 0 \text{ for } q > \max\left[1 - \frac{\beta}{\Delta V}, \frac{\beta}{\theta \Delta V}\right]$$

and

$$t_1^* > 0 \text{ and } t_2^* = 0 \text{ for } q < \min\left[1 - \frac{\beta}{\Delta V}, \frac{\beta}{\theta \Delta V}\right].$$

For intermediate levels of q such that

$$\min\left[1 - \frac{\beta}{\Delta V}, \frac{\beta}{\theta \Delta V}\right] \leq q \leq \max\left[1 - \frac{\beta}{\Delta V}, \frac{\beta}{\theta \Delta V}\right],$$

we have to distinguish two possible cases depending on the parameter θ.

Case 1 *If $\theta \leq \frac{\beta}{\Delta V - \beta}$, we have that $1 - \frac{\beta}{\Delta V} \leq \frac{\beta}{\theta \Delta V}$. Then, for $1 - \frac{\beta}{\Delta V} \leq q \leq \frac{\beta}{\theta \Delta V}$, neither group does any education and hence $t_1^* = t_2^* = 0$. Notice that a lower bound to the range of the parameter θ is given by the second inequality in Assumption 1. Hence we will have zero education for both groups when*

$$\frac{\beta}{\Delta V} < \theta \leq \frac{\beta}{\Delta V - \beta}, \quad (6)$$

which recalling that $\theta \leq 1$ implies the parameter restriction $\Delta V \leq 2\beta$. In words, in Case 1, the entertainment value of television is relatively high compared to the importance to keep one's trait.

[9] Then Assumption 1 boils down to $c \geq \Delta V - \beta \geq \theta \Delta V - \beta \geq 0$.

Case 2 *If* $\theta > \frac{\beta}{\Delta V - \beta}$, *we have that* $\frac{\beta}{\theta \Delta V} < 1 - \frac{\beta}{\Delta V}$. *Then, for* $\frac{\beta}{\theta \Delta V} \leq q \leq 1 - \frac{\beta}{\Delta V}$, *both groups educate their children, that is,* $t_1^* > 0$ *and* $t_2^* > 0$. *Hence, both groups will educate their children for*

$$\frac{\beta}{\Delta V - \beta} < \theta \leq 1. \tag{7}$$

This also implies that in Case 2 *the entertainment value of television is relatively low compared to the importance of keeping one's trait, i.e.*

$$\Delta V \geq 2\beta. \tag{8}$$

Proposition 1 summarizes the optimal parental choice between education and TV time.

Proposition 1 (Education and TV watching) *The allocation of time between education and TV watching depends on the relative distance between the entertainment value of television and the importance to keep one's trait between the groups:*

If (6) holds, this difference is small and we have

$$\begin{aligned} t_1^* &= \frac{\Delta V(1-q) - \beta}{c} \text{ and } t_2^* = 0 \text{ for } q < 1 - \frac{\beta}{\Delta V}, \\ t_1^* &= t_2^* = 0 \text{ for } 1 - \frac{\beta}{\Delta V} \leq q \leq \frac{\beta}{\theta \Delta V}, \\ t_1^* &= 0 \text{ and } t_2^* = \frac{\theta \Delta V q - \beta}{c} \text{ for } q > \frac{\beta}{\theta \Delta V}. \end{aligned}$$

If (7) holds, this difference is large and we have

$$\begin{aligned} t_1^* &= \frac{\Delta V(1-q) - \beta}{c} \text{ and } t_2^* = 0 \text{ for } q < \frac{\beta}{\theta \Delta V}, \\ t_1^* &= \frac{\Delta V(1-q) - \beta}{c} \text{ and } t_2^* = \frac{\theta \Delta V q - \beta}{c} \text{ for } \frac{\beta}{\theta \Delta V} \leq q \leq 1 - \frac{\beta}{\Delta V}, \\ t_1^* &= 0 \text{ and } t_2^* = \frac{\theta \Delta V q - \beta}{c} \text{ for } q > 1 - \frac{\beta}{\Delta V}. \end{aligned}$$

From the previous result we get some interesting empirically testable predictions which we summarize below.

Empirical Predictions 1 (TV watching) *i) The time each group watches TV increases in the coverage of its own cultural trait;*

ii) TV watching is decreasing in the importance to keep one's own trait (ΔV and $\theta\Delta V$) and increasing both in the entertainment value, β and in the cost of education, c.

The intuitions for these empirical predictions are simple. Point i) says that the higher q, the more trait 1 parents can substitute away from education because their children are more likely to get the right trait by watching TV while trait 2 parents have to fight the increasing danger of a trait change implied by a higher coverage of trait 1. Instead, point ii) says that an increase in the importance to keep one's own cultural trait, ΔV will increase the incentive to invest in education. So does an increases of θ for group 2, who now cares more about perserving its trait and hence decreases TV time. Since people substitute from the less beneficial to the more beneficial activity, an increase in the entertainment value of watching television or in the cost of educational effort will decrease the time devoted to education and increase television watching.

5 The monopolistic media industry

We now describe the coverage of each cultural trait by the media industry. We assume for the time being that there is a monopolistic media industry which maximizes its revenue from advertisement taking the parent's optimal time allocation into account, that is it chooses the q that maximizes (2) given (education1) and (education2). The TV coverage and the corresponding profits are characterized in the following proposition.

Proposition 2 (Media coverage and profits) *The TV coverage and the corresponding profits are as follows:*

1. *If (6) holds, then any $1-\frac{\beta}{\Delta V}\leq q\leq\frac{\beta}{\theta\Delta V}$ is optimal. Both traits watch TV all the time and $\pi=\gamma\left(n+\alpha(1-n)\right)$.*

2. *If (7) holds, only one trait will invest in education while the other trait watches TV all the time. Moreover, the optimal coverage depends on the size of the groups. Specifically, there is a cutoff*

$$\widetilde{n} = \frac{\theta\alpha}{1+\theta\alpha} = 1 - \frac{1}{1+\theta\alpha} \tag{9}$$

such that for $n \leq \widetilde{n}$ *the optimal coverage is* $q^a = \frac{\beta}{\theta\Delta V}$*, only trait 1 invests in education and profits are*

$$\pi^a = \gamma\left[\alpha(1-n) + n\left(\frac{c\theta+\beta\theta+\beta-\theta\Delta V}{c\theta}\right)\right]; \tag{10}$$

while for $n > \widetilde{n}$ *the optimal coverage is* $q^b = 1 - \frac{\beta}{\Delta V}$*, only trait 2 invests in education and profits are equal to*

$$\pi^b = \gamma\left[n + \alpha(1-n)\left(\frac{c+\beta-\theta\Delta V+\theta\beta}{c}\right)\right]. \tag{11}$$

The intuition is simple. If (6) holds, for $1 - \frac{\beta}{\Delta V} \leq q \leq \frac{\beta}{\theta\Delta V}$ both traits watch TV all the time, hence any coverage in this range is optimal. This happens because the cultural distance between the two groups is small and the entertainment value of watching television is large compared to the importance to keep one's trait. This allows the media industry to choose an optimal coverage mix that totally satisfies both groups. If instead (7) holds, the entertainment value is relatively small and the cultural distance large. Increasing the time one group watches TV implies decreasing the time the other group watches TV. Therefore, the media industry chooses to capture more TV time from the most profitable group, where profitability depends on the size of the group n, on the relative advertisement sensitivity of the group α, and on how radical one group is compared to the other θ. The greater the importance to group 2 parents to preserve their trait relative to the importance to group 1 parents, the bigger must be the size of group 1 for the media to be willing to switch coverage to capture full TV time by trait 1. In other words, the threshold $\widetilde{n} = 1 - \frac{1}{1+\theta\alpha}$ is increasing in θ because the media industry would loose a lot of group 2's TV time by not satisfying group 2 parents. The same argument applies to the advertisement sensitivity.

Figure 1 illustrates how the profits of the media industry change with n for fixed θ and α. Notice that π^b is always increasing in n, it is equal to $\alpha\gamma(1-t_2^*)$ for $n=0$ and reaches γ for $n=1$. On the contrary, π^a is always decreasing in n, it is equal to $\alpha\gamma$ for $n=0$ and decreases to $(1-t_1^*)\gamma$ for $n=1$. For low n the media industry captures all television time of trait 2, however, forgoing TV time from trait 1 becomes more and more expensive the more parents with this trait are around. Similarly, capturing all TV time from trait 1 and foregoing TV time from trait 2 becomes more and more attractive the more of trait 1 parents are around. Finally, if we allow θ and/or α to vary also the switching point $\widetilde{n}$ will vary, as already explained in the previous paragraph.

[include figure 1 around here]

The previous discussion provides us with some interesting empirically testable predictions which we summarize below.

Empirical Predictions 2 (Media coverage)

i) *An increase in the size of the group increases the probability that the group gets more coverage;*

ii) *For given group sizes, an increase in the relative advertisement sensitivity of one group with respect to the other and/or an increase in its relative cultural radicalness increases the probability that this group gets more coverage.*[10]

[10] unless the group is so radical that it will never watch TV if $q<1$, a possibility excluded by Assumption 1.

