Collective Memory, Identity and Cultural Investments*

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Abstract

I study the intergenerational transmission of knowledge in the presence of social externalities associated with individual investment decisions (learning and respecting social norms, cooperation with others, human capital). The younger generation's decisions are based on beliefs about the quality of existing institutions, social norms and values; these beliefs are influenced by the information received from the older generation. I examine whether and when the older generation can engage in welfare-enhancing manipulation of the information transmitted to the younger generation. I then investigate the costs and benefits of having multiple principals involved in the intergenerational transmission of knowledge, and in particular the role of close family ties. Finally, the paper studies the implications of heterogeneous cultural identities for the optimal transmission of knowledge.

My findings are consistent with the empirical evidence on the intergenerational transmission of knowledge and the evolution of collective memory in a variety of countries.

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1. Introduction

How should each generation communicate its knowledge to the following one? Should it aim to be as unbiased, accurate and comprehensive as possible? Can there be any benefits, for society as a whole, from a biased transmission of information to the younger generation, which emphasizes certain aspects whilst neglecting others? What would be the costs? What are the implications for the role of the state, and of parents? These questions are the heart of many current debates, including those over education policy (e.g. how should history be taught? how much control should the state have over schools' curriculum?), over social policy (e.g. should the state support or discourage close family ties?), and over policies on cultural integration, both within countries (e.g. "assimilation" versus "multi-culturalism") and between countries (e.g. centralized versus decentralized institutions in the European Union). While the debates are of very general interest, economists are well placed to help shed light on at least some of the key issues: this paper takes a step in that direction.

The main idea I want to explore is simple. The prosperity and well-being of any society depend to a large extent on the willingness of its members to make significant investments (time, effort, resources) which can benefit them individually but also generate substantial positive externalities: for example, investment in learning and respecting certain social norms, in cooperating with others, in acquiring human capital, in becoming a "good citizen". Individuals will only be willing to invest in this way if they are sufficiently confident that the future returns (psychological as well as practical) will justify incurring current costs. Their investment decisions will therefore depend on their beliefs about the key determinants of these returns, including the quality of the shared values, norms and institutions, i.e. the culture[1], of the society (nation, community) to which they belong. At the time when the young have to take some of their main investment decisions, their beliefs are strongly influenced by the information they receive from the older generation through a variety of channels (e.g. education, media, families). This is obviously true for children and adolescents, but it is also largely the case for young adults, since searching individually for information is costly and the value of information is often very difficult to predict. Thus readily available information, selected and transmitted by the older generation, tends to

[1]This is my definition of culture, which I use throughout the paper. It differs somewhat from the definitions given by sociologists, who have moved from a "narrow" definition of culture as "subjective ideas, values or attitudes" to a "broader" definition as the "symbolic aspect of all social situations" (Olick and Levy (1997)). Whilst I agree with them that culture is "embodied in symbolism and patterns of meaning" and hence "pervasive", I really wish to focus on norms, values and institutions. An alternative term to denote these might have been "social capital", but this has been used in the economics literature with quite different meanings.

be particularly salient and has a substantial impact on beliefs.

This suggests that the selection and presentation of information to the young could be used beneficially to "internalize" the externalities associated with individual investment decisions; i.e. to correct for the tendency to under-invest which would otherwise result in the presence of externalities. The first part of the paper explores this possibility and its implications. I begin by studying the benchmark case of a culturally homogeneous ("mono-cultural") society. The older generation is represented by an informed "principal", who selects the information to be transmitted to the young so as to maximize their welfare. The young are represented by two identical "agents": each agent's investment decision exerts an externality on the other agent. This is the simplest framework that will allow me to study the optimal transmission of knowledge from one generation to the next; it will be modified and extended in the second part of the paper to allow for heterogeneity (multiple principals, heterogeneous agents).

When the externality between the agents is sufficiently important, I find that it can indeed be optimal to select and present information to the young so as to *foster optimism* about the value of the existing culture, thereby inducing greater investments than would be possible with full and accurate transmission of information. In practice, this may be achieved in several ways: first, by neglecting to communicate information that represents "bad news" about the value of the existing culture. Second, by presenting and interpreting the information in such a way as to effectively suppress the underlying bad signal. Third, by emphasizing and focusing attention on information that represents "good news", thereby distracting attention from any bad signal. There is ample evidence, discussed in section 5 below, of the occurrence of all three, in many different situations, and many countries. The evidence comes from the literature on collective memory, based on the work of historians, sociologists and psychologists. This literature documents the ways in which different societies at different times recall and interpret the past, drawing not only on historical sources, but also on school textbooks, newspaper articles, television and radio programs, film, plays, and novels. In other words, the sources that are most likely to impact on the beliefs of the young.

Whilst the analysis in this paper identifies a potential benefit from the selective emphasis, suppression and elaboration of information, it also highlights some of the potential costs. First, when the underlying signal is bad, suppression may give rise to cultural *over-optimism*. Second, when the underlying signal is good, there is the opposite problem: to the extent that the young are aware of the likely bias towards suppressing bad signals, they will distrust the "positive" information transmitted by the older generation, and they will be unduly *pessimistic* about the value of their culture. If these costs outweigh the benefits, the older generation would prefer to commit to truthful communication of information. What role can

families play in this regard?

Section 4 investigates this question by studying the informational role of parents. I extend the basic model to allow for three principals: the first, as before, seeks to maximize the welfare of the younger generation (i.e. the two agents), and can be interpreted as the state (or more generally, the "establishment")[2]. The other two principals, one for each agent, seek to maximize their own agent's welfare, and can be interpreted as parents. I find that the presence of close links between parents and children (high-trust family relationships) can have two types of informational effect: a *welfare-reducing* effect, since they represent a constraint on the state's ability to suppress "bad news" which discourage investment, and a *welfare-enhancing* effect, since they increase the credibility of "good news" and reduce potential losses due to distrust of the information transmitted by the state. However, parents may also be influenced by objectives other than the maximization of their children's welfare; moreover, they are likely to possess less information than the state. Thus their role will generally fall short of ensuring truthful and comprehensive communication of information.

Section 5 reviews the evidence on collective memory and the intergenerational transmission of information. It shows that, in spite of the relatively decentralized character of this form of information transmission in modern democracies, bad signals tend to be suppressed in a variety of ways. The evidence also makes clear that the degree of heterogeneity within a society has an important impact on the transmission of knowledge. I therefore go on to explore the implications of heterogeneity in section 6.

I modify the benchmark model to study a society with two distinct communities ("cultural groups"), each endowed with its own cultural identity (norms, values, history). In this case, each individual has to make two investment decisions: the first concerns "own-cultural" investment (learning about and participating in the culture of his own cultural group); the second concerns "cross-cultural" investment (learning about and participating in the culture of the other group). These investments generate two types of externality: the first is the externality exerted by each individual on other members of his own cultural group, and the second is the externality exerted by the individual on members of the other cultural group. I consider the natural benchmark case of two symmetric communities, which differ only in terms of their cultural identity. As in section 3, I study the role of a welfare-maximizing informed principal who selects the information to be transmitted to the younger generation. A natural interpretation for the

[2]I deliberately make the most favorable assumption concerning the state's objective, to investigate whether close family ties can play a valuable role even in this case, as a commitment device. As discussed in section 4, it is easy to find a valuable informational role for parents when the state is *not* assumed to be maximizing social welfare.

principal in this multi-cultural context would be the state, inclusive in particular of all those public institutions that are involved in the transmission of knowledge to the young and are common to all cultural groups within a society (e.g. state schools, museums, public service broadcasting). Thus by assuming that the principal maximizes social welfare, I am effectively focusing on the question "what should the state do?".

The key new issue that arises in the presence of cultural heterogeneity concerns the transmission of "mixed news" signals; that is, signals that are "good news" about one culture and at the same time "bad news" about the other. For example, evidence of the achievements and successes of one community can often draw attention to the failures, or simply the lack of achievements, of another. Similarly, evidence of "bad" behavior by one community can highlight, by contrast, the "good" behavior, or at any rate the absence of bad behavior, of another. It is sometimes suggested that this kind of signal should be suppressed in order for multi-cultural societies to function well. I find, however, that this has a cost: indeed, with two symmetric communities, it is always optimal to *communicate truthfully "mixed news" signals.* The reason is that the welfare loss from reducing confidence in the culture with the higher value of the underlying signal (leading to under-investment in that culture by members of both cultural groups) would be greater than the welfare gain from increasing confidence in the culture with the lower value of the underlying signal (which tends to correct for the under-investment due to the presence of externalities).

This means that the only potentially beneficial departure from truthful communication is associated with the possibility of suppressing signals that are "bad news" for both cultures, or equivalently emphasizing signals that are "good news" for both. In this sense, the presence of *cultural heterogeneity reduces the scope for welfare-enhancing manipulation of the information transmitted to the young.* In equilibrium, this increases the credibility of "good news", which can benefit equally both communities. Disclosure of "mixed news", on the other hand, has an asymmetric impact on the two communities. In this case, the state has a potentially important role in promoting policies aimed at facilitating cross-cultural investments.

This paper is clearly related to the existing literature on cultural transmission and on identity within economics. Bisin and Verdier (2000, 2001) study the transmission of cultural traits which results from the interaction of two key influences on the preferences of the young: first, the direct socialization effort of their parents, who wish to transmit their own cultural traits; second, the effect of the broader social and cultural environment, including friends, peers, teachers and others who may act as role models. These influences are not modelled explicitly, however: parents can, at a cost, affect the probability that their children

will inherit their cultural traits; if this parental socialization effort fails, children acquire the cultural traits of some role model chosen randomly from the population at large. I view my work as essentially complementary to that of Bisin and Verdier, since it explores one important way in which parents and society at large influence the acquisition of cultural traits by the young. Specifically, I analyze the transmission and manipulation of memory (information) by the state and by parents. This in turn influences the cultural investment decisions made by the young: it is through this channel that it will ultimately affect their preferences, including their acquisition of cultural traits. While complementary to that of Bisin and Verdier, this approach allows me to identify a different set of important externalities and corresponding distinct roles for the state and for families, with quite different welfare implications.

Collective memory is an important determinant of identity: in this sense, the present paper can also be viewed as complementary to Akerlof and Kranton (2000), which studies the implications of identity for individual behavior. Moreover, Akerlof and Kranton examine individual decisions to adopt a particular identity. The present paper also views identity as (partly) endogenous. In the model of section 6 below, individuals are endowed with an initial "cultural identity" through membership of a "cultural group", but they then choose how much to invest in their own culture, and in the other culture (bi-cultural society)[3]. These investments clearly shape their identity.

Finally, Bénabou and Tirole (2002) study the incentives that an individual may have to manage (manipulate) his own memory, when his preferences exhibit time inconsistency. There is an interesting analogy between this manipulation of individual memory and the manipulation of collective memory examined in the present paper. A key difference is that the gains from manipulation in Bénabou and Tirole stem from a feature of individual preferences (time inconsistency), while here they are due to the presence of social externalities. In this respect my paper is also related to Bénabou and Tirole (2003), which studies an informed principal's incentives to manipulate an agent's self-confidence. The common link is that both papers analyze the transmission of information in the presence of externalities, although the nature of the game, the ways in which information may be manipulated, and the externalities involved, all differ considerably.

The paper proceeds as follows. Section 2 presents the basic version of the model, which is analyzed in section 3. Section 4 modifies the model to study the implications of close family ties. Section 5 discusses the literature on collective memory and relates it to the model. Section 6 extends the model to study the implications of cultural heterogeneity. Section 7 concludes.

[3]For another related paper which explores the choice between bi-culturalism and mono-culturalism, see Lazear (1999).

2. The model

This section introduces the simplest version of the model, which will be used to study the benchmark case in section 3. This basic version of the model will be extended in later sections to allow for multiple principals, and for heterogeneous agents.

The model has three dates, $t = 0, 1, 2$, and three players, a "principal" P and two identical "agents", A_i and A_j.The principal represents the first generation ("old"), while the agents represent the second generation ("young"): for simplicity, all players are assumed to be risk-neutral. Information is transmitted by the principal to the agents at date 0; given this information, the agents at date 1 have to make their investment decisions, which may be thought of as investments in learning and internalizing social norms and values, as well as investments in human capital in a broad sense. In what follows, I shall refer to these equivalently as decisions to "invest in the cooperative project", or simply as "effort" decisions. The returns from these investments are realized at date 2.

The agents' preferences are described by the following utility function:

$$U_i = mx_i + gmx_j - cx_i \tag{2.1}$$

where $x_i \in [0, 1]$ denotes agent A_i's investment (effort) decision: if the agent invests in the cooperative project (exerts effort), $x_i = 1$; if the agent does not invest (exerts no effort), $x_i = 0$. The variable m represents the value of the culture passed on from the "old" to the "young" generation, which in my definition includes institutions, history, language, values, norms, the notion of a shared identity, and other such social assets which affect the young generation's ability to succeed in the cooperative project. A higher value of m increases the returns from both agents' investments. Moreover, the constant g is assumed to be strictly positive, so that each agent benefits to some degree from the cooperative investment (effort) of the other agent: it is this externality which will create the potential for some welfare-enhancing manipulation of information transmission, as will become clear below. Each agent incurs an effort cost c if he invests in the cooperative project. This may be interpreted literally as an effort cost (e.g. the effort of learning, of respecting social norms), but also as an opportunity cost (reflecting the attractiveness of other options, e.g. leisure, crime).