6 Dynamics

The dynamics of the cultural trait is given by

$$\begin{aligned} n_{i_{t+1}} &= n_{i_t}\left(t_i^* + (1-t_i^*)q_i\right) + (1-n_{i_t})(1-t_{-i}^*)q_i \\ &= n_{i_t}\left(t_i^* + (t_{-i}^* - t_i^*)q_i\right) + (1-t_{-i}^*)q_i. \end{aligned} \tag{12}$$

Trait i parents will have a trait i child if education is successful (with probability t_i^*) or if education fails (with probability $1-t_i^*$) and their child is successfully socialized by television (with probability q_i). Moreover, some trait i individuals of the next generation will stem from those trait $-i$ parents $(1-n_i)$ who were unsuccessful at education and whose children were socialized by TV to trait i (with probability $(1-t_{-i}^*)q_i$).

A first intuitive and general result is the following. Failure to cover a trait will lead to the long-run elimination of the trait. Clearly, for $q_i = 0$ the steady state converges to $n_i = 0$ and for $q_i = 1$ the steady state converges to $n_i = 1$.

In general for intermediate values of the coverage, the size of group i can increase, decrease or remain constant, that is, $n_{i_{t+1}} \gtreqless n_{i_t}$ whenever

$$n_{i_t}\left(t_i^* + (t_{-i}^* - t_i^*)q_i\right) + (1-t_{-i}^*)q_i \gtreqless n_{i_t},$$

or equivalently

$$n_{i_t} \lesseqgtr \frac{(1-t_{-i}^*)q_i}{1-\left(t_i^* + (t_{-i}^* - t_i^*)q_i\right)}.$$

Hence in steady state

$$n_i^* = \frac{(1-t_{-i}^*)q_i}{1-\left(t_i^* + (t_{-i}^* - t_i^*)q_i\right)}. \tag{13}$$

The steady state when condition (6) holds is trivial since $t_1^* = t_2^* = 0$, hence $n^* = q^*$ with $1 - \frac{\beta}{\Delta V} \leq q^* \leq \frac{\beta}{\theta \Delta V}$.

Let's now turn to the case when (7) holds. In this case the media industry will either implement $q^a = \frac{\beta}{\theta \Delta V}$ or $q^b = 1 - \frac{\beta}{\Delta V}$. Using the equilibrium values for TV watching which correspond to q^a

and q^b (Proposition 1), we find the two steady states candidates

$$n_a^* = \frac{\frac{c\beta}{\theta\Delta V}}{c - \Delta V \left(1 - \frac{\beta}{\theta\Delta V}\right)^2 + \beta\left(1 - \frac{\beta}{\theta\Delta V}\right)} \tag{14}$$

and

$$n_b^* = 1 - \frac{\frac{c\beta}{\Delta V}}{c - \theta\Delta V \left(1 - \frac{\beta}{\Delta V}\right)^2 + \beta\left(1 - \frac{\beta}{\Delta V}\right)}. \tag{15}$$

A useful intermediate result is the following.

Lemma 1 *Both* $\frac{\partial n_a^*}{\partial \theta} < 0$ *and* $\frac{\partial n_b^*}{\partial \theta} < 0$.

The intuition for the result is as follows. A higher θ makes group 2 more culturally aggressive, leading to a bigger size for group 2 in steady state. Correspondingly, the size of group 1 as described by n_a^* or n_b^* has to shrink.

Notice that these potential steady states are always interior.[11] Also, they are independent of the advertisement sensitivity α because neither coverage q^a/q^b nor optimal TV time depend on α. To understand which of the two candidates steady states is an equilibrium we check if for n_a^* and n_b^* the TV industry indeed chooses q^a and q^b respectively. Hence, we check the location of n_a^* and n_b^* with respect to the threshold $\widetilde{n}$ defined by (9) and determine which of the following scenarios can occur.

1. If $n_a^* \leq \widetilde{n} \leq n_b^*$ was possible then both n_a^* and n_b^* would be stable. The dynamics would converge to n_a^* if the initial $n_0 < \widetilde{n}$ and to n_b^* otherwise.

2. If both n_a^* and n_b^* were smaller than $\widetilde{n}$ then the system would converge to n_a^*. Indeed, if the initial $n_0 \leq \widetilde{n}$ the media industry would always implement q^a. Instead, if the initial $n_0 > \widetilde{n}$, q^b would be implemented causing a reduction in n (because $n_b^* < n_0$). However, since cultural trait 1 would be shrinking there would be a period t at which $n_t \leq \widetilde{n}$ and the media industry would switch to implementing coverage q^a.

[11] For $0 < n_a^* < 1$ we need $c > \frac{\theta\Delta V - \beta - \theta\beta}{\theta} = \Delta V - \beta - \frac{\beta}{\theta}$ while for $0 < n_b^* < 1$ we need $c > \theta\Delta V - \beta - \theta\beta$. Both conditions are guranteed by Assumption 1.

3. If both n_a^* and n_b^* were bigger than $\widetilde{n}$ then the system would converges to n_b^*. Indeed, if the initial $n_0 \geq \widetilde{n}$ the media industry would always implement q^b. Instead, if $n_0 < \widetilde{n}$, initially q^a would be implemented causing n to increase (because $n_a^* > n_0$) and since cultural trait 1 would be growing there would be a period t at which $n_t \geq \widetilde{n}$ and the media industry would switch to q^b.

4. Finally, if $n_b^* < \widetilde{n} < n_a^*$ was possible, then both n_a^* and n_b^* would be unstable. Whenever $n > \widetilde{n}$ the media industry would implement q^b causing n to shrink. But whenever n has shrunk sufficiently, so that $n \leq \widetilde{n}$, the media industry would switch to q^a so that n would increase leading at some point to the optimality of q^b and so on.

We will now show that complete instability (case 4) is never an equilibrium outcome and derive the parameter conditions on α and θ for which cases 1, 2 and 3 occur. The results are summarized in Proposition 3.

Proposition 3 (Steady states) *For all θ satisfying condition (7), there exist thresholds α_a, α_b, α_c, θ_a and θ_b, (all given in the appendix) such that the steady states are as follows:*

1. *for $\alpha < \alpha_a$ the system converges to n_b^*;*

2. *for $\alpha_a \leq \alpha \leq \alpha_b$ the system converges to n_b^* for $\theta_{\min} \leq \theta < \theta_a$ while for $\theta_a \leq \theta \leq \theta_{\max}$ the system converges to n_a^* whenever the initial $n_0 < \widetilde{n}$ and converges to n_b^* otherwise;*

3. *for $\alpha_b < \alpha \leq \alpha_c$ we get the following subcases:*

   (a) *for $\theta_{\min} \leq \theta < \theta_a$ the system converges to n_b^*;*

   (b) *for $\theta_a \leq \theta \leq \theta_b$ the system converges to n_a^* whenever the initial $n_0 < \widetilde{n}$ and converges to n_b^* otherwise;*

   (c) *for $\theta_b < \theta \leq \theta_{\max}$ the system converges to n_a^*.*

4. for $\alpha > \alpha_c$ the system converges to n_a^*.

In steady state n_a^* the media industry chooses coverage q^a and only trait 1 invest in education. In steady state n_b^* the media industry chooses coverage q^b and only trait 2 parents invest in education.

Figure 2 illustrates Proposition 3. The picture illustrates that n_b^* can only be an equilibrium if group 2 is not too sensitive to advertisement (there is an upper bound on α). Moreover, if group 2 becomes more culturally radical (higher θ), this change must be accompanied by a lower advertisement sensitivity and vice versa. This happens because higher α and θ make group 2 more valuable for the media industry relative to group 1. Hence, if the product of these values becomes too high the media industry would like to capture group 2's entire TV time resulting in n_a^*.

include figure 2 (equilibria) around here

The figure nicely illustrates that for any fixed $\theta > \theta_{\min}$ – as α increases – the steady state will change from n_b^* to a region where convergence depends on the initial size of the groups and finally to n_a^*. However, the existence of the region where convergence depends on the initial size of the groups is only possible if $n_a^* < \widetilde{n} < n_b^*$. Since for all $\theta > \theta_{\min}$ there always exist some values of α such that the region is not empty, we must have that $n_a^* < n_b^*$ always. At $\theta_{\min}$ itself, $n_a^* = n_b^*$ and coincides with $\widetilde{n}$ at α_c. This establishes Proposition 4.

Proposition 4 *$n_a^* \leq n_b^*$ for all permitted θ. The inequality is strict if $\theta \neq \theta_{\min}$.*

We can therefore derive the following empirical predictions.

Empirical Predictions 3 (Cultural trait dynamics) *Increasing the relative advertisement sensitivity of one group with respect to the other and/or its relative cultural radicalness, increases the probability of moving to a steady state in which this group is larger.*

7 Competitive media industry

We now modify the previous model to allow for a competitive media industry. Specifically, consider an infinitely lived media industry made up by two firms/channels, I and II, who are interested in maximizing their revenue from advertisement and have to decide the coverage of each cultural trait. Having the choice, individuals will now decide both their preferred channel and how much time to watch TV. Being afraid that the child might get 'infected' by the cultural values transmitted by the television programs, parents will choose the channel that gives a higher coverage to their own trait. Let q_i^I and q_i^{II} denote the coverage of trait i by channel I and II respectively. Then, the parent's maximization problem in (1) is unchanged except that now $q_i = \max\left\{q_i^I, q_i^{II}\right\}$.