I shall assume that the principal fully internalizes the agents' welfare. Thus his utility is simply equal to the sum of the agents' individual utilities:

$$U_p = U_i + U_j = (m + gm - c)(x_i + x_j) \tag{2.2}$$

This specification provides an interesting benchmark because it represents perfect altruism on the part of the older generation, or equivalently a benevolent social

planner (benevolent towards the young); other possibilities will be considered below.

The model's information structure is as follows. At date 0, the principal receives a signal s which is informative about m (e.g. historical evidence informative about how good those institutions and norms really are). I will assume that the principal cannot simply manufacture a good signal (e.g. invent history), but he can suppress a bad signal, as discussed in the introduction and more fully in section 5 below: for example, by casting doubt on the reliability of historical records or, more subtly, by providing alternative interpretations, and by advertising and emphasizing good signals while failing to do the same for bad signals (think of the choice of schools' curriculum, and also of the role of the media, the arts, etc.). A bad signal may correspond to a change for the worst, relative to the past: in this case, if the current situation is publicly observable, the bad signal can nevertheless be suppressed by suppressing accurate records (memories) of the previous (better) situation, thereby eliminating the possibility of unfavorable comparisons.

For simplicity, I shall focus on the case where s can take just two values: $s = B$ ("bad" signal) and $s = \emptyset$ (no signal). The expected value of m conditional on each possible realization of the true signal s is given by:

$$m_L = E[m|s = B] < m_H = E[m|s = \emptyset] \tag{2.3}$$

The problem for the young is that they do not observe the signal s before they have to make their effort (investment) decisions: they therefore rely on the information transmitted by the older generation. At the same time, they do not rely on such information blindly (naively), and they are aware of the possibility that the older generation may manipulate the information it transmits to them in order to manipulate their beliefs and thereby affect their investment decisions (see below).

Let $\hat{s}$ be the signal transmitted by the principal to the agents. Given our assumptions, if the true signal is $s = \emptyset$, there is no opportunity for signal manipulation; thus $\hat{s} = \emptyset$. On the other hand, if the true signal is $s = B$, the principal may either communicate the signal truthfully to the agents ($\hat{s} = B$), or he may decide to suppress the bad signal ($\hat{s} = \emptyset$). Given the information transmitted by the principal at date 0, the agents at date 1 have to make their respective investment decisions. At this date, and before choosing his effort, each agent learns the cost of effort, c. I assume that this is not known at date 0: this is a convenient way of allowing for some uncertainty at date 0 which is resolved at date 1, so that when the principal decides which signal to transmit to the agents he cannot know with certainty the impact that his decision will have on the agents' effort choices, and its welfare implications. However, he knows that the effort cost c has a continuous distribution $F(c)$ over the interval $[c_L, c_H]$, with density $f(c) > 0$. To make the analysis interesting, I will make the following assumption:

$$c_L < m_L < m_H < c_H \tag{2.4}$$

implying that, regardless of the information transmitted by the principal, there is a strictly positive ex-ante probability that the agents will exert effort ex post, and a strictly positive ex-ante probability that they will not. Finally, I assume, for simplicity, that the value of g is public information: that is, the principal and the agents all know the magnitude of the externalities associated with each agent's investment decision.

3. Information transmission in a mono-cultural society

This section examines the implications of the benchmark case outlined in section 2, with a single principal and two identical agents. Consider to begin with the agents' decisions at date 1, in the light of the information then available to them. Each agent has to form expectations over the returns from exerting effort, hence over m. In doing so, the agents will take into account the possibility that the signal transmitted by the principal may be manipulated, relative to the true signal s. Let the agents' prior beliefs concerning the true signal be described by the probability q; that is, the agents believe that $s = \emptyset$ with probability q and $s = B$ with probability $1-q$ (these "uninformed" beliefs will be based on whatever information is readily apparent to everyone, including the young). When they receive the principal's signal, $\hat{s}$, the agents have to assess its reliability, based on their beliefs concerning the true signal and their beliefs concerning the communication strategy (truthful or otherwise) used by the principal. Given our assumptions, the principal's *communication strategy* can be described by the probability h that the principal will truthfully communicate the bad signal:

$$h = \Pr[\hat{s} = B | s = B] \tag{3.1}$$

The agents' beliefs concerning the principal's communication strategy will be denoted by h^*: thus a high value of h^* corresponds to a high level of "trust" between the older and the younger generation, and conversely a low value of h^* implies that the young give a relatively low weight to the information transmitted by the older generation in forming their beliefs. In the limit, when $h^* = 0$, the young regard the signal transmitted by the old as completely uninformative.

I will assume that the agents update their beliefs according to Bayes' rule, which captures the idea that the young cannot simply be fooled into believing anything the older generation wishes them to believe. Thus if the principal transmits the signal $\hat{s} = \emptyset$, the agents estimate the following probability that the signal is accurate (the signal's "*reliability*"):

$$r^* = \Pr[s = \emptyset | \hat{s} = \emptyset; h^*] = \frac{q}{q + (1-q)(1-h^*)} \tag{3.2}$$

implying that their expected value of m is given by:

$$m(r^*) = r^* m_H + (1 - r^*) m_L \tag{3.3}$$

When will the agents provide effort? Given the principal's signal $\hat{s}$, each agent will provide effort (invest in the cooperative project) if, and only if:

$$E[m|\hat{s}] \geqslant c \tag{3.4}$$

We can immediately see that the principal may have an incentive to manipulate the information he communicates to the agents by considering his expected utility when the true signal is s and he transmits the signal $\hat{s}$:

$$E(U_p|s, \hat{s}) = \int_{c_L}^{E[m|\hat{s}]} 2\{(1+g)E[m|s] - c\} dF(c) \tag{3.5}$$

If the principal could simply *choose* the agents' beliefs, he would clearly set them equal to:

$$E[m|\hat{s}] = (1+g)E[m|s] \tag{3.6}$$

Thus as long as $g > 0$, the *principal would like the agents to be optimistic* about the value of the existing norms and institutions; that is, to form higher expectations than they would if they could observe the true signal s. The reason is of course that when $g > 0$, each agent's decision to invest in the cooperative project exerts a positive externality on the other agent, but neither agent takes this into account when choosing his effort. If the agents are accurately informed about the true signal, the result is an under-provision of effort relative to the social optimum. By manipulating the agents' beliefs and increasing their confidence in the value of their culture, the principal could correct this under-provision of effort.

However, the principal cannot simply choose the agents' beliefs. We must therefore examine the relationship between the principal's communication strategy, h, and the agents' beliefs and investment decisions.

3.1. What to do with bad signals: disclose or suppress?

Suppose the principal observes the "bad" signal ($s = B$) at date 0. If he transmits the signal accurately to the agents ($\hat{s} = B$), his expected utility is given by:

$$SW_T(m_L) = \int_{c_L}^{m_L} 2\{(1+g)m_L - c\} dF(c) \tag{3.7}$$

where the subscript T stands for "telling the truth". If on the other hand the principal suppresses the bad signal ($\hat{s} = \emptyset$), his expected utility depends on the agents' beliefs about the reliability of the principal's signal, r^*,and is given by:

$$SW_S(m_L, r^*) = \int_{c_L}^{m(r^*)} 2\{(1+g)m_L - c\}dF(c) \tag{3.8}$$

where the subscript S stands for "suppression". The net gain from suppressing the bad signal is therefore equal to:

$$SW_S(m_L, r^*) - SW_T(m_L) = \int_{m_L}^{m(r^*)} 2\{(1+g)m_L - c\}dF(c) \tag{3.9}$$

If $m(r^*) > (1+g)m_L$, the net gain can be written as follows:

$$\int_{m_L}^{(1+g)m_L} 2\{(1+g)m_L - c\}dF(c) - \int_{(1+g)m_L}^{m(r^*)} 2\{c - (1+g)m_L\}dF(c) \tag{3.10}$$

The first integral represents the gains from suppressing the bad signal: by inducing greater optimism about the value of the existing norms and institutions, and hence about the returns from investment, suppressing the bad signal elicits more effort and thereby corrects the under-provision of effort due to the presence of externalities between the agents. However, optimism can go too far: the second integral represents the loss from excessive optimism, which leads agents to provide too much effort (i.e. provide effort even in those states of nature - cost realizations - in which it would be socially optimal not to provide effort).

The net gain from suppressing the bad signal is clearly increasing in g, the magnitude of the externalities between the two agents, and decreasing in r^*, the agents' beliefs about the reliability of the principal's signal. Thus when the agents' "trust" is high (high value of r^*), the principal's net gain from suppressing the bad signal tends to be lower, because there is a greater danger of excessive optimism: this suggests the possibility of multiple equilibria with different degrees of trust. On the other hand, for sufficiently large values of g (sufficiently important externalities), the net gain from manipulating information will always be strictly positive, irrespective of the agents' beliefs: in this case "high trust" equilibria cannot be sustained. The intuition just outlined is confirmed by Proposition 1 below, which characterizes the set of Perfect Bayesian equilibria (PBEs)[4].

Proposition 1 *There exist g_H and g_L, with $g_H > g_L > 0$, such that:*

[4]Details of the principal's optimization problem, as well as the definition of PBE, are relegated to Appendix 2 for ease of exposition.

(i) *For all* $g > g_H$, *there is a unique PBE with* $h^* = 0$;

(ii) *For all* $g < g_L$, *there is a unique PBE with* $h^* = 1$;

(iii) *For all* $g \in [g_L, g_H]$, *there are three PBEs: (a)* $h^* = 0$, *(b)* $h^* = 1$, *and (c)* $h^* = h(g)$, *where* $h(g)$ *increases from* 0 *to* 1 *as* g *increases from* g_L *to* g_H.

Proof: see Appendix 1.

Proposition 1 indeed confirms our intuition concerning the possibility of multiple equilibria: for intermediate values of g, both "high-trust" ($h^* = 1$) and "low-trust" ($h^* = 0$) equilibria are feasible, as well as equilibria with an intermediate degree of trust. For high values of g, on the other hand, only low-trust equilibria are feasible: when the externalities between the two agents are sufficiently important, the only credible strategy for the principal is to suppress the bad signal. For sufficiently low values of g, the opposite is true: the loss from over-investment would exceed any gain from the correction of under-investment; thus the principal's optimal strategy is always to tell the truth, and the only equilibria are high-trust equilibria.

Interpretation and discussion

The results so far have a number of interesting implications for the intergenerational transmission of knowledge. We have shown that if the older generation's objective is to maximize the welfare of the younger generation, it will choose to suppress bad signals when the externalities generated by individual decisions to invest in the cooperative project are sufficiently important. Thus "telling the whole truth" is not always an optimal strategy: in some cases it is better to manipulate the information transmitted to the young in order to foster optimism about the value of existing norms and institutions and hence about the returns from investment. This leads to a higher provision of effort than would be the case with truthful information transmission, thereby counteracting the tendency for individuals to under-provide effort because they do not take into account the positive externalities their effort exerts on others.

While the results have been obtained under the assumption that the older generation is only concerned with maximizing the younger generation's welfare, it is straightforward to extend the analysis to allow for a direct impact on the older generation's welfare (as opposed to the indirect impact due to the fact that the older generation will, at least to some degree, care for the well-being of the younger generation). In practice, the younger generation's investment in the cooperative project will imply some costs (time, effort and resources) for the older generation; at the same time, the older generation will reap some benefits from these investments. The net direct benefits to the older generation therefore represent an important additional, intergenerational externality, with qualitatively similar implications to those associated with the intragenerational externalities examined earlier. Specifically, if the net direct benefits to the older generation

are strictly positive (negative), the net gains from suppressing bad signals will be correspondingly higher (lower).

A second implication of the results summarized in Proposition 1 is that low-trust equilibria may be better than high-trust equilibria in terms of welfare. For intermediate values of g, there exist multiple equilibria, with low-trust equilibria which are strictly better in terms of social welfare than the corresponding high-trust equilibria (i.e. holding the value of g constant). Thus a high degree of scepticism on the part of the young concerning the reliability of the information transmitted by the older generation need not mean that the society is trapped in a "bad" (low social welfare) equilibrium.

However, this can only be the case if the information available to the older generation represents a "bad" signal ($s = B$), as assumed in this section so far. The implications of a high or low level of trust are of course very different when the information available to the older generation represents a "good" signal ($s = \emptyset$). In this case, it is easy to verify that, for any given value of g, social welfare when trust is high ($h^* = 1$) is strictly higher than social welfare when trust is low ($h^* = 0$). Distrust is costly in this case because it means that the young give no weight to the (truthful) good signal, and as a consequence invest too little: I shall refer to this situation as one of "cultural pessimism".