Both channels simultaneously decide the coverage of each cultural trait. Each channel j, taking as given the choice of the other channel $-j$, decides the coverage q^j to maximize its revenue from advertisement given by

$$\gamma\left[n\left(1-t_1^*\right)1_{q^j>q^{-j}}+\alpha(1-n)\left(1-t_2^*\right)1_{q^j<q^{-j}}+\left(\frac{n\left(1-t_1^*\right)+\alpha(1-n)\left(1-t_2^*\right)}{2}\right)1_{q^j=q^{-j}}\right]. \quad (16)$$

The education efforts for both groups are as in (4) and (5) except that now $q = \max\left\{q^I, q^{II}\right\}$. As before t_1^* and t_2^* are included between zero and 1, t_1^* is non-decreasing in q while t_2^* is non-increasing in q.

We now describe the coverage of each cultural trait by the media industry.

Proposition 5 (Competitive media coverage) *If $\alpha < \underline{\alpha}$ there is only one pure strategy Nash equilibrium with $q^I = q^{II} = 1$, while if $\alpha > \overline{\alpha}$ the only pure strategy Nash equilibrium is $q^I = q^{II} = 0$ where*

$$\underline{\alpha} = \frac{n}{(1-n)\left(1+\frac{\theta\Delta V-\beta}{c}\right)} < \frac{n}{1-n} \text{ and } \overline{\alpha} = \frac{n\left(1+\frac{\Delta V-\beta}{c}\right)}{(1-n)} > \frac{n}{1-n}. \quad (17)$$

For $\underline{\alpha} < \alpha < \overline{\alpha}$, there are only two pure strategy Nash equilibria $(q^I = 0, q^{II} = 1)$ and $(q^I = 1, q^{II} = 0)$. At $\underline{\alpha}$ and $\overline{\alpha}$, besides the pooling equilibria – $(q^I = q^{II} = 1)$ at $\underline{\alpha}$ and $(q^I = q^{II} = 0)$ at

$\overline{\alpha}$ – there are also the two separating equilibria ($q^I = 0, q^{II} = 1$) and ($q^I = 1, q^{II} = 0$). Finally, for the equal profitability point ($\alpha = \frac{n}{1-n}$), there are an infinite number of equilibria.

If a group is particularly sensitive to advertisement with respect to the other, that is if α is smaller than $\underline{\alpha}$ or is larger than $\overline{\alpha}$, then, the media industry will concentrate to cover that group. Instead, for intermediate values of the advertisement sensitivity parameter α, each channel will cover a different group. If $n = 0$, then $\underline{\alpha} = \overline{\alpha} = 0$ hence the only equilibrium will be $q^I = q^{II} = 0$ for any α. If, instead, $n = 1$, then $\underline{\alpha} = \overline{\alpha} = +\infty$ and the only equilibrium will be $q^I = q^{II} = 1$. Notice that the thresholds in Proposition 5 can be rewritten in terms of group size. Indeed, $\alpha < \underline{\alpha}$ implies

$$n > \overline{n} = \frac{\alpha\left(c + \theta\Delta V - \beta\right)}{\alpha\left(c + \theta\Delta V - \beta\right) + c}, \tag{18}$$

while $\alpha > \overline{\alpha}$ implies

$$n < \underline{n} = \frac{\alpha c}{\alpha c + c + \Delta V - \beta}. \tag{19}$$

Hence, for intermediate group sizes the media industry will specialize on different traits. It is instructive to study when specialization is most likely to occur. First, notice that only $\overline{n}$ is affected by θ and it is increasing in θ, making specialization most likely for $\theta = 1$ when both groups are equally radical. Moreover, the size of the interval for which specialization on different traits occurs by the TV industry $\overline{n} - \underline{n}$ is increasing for $\alpha < \widehat{\alpha}$, decreasing for $\alpha > \widehat{\alpha}$ and largest for $\alpha = \widehat{\alpha}$, where[12]

$$\widehat{\alpha} = \frac{\sqrt{\left(c - \beta + V\Delta\right)\left(c - \beta + V\theta\Delta\right)}}{c - \beta + V\theta\Delta}.$$

Notice that for $\theta = 1$ we have that $\widehat{\alpha} = 1$ as well. Indeed, this analysis uncovers that the thresholds on n drift apart, the more 'equal' the groups are. If $\theta < 1$ – meaning that group 1 is more radical than group 2 – than this must be countervailed by an higher sensitivity to advertisement ($\widehat{\alpha} > 1$) for group 2.

We can summarize the previous discussion in the following empirical predictions.

[12] For details on this derivation see the proof of Proposition 5.

Empirical Predictions 4 (Competition and media coverage)

i) *If a group is particularly profitable the media industry will concentrate to cover that group. Otherwise, all groups will be covered;*

ii) *A decrease in the size of a group, its advertisement sensitivity or its degree of cultural radicalness will decrease the probability that the media industry will concentrate to cover that group.*

We now show that if we ignore the single point where $\alpha = \frac{n}{1-n}$ the dynamics is rather simple. First, notice that, even if for $\underline{\alpha} \leqslant \alpha \leqslant \overline{\alpha}$ there are two pure strategy Nash equilibria $(q^I = 0, q^{II} = 1)$ and $(q^I = 1, q^{II} = 0)$, the two are equivalent in terms of coverage and hence in terms of dynamics. Second, at $\underline{\alpha}$ and $\overline{\alpha}$, besides the pooling equilibria – $(q^I = q^{II} = 1)$ at $\underline{\alpha}$ and $(q^I = q^{II} = 0)$ at $\overline{\alpha}$ – there are also the two separating equilibria $(q^I = 0, q^{II} = 1)$ and $(q^I = 1, q^{II} = 0)$. However, the separating equilibria are Pareto superior so we will concentrate on those. Hence, the steady states are as follows.

Proposition 6 *For $\alpha < \underline{\alpha}$ the system converges to $n = 1$. For $\alpha > \overline{\alpha}$, instead, it converges to $n = 0$. Finally, for $\underline{\alpha} \leqslant \alpha \leqslant \overline{\alpha}$ both cultural groups receive full coverage and are not affected by the other group, so that the steady state n is equal to the starting size n_o.*

If a group is particularly sensitive to advertisement with respect to the other, that is if α is smaller than $\underline{\alpha}$ or is larger than $\overline{\alpha}$, then its trait will become the only one in society. For intermediate values of the advertisement sensitivity parameter α, instead, each group will keep its original size.

Empirical Predictions 5 (Competition and cultural trait dynamics) *Competition in the media industry gives more extreme dynamics (with respect to monopoly) if there are big differences in the groups sensitivity to advertisement but less extreme dynamics if those differences are small.*

8 Discussion and Conclusion

Television does not only provide entertainment but is also an important source of oblique socialization. This paper translates this observation into a theoretical model in order to study both the demand and supply side of television and its resulting influence on cultural change. The model derives three sets of predictions concerning: (i) TV demand (empirical Prediction 1), (ii) TV supply (empirical Predictions 2 and 4) and (iii) the cultural dynamics and resulting steady states (empirical Predictions 3 and 5).

On the **demand side** the model mainly predicts that TV time is increasing in cultural coverage and decreasing in the importance to keep one's trait.[13] There exists at least some indirect evidence for this prediction. In the communication literature it is a well established fact that people like home produced TV products more even if they are worse in quality. In other words, people watch more television if the coverage of their cultural traits is larger. In the same vain, cultural proximity has been shown to be a key factor for TV success (Trepete, (2003), Straubhaar (1991, 2008), La Pastina and Straubhaar (2005), Straubhaar et al. (2003), de Bens and Schmaele (2001)). Imported programs that are produced in a culture which is close in terms of language, dress, ethnic types, body language, definitions of humor, ideas about story pacing, music traditions, religious elements etc...tend to be more successful: Brazilian telenovelas dubbed into Spanish are more popular in Latin America than any American Soap, while Japanese and Chinese television are more successful in Asia than American imports, to mention a few examples.

Israel is an ideal country to study different cultural groups' viewing behaviors. Indeed, Cohen (2005) and Cohen and Tukachinsky (2007) in their case study show that viewing patterns differ

[13]It also predicts that TV time is increasing in the entertainment value of TV and in the cost of education. The former prediction would be shared by any model of TV demand and seems trivially true. The latter prediction is just the other side of the coin: the cost of the alternative activity increases and hence its demand falls. However, whether education is an important alternative activity to TV watching needs to be tested empirically. We are not aware of any study looking at how the cost of time spent in educating children affects TV viewing behavior.

among groups and each group watches the channels that cover their culture better. Moreover, they also look at the **supply side** and illustrate how the Israelian TV market has responded to this demand by creating different niches for different cultures. In this market, all traits are covered except for the ultra orthodox Jews who do not watch TV. This is in accordance with our model: in Israel cultural groups are of similar sizes (profitability) so that a competitive TV industry finds it convenient to cover all of them except for the ultra orthodox Jews who are very insensitive to advertisement.[14] Moreover, it is extremely important for the ultra orthodox Jews to keep their own trait, this motive is so dominant with respect to the possible entertainment value of TV and to the cost of educating their children that their optimal choice is zero television ($c + \beta < \Delta V$) unless there is full coverage. The optimal reaction by the supply side is not to cover this trait at all due to its low advertisement sensitivity.