The results of this section illustrate both the potential benefits and the potential costs associated with the possibility of suppressing bad signals. On the one hand, this may be beneficial for society, to the extent that it corrects the tendency to under-invest in the presence of important social externalities. On the other hand, it may be detrimental for society, in two different ways: first, when the underlying signal is indeed bad, suppression can lead to cultural over-optimism and over-investment, as discussed earlier. Second, when the underlying signal is in fact good, distrust of the older generation can give rise to cultural pessimism and exacerbate the under-investment problem.

Clearly, therefore, if the older generation could credibly restrict its own ability to suppress "negative" information, it could have a beneficial effect on investment, by increasing the perceived reliability of a good signal. On the other hand, such a restriction would obviously reduce the potential gains from manipulating information when the signal is bad. One possible source of effective constraints on the ability to manipulate information is the involvement of multiple principals in the transmission of knowledge: the next section analyzes the implications of close family ties from this perspective.

4. Multiple principals in a mono-cultural society: the different roles of parents and the state

The benchmark analysis developed in section 3 was based on the assumption that the older generation could be represented by a single principal: a natural interpretation for this principal would be "the state" (or "the establishment"). This section extends the analysis by allowing for greater heterogeneity within the older generation; specifically, I investigate the different roles of parents and the state.

4.1. The model: modifications

In terms of the model, the extension requires introducing multiple principals. I shall retain the original players of section 3, namely a principal P and two identical agents A_i and A_j, and add two additional players, principals P_i and P_j. Principal P represents the state, while P_i and P_j are the parents of A_i and A_j, respectively. To focus attention on the consequences of allowing for multiple principals, I continue to make the same assumptions as in section 3 concerning P, A_i and A_j: specifically, they have the same preferences (described by equations (2.1) and (2.2)), and possess the same information as in section 3.

The question is then what assumptions to make concerning the preferences and information set of P_i and P_j. For simplicity, I shall assume that each parent fully internalizes the utility of her[5] child:

$$U_{P_i} = U_i = mx_i + gmx_j - cx_i \tag{4.1}$$

While this may be extreme, it captures the very plausible notion that each parent will give a higher weight to her own child's welfare, and correspondingly lower weight to other children's welfare, than the state. Other assumptions concerning the parents' utility functions will be discussed below.

As for the information set, the state can typically obtain more and better information than the average parent, who is much more constrained in terms of the time and resources she can devote to gathering and interpreting information (and in terms of the power to obtain access to certain types of information). I model the state's informational advantage relative to individual parents as follows. The state (P) receives the "true" signal, s; parents, however, only observe whether the true signal is bad with probability w ($1 > w > 0$). Formally, each parent receives a coarser signal, s_p, such that if $s = \emptyset$, $s_p = \emptyset$; if $s = B$, $s_p = B$ with probability w, and otherwise $s_p = \emptyset$. The signal s_p can be thought of as information that was

[5]For expositional convenience, I shall refer to each parent as "she" and each child as "he" from now on.

publicly available to the older generation. In this case, the state will be aware that the information was publicly available, and will be able to condition its own (public) communication strategy on the signal received by parents.

Given the parents' assumed preferences, each parent will communicate her signal truthfully to her child. It is therefore pointless for the state to suppress the bad signal when it knows the signal has also been received by parents. The state's communication strategy is then given by the probability j that it will communicate truthfully the bad signal when the signal has not been received by parents:

$$j = \Pr[\hat{s} = B | s = B, s_p = \emptyset] \tag{4.2}$$

Letting "uninformed" beliefs be represented by the probability q as in section 3, the reliability of a "good" signal is now given by:

$$r_j^* = \Pr[s = \emptyset | \hat{s} = \hat{s}_p = \emptyset; j^*] = \frac{q}{q + (1-q)(1-w)(1-j^*)} \tag{4.3}$$

where j^* represents the agents' beliefs concerning P's communication strategy.

4.2. Parents and the state

We can now apply the same analysis[6] as in section 3, to obtain an analogous result:

Proposition 2 *There exist G_H and G_L, with $G_H = g_H$* and *$G_L > g_L$, such that:*

(i) *For all $g > G_H$, there is a unique PBE with $j^* = 0$;*

(ii) *For all $g < G_L$, there is a unique PBE with $j^* = 1$;*

(iii) *For all $g \in [G_L, G_H]$, there are three PBEs: (a) $j^* = 0$, (b) $j^* = 1$, and (c) $j^* = j(g)$, where $j(g)$ increases from 0 to 1 as g increases from G_L to G_H.*

Proof: as for Proposition 1. The only difference is that
$r_j \in [\frac{q}{q + (1-q)(1-w)}, 1]$, so that $G_H = G(1) = g_H$,
while $G_L = G(\frac{q}{q + (1-q)(1-w)}) > G(q) = g_L$.

Proposition 2 shows that the value of the externality g below which we have a unique PBE with truthful communication is higher in the multi-principals case examined here than in the single-principal case analyzed in the previous section ($G_L > g_L$). The reason is that the reliability of the good signal (r_j^*) cannot fall below a threshold level which is strictly higher than the corresponding level

[6] Details are available in Appendix 2.

for the single-principal case. Thus for values of g in the range $g_L \leqslant g < G_L$, we have multiple equilibria in the single-principal case, including equilibria with partial or total suppression of the bad signal; in the multi-principals case, the unique equilibrium entails truthful communication. This is one sense in which the presence of principals P_i and P_j who communicate truthfully with agents A_i and A_j, respectively, restricts P's ability to manipulate information in equilibrium. The other restriction is the obvious one: in the presence of P_i and P_j, irrespective of P's communication strategy, the agents will always receive the (true) bad signal with strictly positive probability ($w > 0$).

This suggests that having a single principal, P, might be (weakly) preferred when the true signal is bad, while having multiple principals, P, P_i and P_j, might be (weakly) preferred when the true signal is good. The following Proposition investigates this intuition.

Proposition 3 *(a) Suppose $g > g_H$. Then: (i) if $s = \emptyset$, social welfare is strictly higher with multiple principals P, P_i and P_j than with a single principal P; (ii) if $s = B$, and the effort cost c is uniformly distributed, social welfare is strictly higher with a single principal than with multiple principals. But there exist distributions $F(c)$ for which social welfare is strictly higher with multiple principals.*

(b) Suppose $g_L \leqslant g < G_L$. Then: (i) if $s = \emptyset$, social welfare is (weakly) higher with multiple principals than with a single principal; (ii) if $s = B$, social welfare is (weakly) higher with a single principal.

(c) Suppose $g < g_L$. Then social welfare is the same irrespective of whether there is a single principal or multiple principals.