Cohen (2005) is the only paper (we are aware of) looking at the supply side that tries to distinguish channels by their cultural coverage. All other papers studying the supply side of television look at different measures of channel diversity, mainly based on the type of programs that the channels transmit, and try to understand whether more competition leads to more or less diversity. The empirical findings are mixed: in some markets diversity seems to have increased, in others declined (Signorielli (1986), De Jong and Bates (1991), Lin, (1995), Li and Chiang (2001), Van der Wurff (2004, 2005)). Diversity measures can vary considerably across markets with similar number of channels. These findings can be made consistent with our model since the effect of competition on diversity depends on the relative profitability of the different cultural groups. Controlling for cultural aspects of programs and not only for program type, for group size and advertisement sensitivity of different cultures can serve as an empirical strategy to disentangle this mixed evidence, a possibility alluded to in Van der Wurff (2005) who suggests that the different

[14] Cultural groups in Israel consist of around 12% Ultra-Orthodox Jews, 18% Arabs, 20% immigrants from the former Soviet Union while the remaining 50% is split among tradional-Mizrahi, secular-Ashkenazi and national religious groups (Cohen, 2005).

channel diversity might be due to "differences in audience demand for minority programmes, country-specific (cultural-historical) differences in channel programming or a combination of these factors" (p.267). All our other predictions concerning the supply side of television simply say that the relatively more profitable cultural group gets more coverage.[15] While this seems intuitive, it is interesting that profitability does not only depend on group size and advertisement sensitivity but also on cultural radicalness. More radical groups should get more coverage, unless they are very insensitive to advertisement and so radical that they can only be induced to watch television if their trait is fully covered. The empirical test of this prediction requires data on the relative cultural dislike of one cultural trait towards the others and is left for future research.

The third set of predictions of our model concerns the **cultural dynamics**. Our model predicts that under a monopolistic TV industry some cultural groups might get diminished in size but will never be wiped off the map. This can happen if the TV market is competitive, however, only if the cultural group is not too radical not to watch any TV at all and is very insensitive to advertisement. If these conditions are not satisfied, a competitive TV industry will have a smaller effect on the cultural distribution of traits than a monopoly.[16] While we are not aware of any studies testing our predictions directly,[17] some efforts have been made to study cultural change over time. Inglehart and Baker (2000) use three waves of the World Value Surveys including 65% of societies to show both massive cultural change and the persistence of distinctive cultural values. Especially the broad heritage of a society in terms of religion is shown to leave a deep imprint on values that endure modernization. The role of the mass media is ignored in the study. However, in a recent

[15] A parallel argument could be made for commercial radios concentrating on the most profitable groups. Siegelman and Waldfogel (2001) provide empirical evidence that US commercial radio mainly covers white audiences and underprovides minority listeners (blacks and hispanics) who have a very distinctive taste.

[16] In our model the effect of the competitive industry is zero because we have as many competitors as cultural traits.

[17] The closest attempt might be due to Morgan (1986) who investigated the effect of watching TV on regional diversity in the US between 1975 and 1983 examining the General Social Surveys conducted by the National Opinion Research Centre and discovered that heavy viewers had less regional diversity than light or moderate viewers. Morgan (1986) did not find any dynamic effect for heavy viewers.

book Norris and Inglehart (2009) take a first look at the role of the media for cultural change again using the World Value Survey. While Chapter 8 suggests a consistent relationship linking patterns of media use with moral values, and this link is stronger in societies more open to information flows across cultural borders, no evidence for convergence in values across countries world wide could be established (Chapter 10). Norris and Inglehart (2009) expect cultural diversity to persist for the foreseeable future and conclude that the risks to national diversity due to mass media is exaggerated.[18] Based on this risk the UNESCO passed the Universal Declaration of Cultural Diversity in 2005: protectionist measures have also been passed by the European Union in the 2007 Audiovisual Media Service Directive.

Cultural extinction can occur in our model but only under special circumstances. Parental concern about the survival of cultural traits acts as a firewall against cultural convergence. If parents care about their culture, their children will only be allowed to watch television that gives a sufficient coverage to their cultural trait. It is this aspect of the demand side that acts as an insurance towards cultural survival and can make protectionist policies superfluous. E.g. when studying the Israeli TV market where all channels have quotas on Israeli productions, Cohen (2005) discovered all commercial channels voluntarily surpassed these quotas because that was what consumers demanded.

However, a serious conclusion concerning cultural convergence versus nonconvergence due to mass media can only be given by an empirical test of our dynamic predictions. In order to do so, one would need a long panel with data on people's time use and values, together with data on TV contents that allow for cultural differentiation between channels. This very demanding task is left for future research.

[18] Disdier et al. (2010) reach the same conclusion. In their paper they offer systematic evidence of the influence of foreign media on one particular cultural trait, namely naming patterns in France. Names given to babies are seen as "emblematic characteristics of national cultural traditions" and hence "expressions of cultural identity". Disdier et al. (2010) show that despite the existence of many examples of non-traditional names in France the aggregate impact of foreign media is modest and has changed less than 5% of the names.

The present paper only looked at free to air television and did not consider pay TV where media platforms additionally to advertisement revenues receive direct revenues from viewers. Also, our model of advertisement income was very simplistic. There is an economic literature comparing pay-TV versus free-to-air TV. The most sophisticated studies using a model of two-sided markets (TV and advertisement market) show that under pay-TV program quality is higher (Armstrong and Weeds (2007)) and contents are more differentiated (Peitz and Valletti (2008)). This suggests that introducing pay TV when there is competition in the media industry into our model would only improve the coverage of the different cultural traits. With this in mind, our model can be interpreted as the worst case scenario for cultural survival. Another interesting extension is to allow for firms to broadcast multiple channels and offer bundles. Crawford and Cullen (2007) show in numerical welfare simulations that consumers would benefit if cable television networks were offered à la carte. If cultural survival is a concern, this is likely to reinforce their conclusion. Finally, if we allowed for public broadcasters (see e.g. Cabizza, (2001) and Rasch (2007)) who also care about consumer welfare or even about cultural diversity, this would also work in favor of cultural survival.

Appendix

Proof of Proposition 2. If (6) holds, given the optimal education choices described by Lemma 1, it is immediate to conclude that (2) will be maximized by any $q \in \left\{1 - \frac{\beta}{\Delta V},\ \frac{\beta}{\theta \Delta V}\right\}$ where both traits watch TV all the time. Moreover, if $1 - t_1^* = 1 - t_2^* = 1$, it is also immediate to see that $\pi = \gamma\left(n + \alpha(1-n)\right)$.

If (7) holds, we proceed in the following way: first we find the optimal q for each subinterval described in Lemma 1 and then we compare the level of profits in each subinterval to find the overall optimal q.

For $q < \frac{\beta}{\theta \Delta V}$ the optimal $q^a = \frac{\beta}{\theta \Delta V}$ since $\left(1 - t_1^*\right)$ is increasing in q while $\left(1 - t_2^*\right)$ is constant and equal to 1. Using (4), (2) and $q^a = \frac{\beta}{\theta \Delta V}$, profits are easily shown to be equal to (10).

We now solve for the last subinterval where $q^b > 1 - \frac{\beta}{\Delta V}$. Given that $\left(1 - t_1^*\right)$ is constant and equal to 1, while $\left(1 - t_2^*\right)$ is decreasing in q the optimal coverage mix is $q^c = 1 - \frac{\beta}{\Delta V}$ and profits are equal to (11).

Finally, in the second subinterval where $\frac{\beta}{\theta \Delta V} \leq q \leq 1 - \frac{\beta}{\Delta V}$ the firm has to maximize

$$\max_{\frac{\beta}{\theta\Delta V} \leq q \leq 1 - \frac{\beta}{\Delta V}} \gamma \left\{ n \left(\frac{c + \beta - \Delta V(1-q)}{c} \right) + \alpha(1-n) \left(\frac{c + \beta - \theta \Delta V q}{c} \right) \right\}.$$

Since the problem is linear, we get a corner solution leading either to q^a and π^a or to q^b and π^b. It is easy to show that $\pi^a \geq \pi^b$ whenever $n \leq \widetilde{n} = \frac{\theta\alpha}{1+\theta\alpha} = 1 - \frac{1}{1+\theta\alpha}$. ■

Proof of Lemma 1. We use (14) and (15) to calculate

$$\frac{\partial n_a^*}{\partial \theta} = \frac{c\beta}{\Delta V} \left(\frac{-\frac{1}{\theta^2}\left(c - \Delta V \left(1 - \frac{\beta}{\theta \Delta V}\right)^2 + \beta \left(1 - \frac{\beta}{\theta\Delta V}\right)\right) - \frac{1}{\theta}\left(2\Delta V \left(1 - \frac{\beta}{\theta\Delta V}\right) \frac{\beta}{\theta^2 \Delta V} + \frac{\beta^2}{\theta^2 \Delta V}\right)}{\left(c - \Delta V \left(1 - \frac{\beta}{\theta \Delta V}\right)^2 + \beta\left(1 - \frac{\beta}{\theta\Delta V}\right)\right)^2} \right)$$

and

$$\frac{\partial n_b^*}{\partial \theta} = \frac{\beta c}{\Delta V} \frac{-\Delta V \left(1 - \frac{\beta}{\Delta V}\right)^2}{\left(c - \theta\Delta V \left(1 - \frac{\beta}{\Delta V}\right)^2 + \beta\left(1 - \frac{\beta}{\Delta V}\right)\right)^2},$$

which are both negative. ■

Proof of Proposition 3. The proof consists of a series of lemmas. We briefly comment on the strategy of the proof. The dynamics give us the conditions for stability: n_a^* is stable whenever $n_a^* \leq \widetilde{n}$, while n_b^* is stable whenever $\widetilde{n} \leq n_b^*$. We first translate these conditions into restrictions on the parameter θ. Since both n_a^* and n_b^* are decreasing while $\widetilde{n}$ is increasing in θ, the analysis will deliver a minimum value θ_a for n_a^* defined by (20) and a maximum value θ_b for n_b^* defined by (21) to be stable. We then examine for which values of α these two thresholds fall outside the permitted range of θ as defined by $\theta_{\min}$ and $\theta_{\max}$ in (7). From this exercise we learn the bounds on α for which n_a^*/n_b^* are always stable (determined by $\theta_a \leq \theta_{\min}$ for n_a^* and by $\theta_b \geq \theta_{\max}$ for n_b^*) and for which n_a^*/n_b^* are always unstable (determined by $\theta_a > \theta_{\max}$ for n_a^* and by $\theta_b < \theta_{\min}$ for n_b^*). It turns out that the condition for complete instability for n_b^* and for complete stability for n_a^* coincide at $\alpha > \alpha_c$ defined by (24) which tells us that whenever n_b^* is completely unstable for all permitted θ, n_a^* is completely stable: we are in case 2. The conditions for complete instability of n_a^*, namely $\alpha < \alpha_a$ defined by (22) and complete stability of n_b^*, namely $\alpha < \alpha_b$ defined by (23) do not coincide, however it can be shown that $\alpha_a < \alpha_b$, so complete instability of n_a^* (namely $\alpha < \alpha_b$) implies complete stability of n_b^* for all possible θ: we are in case 3. For $\alpha_a \leq \alpha \leq \alpha_b$ we are also in case 3 for $\theta_{\min} < \theta < \theta_a$ and in case 1 for $\theta_a < \theta < \theta_{\max}$. The remainder of the proof establishes that $\theta_a \leq \theta_b$ for $\alpha_b \leq \alpha \leq \alpha_c$, hence we are in case 1 for $\theta_a \leq \theta \leq \theta_b$, in case 2 for $\theta_b < \theta \leq \theta_{\max}$ and in case 3 for $\theta_{\min} \leq \theta < \theta_a$ while case 4 never occurs.

Lemma 2 *$n_a^* \leq \widetilde{n}$ whenever $\theta \geq \theta_a$ where*

$$\theta_a = \frac{-\alpha\left(2\Delta V - c - \beta\right)\beta + \sqrt{\alpha^2\left(2\Delta V - c - \beta\right)^2\beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V\left(c + \beta - \Delta V\right)}}{2\alpha\Delta V\left(c + \beta - \Delta V\right)} \tag{20}$$

while $\widetilde{n} \leq n_b^*$ whenever $\theta \leq \theta_b$ where

$$\theta_b = \frac{\left(\Delta V - \beta\right)\left(c + \beta\right)}{\left(\Delta V - \beta\right)^2 + \alpha\beta c}. \tag{21}$$

Moreover both θ_a and θ_b are decreasing in α.

Proof. We first derive the condition for $n_a^* \leq \widetilde{n}$. This is equivalent to

$$\frac{\theta\alpha}{1 + \theta\alpha} \geq \frac{\frac{c\beta}{\theta\Delta V}}{c - \left(1 - \frac{\beta}{\theta\Delta V}\right)\left(\frac{\theta\Delta V - \beta - \beta\theta}{\theta}\right)},$$

which after some algebra gives

$$\theta^2\alpha\Delta V\left(c + \beta - \Delta V\right) + \theta\alpha\left(2\Delta V - c - \beta\right)\beta - \beta(\alpha\beta + c) \geq 0.$$

The general solution for θ is

$$\theta = \frac{-\alpha\left(2\Delta V - c - \beta\right)\beta \pm \sqrt{\alpha^2\left(2\Delta V - c - \beta\right)^2\beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V\left(c + \beta - \Delta V\right)}}{2\alpha\Delta V\left(c + \beta - \Delta V\right)}.$$

However, given that by assumption 1 we have that $\left(c + \beta - \Delta V\right) > 0$ and that the expression under the square bracket is always bigger than $\alpha\left(2\Delta V - c - \beta\right)\beta$, the correct solution is

$$\theta \geq \theta_a = \frac{-\alpha\left(2\Delta V - c - \beta\right)\beta + \sqrt{\alpha^2\left(2\Delta V - c - \beta\right)^2\beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V\left(c + \beta - \Delta V\right)}}{2\alpha\Delta V\left(c + \beta - \Delta V\right)}.$$

Now we look at the condition for $n_b^* \geq \widetilde{n}$, namely

$$1 - \frac{\frac{\beta c}{\Delta V}}{c - \left(1 - \frac{\beta}{\Delta V}\right)(\theta \Delta V - \theta\beta - \beta)} \geq \frac{\theta\alpha}{1+\theta\alpha} = 1 - \frac{1}{1+\theta\alpha}.$$

Some algebra transforms it into a condition on θ

$$\theta \leq \frac{(\Delta V - \beta)(c+\beta)}{(\Delta V - \beta)^2 + \alpha\beta c} = \theta_b.$$

While it is immediate to see that $\frac{\partial \theta_b}{\partial \alpha} < 0$. To show that $\frac{\partial \theta_a}{\partial \alpha} < 0$ notice that θ_a can be rewritten as

$$\theta_a = -\frac{(2\Delta V - c - \beta)\beta}{2\Delta V(c+\beta-\Delta V)} + \frac{\sqrt{\alpha^2 (2\Delta V - c - \beta)^2 \beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V (c+\beta-\Delta V)}}{2\alpha\Delta V(c+\beta-\Delta V)}.$$

Then,

$$\begin{aligned}\frac{\partial \theta_a}{\partial \alpha} &= \frac{\frac{\left(\left(2\alpha(2\Delta V - c-\beta)^2\beta^2 + 4\beta(2\alpha\beta+c)\Delta V(c+\beta-\Delta V)\right)\right)2\alpha\Delta V(c+\beta-\Delta V)}{2\sqrt{\alpha^2(2\Delta V-c-\beta)^2\beta^2+4\beta(\alpha\beta+c)\alpha\Delta V(c+\beta-\Delta V)}}}{(2\alpha\Delta V(c+\beta-\Delta V))^2} \\ &\quad - \frac{\sqrt{\alpha^2 (2\Delta V - c - \beta)^2 \beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V (c+\beta-\Delta V)}\,2\Delta V(c+\beta-\Delta V)}{(2\alpha\Delta V(c+\beta-\Delta V))^2},\end{aligned}$$

the sign of which is equal to the sign of $-8c\Delta V^2 \alpha\beta (c+\beta-\Delta V)^2 < 0$. ■

Lemmas 3 and 4 provide cutoff values for α such that n_a^* and n_b^* are always stable or always unstable. Those are derived by comparing θ_a and θ_b to the bounds on θ imposed by condition (7). Lemma 3 looks at the upper bound and provides conditions for n_a^* to be always unstable and n_b^* to be always stable.

Lemma 3 $\theta_a > \theta_{\max} = 1$, *hence* n_a^* *is unstable for* $\alpha < \alpha_a$ *with*

$$\alpha_a = \frac{c\beta}{(\Delta V - \beta)(c + 2\beta - \Delta V)} \tag{22}$$

and $\theta_b \geq \theta_{\max}$, *hence* n_b^* *is always stable for* $\alpha \leq \alpha_b$ *with*

$$\alpha_b = \frac{(\Delta V - \beta)(c + 2\beta - \Delta V)}{c\beta}. \tag{23}$$

Moreover $\alpha_a < \alpha_b$.

Proof. Using (20) we rewrite the condition for $\theta_a > 1$ as

$$\left(\alpha^2 (2\Delta V - c - \beta)^2 \beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V (c + \beta - \Delta V)\right)$$
$$- (2\alpha\Delta V (c + \beta - \Delta V) + \alpha (2\Delta V - c - \beta) \beta)^2 > 0,$$

which after some algebra simplifies to

$$4\Delta V\alpha (c + \beta - \Delta V) \left(c\beta + 2\alpha\beta^2 + \Delta V^2\alpha + c\alpha\beta - c\Delta V\alpha - 3\Delta V\alpha\beta\right) > 0.$$

Since $c + \beta - \Delta V > 0$ this requires

$$c\beta + 2\alpha\beta^2 + \Delta V^2\alpha + c\alpha\beta - c\Delta V\alpha - 3\Delta V\alpha\beta > 0,$$

which can be rewritten as $\alpha < \alpha_a = \frac{c\beta}{(\Delta V - \beta)(c+2\beta-\Delta V)}$.