Proof: see Appendix 1.

Interpretation and discussion

This result confirms to some extent our original intuition, but also provides additional insights. When social externalities are sufficiently low ($g < g_L$), it clearly does not matter whether we have a single principal or multiple principals: truthful communication is the unique equilibrium strategy in both cases. For the intermediate range $g_L \leqslant g < G_L$, having multiple principals rules out the equilibria associated with partial or total suppression of the bad signal, which exist in the single-principal case. This may be beneficial when the true signal is good (the state can commit to truthful communication, thereby avoiding welfare losses due to distrust), and detrimental when the true signal is bad (social welfare is higher in the equilibria where the signal is suppressed). These results are in line with the intuition mentioned above.

When social externalities are sufficiently high ($g > g_H$), the intuition has to be developed a little further. The state's optimal strategy in this case is always to suppress the bad signal, if it can. Close links between parents and children

restrict its ability to do so, which makes "good news" ($\hat{s} = \emptyset$) more credible. As we would expect, this is welfare-enhancing when the true signal is good. But it need not reduce welfare even when the true signal is bad. The reason is that there are two effects at work. First, with probability w, the bad signal is communicated truthfully to the agents: this reduces welfare because it discourages investment for cost realizations in the range $[m_L, m(q)]$. Second, with probability $1 - w$, the bad signal is suppressed, and the enhanced credibility of "good news" encourages investment for cost realizations in the range $[m(q), m(\frac{q}{q + (1-q)(1-w)})]$: this increases welfare[7]. The net effect obviously depends on the distribution function, $F(c)$. If c is uniformly distributed, the first effect dominates, and social welfare is lower with multiple principals. On the other hand, if the distribution function has very little probability mass in the range $[m_L, m(q)]$, and a much greater probability mass concentrated in the range $[m(q), m(\frac{q}{q + (1-q)(1-w)})]$, the result can be reversed, yielding higher social welfare with multiple principals.

What implications does Proposition 3 have for the informational role of parents and the state? We have seen that the presence of close links and high-trust relationships between parents and children acts as a constraint on the state's ability to manipulate information. The constraint does not matter if social externalities are sufficiently low, since there is nothing to be gained by manipulating information. This is no longer the case in the presence of important social externalities. The constraint can then be *detrimental* to social welfare when the true signal about the value of the existing norms and institutions is *low* (based on all the information available to the state, i.e. $s = B$), because in this case it would be socially desirable to manipulate the information transmitted to the young so as to foster optimism and elicit greater effort[8]. On the other hand, high-trust relationships between parents and children have a *beneficial* impact on social welfare when the true signal is *high* (based on the information available to the state, i.e. $s = \emptyset$). In this case, the presence of close links between parents and children enables the state to commit to a lower degree of manipulation of the information transmitted to the young, which makes "good news" more credible and alleviates

[7] More precisely, it increases welfare whenever $m(\frac{q}{q + (1-q)(1-w)}) < (1+g)m_L$. Otherwise the net effect on welfare is unambiguously negative; see Appendix 1.

[8] As we saw in Proposition 3, the presence of multiple principals may increase welfare even when the true signal is bad, if the distribution function $F(c)$ is highly skewed; however, while worthy of comment in the theoretical discussion, this possibility seems unlikely in practice. The distribution $F(c)$ captures the uncertainty over the effort (opportunity) cost of investing in the cooperative project for the "representative" member of the younger generation. This cost will be affected, for example, by technological factors, but there is no reason to believe, a priori, that relatively high cost realizations are much more likely than relatively low cost realizations.

the under-provision of effort due to distrust of the state.

Obviously the state cannot determine the nature of family relationships and the degree of closeness and trust that exist between parents and children. Nevertheless, the state can and does adopt a variety of policies that affect families, supporting or undermining close family ties (think of taxes and benefits, childcare, parental leave...): the informational implications of these policies have received relatively little attention. At the same time, the state may also be able to influence w, by making it easier or harder for parents to obtain relevant information (e.g. disclosure policies). Proposition 3 suggests that the state may have an incentive to support (undermine) close links between parents and children, and facilitate (hinder) parental access to information, when the signal s is good (bad) - to the extent that the younger generation cannot observe and correctly interpret the state's actions.

What if parents are biased? For example, they may be biased in favor of investment in the cooperative project by their children, for ideological reasons, or reasons of social esteem. Conversely, they may be biased against, because they perceive the net direct benefits to themselves as negative, and they are not (very) altruistic. The model can easily be modified to allow for these possibilities. If parents are sufficiently biased in favor of investment, they will never disclose the bad signal; the possible equilibria in this case are described by Proposition 1 (assuming that the children, as well as the state, are aware of the bias). If parents are biased against investment, the most they can do is to transmit the bad signal to their children when they receive it, yielding the equilibrium outcomes described in Proposition 2.

What if the state is biased instead? For example, it may be that the true signal s is informative about the state's past performance, so that the state has a vested interest in suppressing a bad signal even when social externalities are small, which leads to over-investment. Clearly in this case there will be further gains from close family ties, to the extent that they limit the scope for manipulation of information.

Before extending the analysis to allow for cultural heterogeneity, it is useful to review the empirical evidence on the suppression of bad signals: is this feasible in practice, and is it an important phenomenon? The following section investigates this question.

5. Collective memory: how we remember, and forget

"*Collective memory continuously negotiates between available historical records and current social and political agendas. And in the process of referring back to these records, it shifts its interpretation, selectively emphasizing, suppressing, and elaborating different aspects of that record*" (Zerubavel 1995, p.5).

"*All memories are "created" in tandem with forgetting; to remember everything would amount to being overwhelmed by memory. Forgetting is a necessary component in the construction of memory. Yet the forgetting of the past in a culture is often highly organized and strategic*" (Sturken 1997, p.7).

The large and growing literature on collective memory[9], based on research by sociologists, historians and psychologists, studies the ways in which societies remember, represent and interpret the past, exploring not only the role of professional historians, but also that of film, novels, popular histories, the media, political speech, textbooks, monuments, museums, commemorative rituals... Of particular interest from the perspective of the present paper is the wealth of detailed case studies documenting the relationship between memory and national identity, for many different countries. These provide evidence, discussed below, of the "suppression of bad signals". As noted earlier, this may occur in several ways: first, "negative" information may be neglected, ignored and forgotten. Second, it may be presented and interpreted in such a way as to effectively suppress the bad signal. Third, attention may be distracted from bad signals by emphasis and elaboration of "positive" information.