Next we check when $\theta_b \geq 1$. This is equivalent to $(\Delta V - \beta)(c + \beta) - (\Delta V - \beta)^2 - \alpha\beta c \geq 0$. After isolating for α we get $\alpha \leq \alpha_b = \frac{(\Delta V - \beta)(c+2\beta-\Delta V)}{c\beta}$. It is easy to see that $\alpha_a < \alpha_b$ since this requires $(2\beta - \Delta V)(c + \beta - \Delta V) < 0$ which is always true since $2\beta < \Delta V$ (in Case 2) while by Assumption 1 the second bracket is positive. ■

Lemma 4 looks at the lower bound and provides conditions for n_b^* to be always unstable and n_a^* to be always stable.

Lemma 4 *Both $\theta_a < \theta_{\min} = \frac{\beta}{\Delta V - \beta}$ and $\theta_b < \theta_{\min}$ for $\alpha > \alpha_c$ where*

$$\alpha_c = \frac{(\Delta V - \beta)^2}{\beta^2}. \tag{24}$$

In this case n_b^* is always unstable and n_a^* is always stable.

Proof. Using (20) we rewrite the condition for $\theta_a < \theta_{\min}$ as

$$(\alpha^2 (2\Delta V - c - \beta)^2 \beta^2 + 4\beta(\alpha\beta + c)\alpha\Delta V (c + \beta - \Delta V)) (\Delta V - \beta)^2$$
$$< \quad (2\alpha\Delta V (c + \beta - \Delta V) \beta + (\Delta V - \beta) \alpha (2\Delta V - c - \beta) \beta)^2 .$$

Taking everything to the left hand and simplifying gives

$$4\Delta V\alpha\beta\left(c+\beta-\Delta V\right)\left(\Delta V^2+\beta^2-\alpha\beta^2-2\Delta V\beta\right)<0.$$

By Assumption 1 the first bracket is positive. Hence we need $\left(\Delta V^2+\beta^2-\alpha\beta^2-2\Delta V\beta\right)<0$ which gives us the cutoff $\alpha>\alpha_c=\frac{(\Delta V-\beta)^2}{\beta^2}$. Similarly, $\theta_b<\theta_{\min}$ is equivalent to $\frac{(\Delta V-\beta)(c+\beta)}{(\Delta V-\beta)^2+\alpha\beta c}<\frac{\beta}{\Delta V-\beta}$,which can be reformulated as $(\Delta V-\beta)^2(c+\beta)<\beta\left((\Delta V-\beta)^2+\alpha\beta c\right)$. Since $\Delta V>\beta$ the condition simplifies to $(\Delta V-\beta)^2<\alpha\beta^2$ which gives us again $\alpha>\alpha_c=\frac{(\Delta V-\beta)^2}{\beta^2}$. ■

Lemma 5 $\alpha_c>\alpha_b$.

Proof. It is easy to see that $\alpha_c=\frac{(\Delta V-\beta)^2}{\beta^2}>\frac{(\Delta V-\beta)(c+2\beta-\Delta V)}{c\beta}=\alpha_b$ since this is equivalent to $c\left(V\Delta-\beta\right)>\beta(c+2\beta-\Delta V)$, which can be reformulated as $\Delta V>2\beta$ something that is guaranteed by (8). ■

From Lemma 4 we learnt that for $\alpha>\alpha_c$ the system always converges to n_a^*. Lemma 3 tells us that for $\alpha<\alpha_a$ the system converges to n_b^* always. Moreover, by Lemma 3 $\theta_a\leq\theta_b$ for $\alpha_a\leq\alpha\leq\alpha_b$. Since n_a^* is unstable for $\theta<\theta_a$ this tells us that for $\theta_{\min}\leq\theta<\theta_a$ the system converges to n_b^* while for $\theta_a\leq\theta\leq\theta_{\max}$ both equilibria candidates are reachable depending on the initial n. To characterize the steady states fully it remains to determine what happens for $\alpha_b<\alpha\leq\alpha_c$. In this area both steady state candidates are sometimes reachable and sometimes unreachable. By establishing how θ_a compares to θ_b the next lemma excludes the possibility of complete instability.

Lemma 6 *For $\alpha_b<\alpha\leq\alpha_c$ it is always the case that $\theta_a<\theta_b$.*

Proof. We know that for $\alpha_b<\alpha<\alpha_c$ both θ_a and θ_b are interior with respect to the bounds defined by (7). We first compare θ_a and θ_b in general and then show that if they lie between $\theta_{\min}$ and $\theta_{\max}$ it must be the case that $\theta_b>\theta_a$. After some reformulation $\theta_a\lesseqqgtr\theta_b$ is equivalent to

$$4Vc\Delta\alpha\left(c+\beta-\Delta V\right)\left(\Delta V^2+\beta^2-\alpha\beta^2-2\Delta V\beta\right)\times$$
$$\left(\left(\Delta V^2+\beta^2\left(1-\alpha\right)-2\beta\Delta V\right)\left(c\alpha+\beta\right)+\Delta V\alpha\left(\beta^2-c^2\right)\right)\lesseqqgtr 0.$$

By Assumption 1 the first bracket is positive, hence we have to look at the second and third bracket only

$$\left(\Delta V^2+\beta^2-\alpha\beta^2-2\Delta V\beta\right)\left(\left(\Delta V^2+\beta^2\left(1-\alpha\right)-2\beta\Delta V\right)\left(c\alpha+\beta\right)+\Delta V\alpha\left(\beta^2-c^2\right)\right)\lesseqgtr 0. \quad (25)$$

Equation (25) tells us that there are two values of α, say α_1 and α_2, for which $\theta_a=\theta_b$. Those values of α can be calculated equating (25) to zero: The zero of the first bracket of (25) gives α_2 which happens to coincide with α_c while the zero of the second bracket gives us α_1. The first bracket is positive $\left(\Delta V^2+\beta^2-\alpha\beta^2-2\Delta V\beta\right)>0$ for $\alpha<\alpha_c$ defined by (24) (see proof of Lemma 4) which is the condition that both $\theta_b>\theta_{\min}$ and $\theta_a>\theta_{\min}$. Hence we only need to sign

$$\begin{aligned}
&\left(\Delta V^2+\beta^2\left(1-\alpha\right)-2\beta\Delta V\right)\left(c\alpha+\beta\right)+\Delta V\alpha\left(\beta^2-c^2\right)\\
=\;&\left(\left(\Delta V-\beta\right)^2-\beta^2\alpha\right)\left(c\alpha+\beta\right)+\Delta V\alpha\left(\beta^2-c^2\right) \qquad (26)\\
=\;&\left(\Delta V-\beta\right)^2\beta+\alpha\left(c\left(\Delta V-\beta\right)^2+\left(\beta^2-c^2\right)\Delta V-\beta^3\right)-\beta^2c\alpha^2. \qquad (27)
\end{aligned}$$

Hence, if we could prove that the sign is negative for $\theta_b<\theta_{\max}$ and $\theta_a<\theta_{\max}$, we would have shown that $\theta_b>\theta_a$. It is clear from (27) that the sign becomes negative for high α. From Lemma 3 we know that $\theta_b<\theta_{\max}$ requires $\alpha>\alpha_b=\frac{(\Delta V-\beta)(c+2\beta-\Delta V)}{c\beta}>1>\frac{c\beta}{(\Delta V-\beta)(c+2\beta-\Delta V)}=\alpha_a$. But the value of (26) at $\alpha=1$ is given by $-\Delta V\left(c+\beta\right)\left(c+\beta-\Delta V\right)<0$ always. Hence, we can conclude that $\theta_b>\theta_a$. In general, the proof shows that $\theta_a<\theta_b$ if and only if $\alpha_1<\alpha<\alpha_2$. ■

The lemma implies that in this last area $(\alpha_b<\alpha\leq\alpha_c)$ n_b^* is the only stable steady state for $\theta<\theta_a$, while n_a^* is the only stable steady state for $\theta>\theta_b$. In the middle region $(\theta_a\leq\theta\leq\theta_b)$ the initial condition n determines which state is reached. Proposition 3 collects all these results. ■

Proof of Proposition 5. We first show that $(q^I=0,q^{II}=1)$ and $(q^I=1,q^{II}=0)$ are two pure strategy Nash equilibria for all $\underline{\alpha}\leqslant\alpha\leqslant\overline{\alpha}$. In those equilibria the channel (no matter which) covering group 2 gets profits $\alpha\gamma\left(1-n\right)$ while the only profitable deviation is to cover group 1 only which would give profits $\gamma\left[\frac{n+\alpha(1-n)\left(1-t_2^*\right)}{2}\right]$ where $t_2^*=\frac{\theta\Delta V-\beta}{c}$ and this is not profitable for $\underline{\alpha}\leqslant\alpha$. For the channel covering group 1, instead, profits are equal to γn, while deviating to cover group 2 would give the profits $\gamma\left[\frac{n\left(1-t_1^*\right)+\alpha(1-n)}{2}\right]$ where $t_1^*=\frac{\Delta V-\beta}{c}$ and this is not profitable for $\alpha\leqslant\overline{\alpha}$.