Obviously what constitutes a "bad signal" at any given time depends on *current* values and interests. As these evolve, we should find that collective memory also evolves, uncovering memories that no longer represent a bad signal (and possibly suppressing others that now do represent a bad signal). Moreover, the degree of consensus within the older generation over what represents a "bad signal" may vary substantially (an issue to which I return in the theoretical analysis of section 6 below, where I explicitly address the implications of cultural heterogeneity): this may give rise to different and possibly conflicting narratives and representations of the past. Evidence on all these aspects is considered below.

Space constraints make it impossible to adequately summarize all the relevant evidence from the literature on collective memory, particularly as this would re-

[9]See Olick and Robbins (1998) for a survey, as well as McBride (2001(b)) and Zerubavel (1995) for excellent discussions. Some authors prefer to use the term "social memory" (e.g. Fentress and Wickham (1992)) or "cultural memory" (e.g. Sturken (1997)). The notion that collective memory is to a large extent shaped by, and suited to, current needs and interests, can be traced back to the sociologist Maurice Halbwachs (1925). See also, among others, Darian-Smith and Hamilton (1994); Edwards and Middleton (1990); Fabre and O'Meally (1994); Kammen (1978); Műller (2002); Schwartz (1991, 1998); Thelen (1989) and Trouillot (1995).

quire providing a significant amount of historical information about each country. I shall therefore focus on three case studies in some detail, which examine aspects of American, French and Israeli collective memory, respectively. The key mechanisms for the suppression of bad signals illustrated in these case studies are by no means specific to those countries or to the particular events and time periods considered: for further evidence, see, among others, Buruma (1994) on German and Japanese collective memory; Maier (1988) and Olick and Levy (1997) also on German collective memory; Kammen (1991) on American collective memory (with a variety of examples beyond the one examined below); Samuel (1998) on British collective memory; McBride (2001(a)) on Irish collective memory, and Hilton and Liu (2003) on collective memory in New Zealand. For a broader historical perspective on these issues, and plenty of examples, see also Hobsbawm and Ranger (1983), Nora (1992) and Renan (1882).

5.1. The Vietnam War

At first glance, the Vietnam War might seem to be a perfect counter-example, in the sense of representing a "bad signal" that was never suppressed in any way. However, the evolution of U.S. collective memory of this war conveys a different message. In his very wide-ranging study of American collective memory, Kammen (1991) notes how "Late in April 1975, after the final U.S. military withdrawal, most Americans felt more than ready to follow President Ford's lead in deliberately disremembering the war. Journalist Fox Butterfield called it a "trance of collective amnesia". On Sunday, November 11, 1984, however, approximately 150,000 people attended ceremonies on the Mall in Washington at which President Reagan officially "accepted" the Vietnam Veterans Memorial on behalf of the nation". Sturken (1997) provides a more detailed examination of the evolution of memory about the Vietnam War, focusing particularly on the role of the media, film, books, and memorials. Because of space constraints, I can only summarize briefly some of the key points of the study, as follows:

(1) When the Vietnam veterans returned home, they were often marginalized; they "were expected to put their war experiences behind them and to assimilate quickly back into society", and when many of them were unable to do so, they were "labeled social misfits and stereotyped as potentially dangerous men liable to erupt violently at any moment". This initial reaction was a blunt way of trying to suppress the "bad signal" of an unpopular and contested war, by marginalizing (and to some extent blaming) those who provided a constant reminder of it.

(2) This initial attitude was subsequently reversed. The building of the Vietnam Veterans Memorial on the Washington Mall marked a turning point in the commemoration and remembrance of the war. It was followed by the emergence

of a "Vietnam War nostalgia industry". The latter represents another way of suppressing the bad signal associated with the war (in Kammen's words, "Nostalgia...is essentially history without guilt."). The Vietnam war became big business in television drama and Hollywood movies. The new generation (those who were too young to experience the war or the antiwar movement) has "flocked to see films about the war, their concepts of it shaped by *Apocalypse Now* (1979) and *Platoon* (1986)". These and other popular films[10] focused attention on the direct experience of war of the American ground soldier, the central character often portrayed as an innocent young man to begin with, who is transformed by the war into a "cynical, seasoned, yet reflective hero". The films offered redemption to the veterans, but in the process, attention was distracted from the politics of the war. Moreover, "there are no male Vietnamese protagonists in these films"; the Vietnamese are typically represented by women in the role of helpless victims, "emblems of the victimized Vietnam, not the victorious Vietnam".

Sturken's analysis illustrates all the main mechanisms for the suppression of bad signals: collective amnesia, selective remembering and emphasis on good signals. Nor is this in any way a peculiarly American or very recent phenomenon, as the following examples demonstrate.

5.2. The legacy of the Second World War

Following World War II, the collective memory of many countries[11] suppressed, to a greater or lesser extent, any "bad signal" associated with their experience of the war. In what follows I shall focus on France to illustrate the key mechanisms at work. Rousso (1991) has studied in depth the evolution of French collective memory of the Occupation and the Vichy regime. To summarize, he identifies four distinct phases:

(1) (1944-1954) At first, France "had to deal directly with the aftermath of civil war, purge and amnesty". This was obviously a difficult period, with little scope for collective amnesia.

(2) (1954-1971) The second phase, by contrast, provides evidence of the tendency for collective memory to suppress bad signals: "The French apparently... repressed memories of the civil war with the aid of what came to be a dominant myth: "resistancialism"... By resistancialism I mean, first, a process that sought to minimize the importance of the Vichy regime and its impact on French society, *including its most negative aspects*; second, the construction of an object of memory, the "Resistance", whose significance transcended by far the sum of its active parts (the small groups of guerrilla partisans who did the actual fighting)... and,

[10] For example, *Born on the Fourth of July*, *Casualties of War*, *Full Metal Jacket*.

[11] See Judt (1992) on the occurrence of this phenomenon.

third, the identification of this "Resistance" with the nation as a whole, a characteristic feature of the Gaullist version of the myth." This period illustrates the way in which the past can be reinterpreted to minimize bad signals and emphasize good signals, thereby largely suppressing the former. Rousso documents the role of political speech (notably by de Gaulle), commemorative rituals (notably the transfer of Jean Moulin's ashes to the Pantheon), films, novels, historical treatises and school textbooks in this reinterpretation of the past.

(3) (1971-1974) In this third phase, the "carefully constructed myth was shattered": film played a very important role here as well (*The Sorrow and the Pity*).

(4) (1974-1991) The shattering of the myth was followed, according to Rousso, by a "phase of obsession, characterized on the one hand by the reawakening of Jewish memory and, on the other, by the importance that reminiscences of the Occupation assumed in French political debate". In the 1980s, the "last taboos evaporated, and the wartime years ceased to be the subject of scandal."