Next, we show that for $\alpha \leqslant \underline{\alpha}$, $q^I = q^{II} = 1$ is an equilibrium. Indeed, for $q^I = q^{II} = 1$ the only possible deviations are for $q < 1$ which would guarantee profits $\alpha\gamma(1-n)$ to the deviating channel. Then, $q^I = q^{II} = 1$ is an equilibrium if $\gamma\left[\frac{n+\alpha(1-n)\left(1-t_2^*\right)}{2}\right] \geqslant \alpha\gamma(1-n)$, that is if $\alpha \leqslant \underline{\alpha} = \frac{n}{(1-n)\left(1+t_2^*\right)}$ where $t_2^* = \frac{\theta\Delta V-\beta}{c}$. We can similarly show that $q^I = q^{II} = 0$ is an equilibrium if $\gamma\left[\frac{n\left(1-t_1^*\right)+\alpha(1-n)}{2}\right] \geqslant \gamma n$, that is if $\alpha \geqslant \overline{\alpha} = \frac{n\left(1+t_1^*\right)}{(1-n)}$ where $t_1^* = \frac{\Delta V-\beta}{c}$.

We now show that there are no other pure strategy Nash equilibria except for the equal profitability point ($\alpha = \frac{n}{1-n}$). Assume there exist an equilibrium with $q^I > q^{II}$ (different from $(q^I = 1, q^{II} = 0)$) then channel I would get profits $\gamma n(1-t_1^*)$ and channel II would get profits $\alpha\gamma(1-n)(1-t_2^*)$. This is never an equilibrium for $(1-t_1^*)$ and/or $(1-t_2^*)$ smaller than 1. In that case I and/or II could deviate and get a larger audience by increasing q^I and/or decreasing q^{II}. This is always true since t_1^* is non-increasing in q while t_2^* is non-decreasing in q and there are some q such that $t_1^* = t_2^* = 0$. If instead, $(1-t_1^*)$ and $(1-t_2^*)$ both equal 1, again this cannot be an equilibrium, except for the single point where $\alpha = \frac{n}{1-n}$. Indeed, the channel that gets viewers from the less profitable group, for $\alpha > \frac{n}{1-n}$ channel I, would profit from deviating to a $q^I < q^{II}$ because would get $\alpha\gamma(1-n)$ which is more than the candidate equilibrium payoff γn. Notice that this reasoning does not work if q^{II} is already equal to zero as in $(q^I = 1, q^{II} = 0)$. Similarly, channel II would deviate if $\alpha < \frac{n}{1-n}$. A similar reasoning shows that there is never an equilibrium for $q^I < q^{II}$ except for $\alpha = \frac{n}{1-n}$.

Assume now that there exist an equilibrium with $q^I = q^{II}$ (different from $q^I = q^{II} = 1$ and $q^I = q^{II} = 0$) then both channels would get profits $\gamma\left[\frac{n\left(1-t_1^*\right)+\alpha(1-n)\left(1-t_2^*\right)}{2}\right]$. In this case the best possible deviation would be to satisfy completely ($1 - t_i^* = 1$) the most profitable group. Therefore, if $\alpha < \frac{n}{1-n}$, that is group 1 is the more profitable group, a deviation to a $q > q^I = q^{II}$ would give to the deviating channel a profit of γn. Then, $q^I = q^{II}$ will be an equilibrium if $\gamma\left[\frac{n\left(1-t_1^*\right)+\alpha(1-n)\left(1-t_2^*\right)}{2}\right] \geqslant \gamma n$ and this is not possible for $\alpha < \frac{n}{1-n}$ even if $(1-t_1^*) = (1-t_2^*) = 1$. If, instead, we assume that the most profitable group is number 2, i.e., $\alpha > \frac{n}{1-n}$, then a deviation to a $q < q^I = q^{II}$ would give to the deviating channel a profit of $\alpha\gamma(1-n)$, which can be shown to be always bigger than $\gamma\left[\frac{n\left(1-t_1^*\right)+\alpha(1-n)\left(1-t_2^*\right)}{2}\right]$ if

$\alpha > \frac{n}{1-n}$.

If the two groups are equally profitable, that is $\alpha = \frac{n}{1-n}$, there are an infinite number of equilibria with $q^I \neq q^{II}$ all such that each channel gets all the time of one group, i.e., with $(1 - t_1^*) = (1 - t_2^*) = 1$. Clearly, if $(1 - t_i^*) < 1$ the channel covering the group could deviate to a lower (or higher q). However, all coverages such that each channel covers completely one group (of equal profitability) is an equilibrium. The complete list of such equilibria is given by all the couple (q^i, q^j) such that $q^i \in \left[1 - \frac{\beta}{\Delta V}, 1\right]$and $q^j \in \left[0, \frac{\beta}{\theta \Delta V}\right]$, with the further restriction that the coverage of group 1 is greater than the coverage of group 2, i.e., $q^i > q^j$. Moreover, for $\alpha = \frac{n}{1-n}$ we also have a continuum of equilibria with $q^I = q^{II}$ when $(1 - t_1^*) = (1 - t_2^*) = 1$. This is possible when parameters are such that $1 - \frac{\beta}{\Delta V} < \frac{\beta}{\theta \Delta V}$ as in Case 1.

We now show what happens to the size of the interval for which specialization on different cultural traits occurs once we rewrite the thresholds $\underline{\alpha}$ and $\overline{\alpha}$ in terms of group sizes, that is, $\overline{n} = \frac{\alpha(c+\theta\Delta V-\beta)}{\alpha(c+\theta\Delta V-\beta)+c} \geq n \geq \frac{\alpha c}{\alpha c+c+\Delta V-\beta} = \underline{n}$. The size of the interval is

$$\overline{n} - \underline{n} = \frac{\alpha \left(\beta^2 - 2c\beta + c\Delta V + \theta \Delta V^2 - \Delta V \beta + c\theta \Delta V - \theta \Delta V \beta\right)}{\left(c + c\alpha - \alpha\beta + \theta \Delta V \alpha\right)\left(c - \beta + \Delta V + c\alpha\right)}.$$

The term in brackets at the numerator can be rewritten as $(c + \Delta V - \beta)(\theta \Delta V - \beta) + c(\Delta V - \beta)$ and is positive (Assumption 1). Hence, the sign of the derivative with respect to the advertisement sensitivity α is equal to the sign of the following expression: $c\left(c - \beta + \Delta V - c\alpha^2 + \alpha^2\beta - \theta \Delta V \alpha^2\right)$ which is zero for $\alpha = \widehat{\alpha} = \frac{\sqrt{(c-\beta+V\Delta)(c-\beta+V\theta\Delta)}}{c-\beta+V\theta\Delta}$, implying that $\overline{n} - \underline{n}$ is increasing for $\alpha < \widehat{\alpha}$, decreasing for $\alpha > \widehat{\alpha}$ and largest for $\alpha = \widehat{\alpha}$. ■

References

[1] Armstrong, Mark and Helen Weeds (2007) "Programme Quality in Subscription and Advertising-Funded Television", mimeo, UCL.

[2] Bisin, Alberto and Thierry Verdier (2001) "The economics of cultural transmission and the dynamics of preferences" Journal of Economic Theory 97: 298-319.

[3] Bisin, Alberto and Thierry Verdier (2010) "The economics of cultural transmission and socialization", prepared for The Handbook of Social Economics edited by Jess Benhabib, Alberto Bisin and Matt Jackson, Elsevier Science.

[4] Cabizza, Mariella, M. (2001) "Minority Programming in TV markets", mimeo, University of York.

[5] Cardoso, Ana Rute and Elsa Fontainha and Chiara Monfardini (2010) "Children's and parents' time use: empirical evidence on investment in human capital in France, Germany and Italy" Rev Econ Household 8:479–504.

[6] Chong, Alberto and Eliana La Ferrara (2009) "Television and Divorce: Evidence from Brazilian Novelas", Journal of the European Economic Association 7:458—468.

[7] Cohen, J. (2005) "Global and Local Viewing Experiences in the Age of Multi-channel Television: the Israeli Experience. Communication Theory 15: 437-455.

[8] Cohen, J. and R. Tukachinsky (2007) "Television and Group Identity in the Age of Multi-channel Television: Local and global viewing patterns of social groups in Israel. Israeli Sociology 8: 241-267.

[9] Crawford, Gregory S. and Joseph Cullen (2007) "Bundling, Product Choice and Efficiency: Should cable television networks be offered a la carte?" Information Economics and Policy 19: 379-404.

[10] Dahl, G., and Della Vigna, S., (forthcoming), "Does Movie Violence Increase Violent Crime?" forthcoming in Quarterly Journal of Economics.

[11] De Bens, Els and Hedwig de Smaele (2001) "The Inflow of American Television Fiction on European Broadcasting Channels Revisited", European Journal of Communication 16(1): 51-76.

[12] De Jong, A.S. and B.J. Bates (1991) "Channel Diversity in Cable Television", Journal of Broadcasting and Electronic Media 35(2): 159-166.

[13] Della Vigna, S. and Kaplan, E., (2007), “The Fox News Effect: Media Bias and Voting,” Quarterly Journal of Economics, 122, 1187–1234.

[14] Disdier, Anne-Celia, Keith Head and Thierry Mayer (2010) "Exposure to foreign media and changes in cultural traits: Evidence from naming patterns in France." Journal of International Economics 80: 226-238.

[15] Gentzkow, M., and Shapiro, J., (2004), “Media, Education and Anti-Americanism in the Muslim World,” Journal of Economic Perspectives, 18, 117–133.

[16] Gerbner, George, Larry Gross, Michael Morgan, Nancy Signorielli and James Shanahan (2002), "Growing up with television, cultivation process" Chapter 3 in Media effects: advances in theory and research (second edition) edited by Jennings Bryant and Dolf Zillmann, LEA London.

[17] Gerbner, G., Gross, L., Morgan, M., & Signorielli, N. (1986). Living with television: The dynamics of the cultivation process. In J. Bryant & D. Zillman (Eds.), Perspectives on media effects (pp. 17–40). Hilldale, NJ: Lawrence Erlbaum Associates.

[18] Granzberg, G., Steinbring, J., and Hamer, J. (1977). New magic for old: TV in Cree culture. Journal of Communication, 27, p. 154-158.

[19] Hauk, Esther and Maria Saez-Marti (2002) "On the Cultural Transmission of Corruption", Journal of Economic Theory 107: 311-335

[20] Inglehart, Ronald and Wayne E. Baker (2000) "Modernization, Cultural Change and the Persistence of Traditional Values", American Sociological Review 65(1): 19-51.

[21] Jensen, Robert and Emily Oster (2009) "The Power of TV: Cable Television and Women’s Status in India" Quarterly Journal of Economics Vol. 124, No. 3, Pages 1057-1094.

[22] La Ferrara, E., A., Chong, and Duryea, S. (2008), “Soap Operas and Fertility: Evidence from Brazil,” BREAD Working Paper No. 172.

[23] La Pastina, A.C. and J.D.Straubhaar (2005) "Multiple Proximities Between Television Genres and Audiences" Gazette: The International Journal for Communication Studies, 67(3): 271-288.

[24] Li, S. and Chiang, C. (2001) "Market Competition and Program Diversity: A study on the Television Market in Taiwan", Journal of Media Economics 14(2): 105-119.

[25] Lin, C.A. (1995) "Diversity of network prime time program formats during the 1980s", Journal of Media Economics 8(4): 17-28.

[26] Morgan, Michael (1986) "Television and the Erosion of Regional Diversity", Journal of Broadcasting and Electronic Media 30(20: 123-139.

[27] Norris, Pippa and Ronald Inglehart (2009) Cosmopolitan Communications. Cultural Diversity in a Globalized World. Cambridge University Press.

[28] Olken, Benjamin A. (2009), "Do Television and Radio Destroy Social Capital? Evidence from Indonesian Villages", American Economic Journal: Applied Economics 1:4, 1—33.

[29] Peitz, Martin and Tommaso M. Valletti (2008) "Content and advertising in the media: Pay-TV versus free-to-air", International Journal of Industrial Organization 26: 949-965.

[30] Pingree, S. and Hawkins, R. (1981). U.S. Programs on Australian Television: The Cultivation Effect. Journal of Communication, 31, p. 97-105.

[31] Rasch, Alexander (2007) "TV programming choice under public funding", mimeo, University of Cologne.

[32] Saez-Marti, Maria and Anna Sjögren (2008) "Peers and Culture", The Scandinavian Journal of Economics 110(1): 73-92

[33] Shanahan, James and Michael Morgan (1999) Television and its viewers. Cultivation theory and research, Cambridge University Press.

[34] Siegelman, Peter and Joel Waldfogel (2001) "Race and Radio: Preference Externalities, Minority Ownership and the Provision of Programming to Minorities", Advances in Applied Microeconomics 10: 73-107.

[35] Signorielli, Nancy. (1986). Selective Television Viewing: A Limited Possibility. Journal of Communication, 36(3), pp. 64 75.

[36] Straubhaar, J. D. (1991) "Beyond Media Imperialism: Asymmetrical Interdependence and cultural proximity", Critical Studies in Mass Communications, 8: 39-59.

[37] Straubhaar, Joseph., Fuentes-Bautista, Martha., Abram, Daniel., McCormick, Patricia., Campbell, Consuelo. and Inagaki, Nobuya. (2003) "National and Regional TV Markets and TV Program Flows" Paper presented at the annual meeting of the International Communication Association, Marriott Hotel, San Diego.

[38] Straubhaar, Joseph (2008). "Rethinking Cultural Proximity: Multiple Television Flows for Multilayered Cultural Identities" Paper presented at the annual meeting of the International Communication Association, TBA, Montreal, Quebec, Canada.

[39] Tan, A. and Suarchavarat, K. (1988). American TV and social stereotypes of Americans in Thailand. Journalism Quarterly, 65(4), p. 648-654.

[40] Tan, A. S. Tan, G. K., and Tan, A. S. (1987). American TV in the Philippines: A test of cultural impact. Journalism Quarterly, 64, p. 65-72, 144.

[41] Trepete, Sabine (2003) "The Intercultural Perspective: Cultural Proximity as a Key Factor of Television Success" Paper presented at ICA conference San Diego, USA.

[42] van Der Wurff, R. (2004) "Program Choices of Multichannel Broadcasters and Diversity of Program Supply in the Netherlands", Journal of Broadcasting and Electronic Media 48(1): 134-150.

[43] van Der Wurff, R. (2005) "Competition, Concentration and Diversity in European Television Markets", Journal of Cultural Economics 29: 249-275.

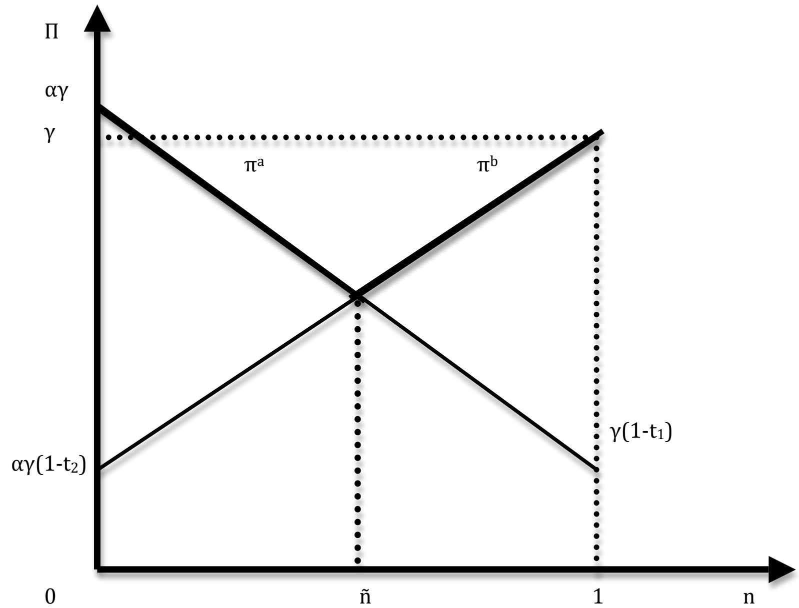

Figure 1: Changes of the profits of the media industry with n

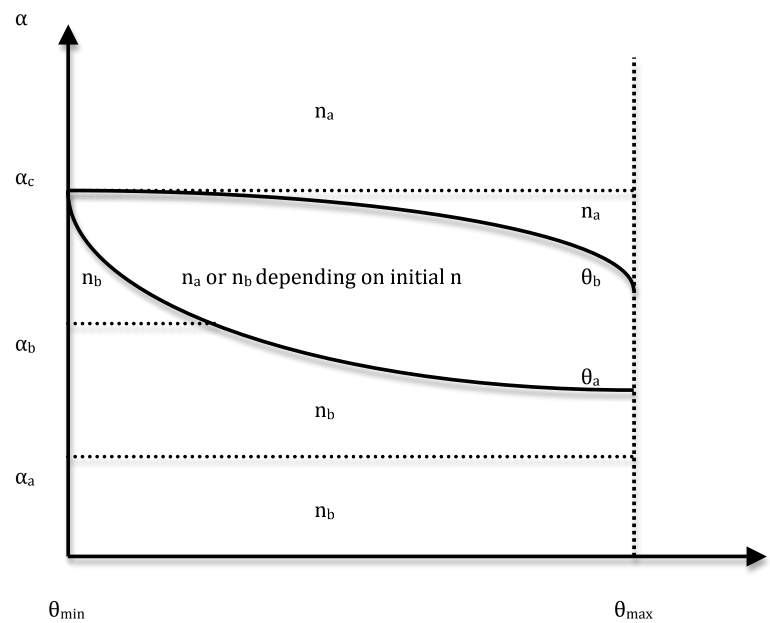

Figure 2: Convergence to steady states with a monopolistic TV industry