Rousso's analysis provides further evidence of the ways in which collective memory tends to suppress bad signals; it also highlights the reliance of this process on a sufficient degree of consensus within the older generation. The problem with the particular way in which the bad signal was suppressed, according to Rousso, was the attempt to identify the whole nation with the Resistance: the myth failed, in the end, because it "was unable to accomodate experiences of the Occupation that had nothing to do with resistance". This seems consistent with the analysis of section 4 above, where the presence of multiple principals (notably parents, with their memories) constrains the state's ability to suppress bad signals.

5.3. The making of a new nation: Israeli collective memory

My last detailed example is the work of Zerubavel (1995) on Israeli collective memory, which focuses on three historical events (the fall of Masada, the Bar Kokhba revolt, and the defense of Tel Hai), and explores the way they have been remembered and interpreted at different times, illustrating the interaction between historical scholarship, archeological discovery, literary work, educational materials and popular narrative in the process of constructing a national memory and identity, as well as in its subsequent evolution and modification. Through a detailed examination of these sources, Zerubavel documents how "while some aspects of the past are uncovered or shift from the margins to the center of our historical consciousness, other aspects of the past are marginalized or fade into oblivion". But does this happen in a way that tends to suppress bad signals and emphasize good signals? The evidence presented by Zerubavel seems to support this view. It is difficult to review the evidence succinctly, without going into considerable detail about Jewish history and memory. Nevertheless, the following

sketch attempts to summarize some key points:

(1) The roots of Israeli collective memory are traced back to the "Zionist constructions of the past as they were formed in the Hebrew culture of Palestinian Jews" prior to the foundation of the State of Israel in 1948. During this period, "the Zionist commemorative narrative accentuated the perception of a "great divide" between Antiquity and Exile"; specifically, Antiquity was portrayed as a positive period, associated with heroic struggles, and "contrasted with a highly negative image of Exile", seen as excessively passive in the face of persecution. Jewish memory in Exile was blamed for a "deliberate suppression of the national memory of the ancient struggles for liberation". This made it possible to actively search for, and reconstruct, a more positive memory of national identity: "The belief in Jewish collective amnesia as far as the national heroic aspects of the past were concerned led to a deliberate Zionist search for suppressed symbols of ancient heroism". Hence, for example, the "rediscovery of Masada[12]", and "the elevation of Bar Kokhba and his revolt as a major turning point in Jewish history".

Where is the suppression of bad signals and emphasis on good signals? From a Zionist perspective, Jewish memory in Exile represented to some extent a "bad signal", which could be suppressed not through amnesia, but by questioning its reliability (in part). This opened the way for the reconstruction of a memory which emphasized "good signals" (ancient struggles for liberation - a positive signal for national identity).

(2) At least as interesting is the subsequent transformation of collective memory from the 1960s to the present day. In Zionist commemorative narrative, the siege and collective suicide at Masada were remembered as a symbol of *active resistance* against the Romans, and hence a model for the new Israeli nation - in contrast with the Jewish experience of Exile. But since then besieged Masada has acquired a new significance, as a symbol of the "great threat to Jewish survival throughout Jewish history, which applies also to the State of Israel". In a nutshell, more recent Israeli experience has changed perceptions, and what was seen as a "bad signal" in the earlier phase no longer represents a bad signal today. Collective memory has evolved accordingly: Zerubavel finds "a greater readiness on the part of Israelis today to accept as their own the Jewish past - not only Antiquity but also the two thousand years of Exile... Israeli collective memory has thus lost much of its oppositionist stance vis-à-vis traditional Judaism". Notice that the "new" commemorative narrative about Masada does not exclude the older one: they coexist in contemporary Israeli culture. Thus Masada "continues

[12]This refers to the siege of Jewish rebels at Masada by the Roman army (A.D. 73), culminating with the Jews' collective suicide before the Romans could enter their fortress. Zerubavel traces "Masada's odyssey from the periphery of historical chronicles to the center of modern Jewish historical consciousness"

to be a historical metaphor of active resistance and renewal in some instances and a historical metaphor of persecution, death, and suicide in others".

(3) However, more critical counternarratives have also emerged. One questions the interpretation of Masada as a symbol of active resistance, viewing the collective suicide not as the ultimate gesture of defiance (choosing death rather than capture), but as a form of escapism (avoiding confrontation with the Romans). Moreover, the image of besieged Masada has been viewed as inducing an excessively defensive posture and hence an uncompromising attitude in negotiating with Arab states and Palestinians (this view being primarily associated with academics and political activists on the Left). Zerubavel ascribes the emergence of conflicting interpretations of the past to the "growing diversity within the society and the increased pressures from within and without". Thus different political cultures are offering different interpretations of the past, consistent with their different views on how current policy should be conducted.

This last case study not only provides further evidence of the tendency for collective memory to suppress bad signals: it also shows how a given event and its memory (here, Masada) may come to represent a "mixed news" signal as society becomes more heterogeneous (here, politically and ideologically). The implications of heterogeneity and the optimal transmission of "mixed news" signals will be the main focus of section 6 below.

6. Information transmission and cultural heterogeneity

What should be the role of the state in the intergenerational transmission of knowledge when different members of society have different cultural identities? I now modify the model to investigate this question.

6.1. The model: modifications

I retain the basic structure of the model of section 2, that is, two agents, A_i and A_j, and one principal, P, who now represents the state. However, the two agents are no longer assumed to be identical: each agent belongs to a different "cultural group" (has a different "cultural identity"). The agents' preferences are described by the following utility function:

$$U_i = m_i x_{ii} + b m_j x_{ij} + g m_i x_{ji} - c(x_{ii} + x_{ij}) \tag{6.1}$$

where m_i and m_j represent the norms, values and institutions of the two cultural groups, respectively. Each agent now has to take two decisions: whether to invest in his own culture (that of his cultural group), and whether to invest in the other

culture. For agent A_i (agent A_j), denote by x_{ii} (x_{jj}) the effort he devotes to learning about his own culture, and by x_{ij} (x_{ji}) the effort he devotes to learning about the other culture. The net benefits from investing in a given culture will depend partly on that culture's norms, values and institutions (as in sections 3 and 4), and partly on the cultural identity of the agent who invests. Thus if agent A_i invests in learning about culture j, he may face higher costs and/or reap lower benefits than if agent A_j makes an equivalent investment: for example, because agent A_j's parents belong to cultural group j, and can more easily communicate knowledge of their own culture to their child (thereby reducing the agent's learning costs), and because agent A_j has greater opportunities to interact with members of cultural group j (which reduces his costs and increases his benefits from learning about culture j). This possible difference is captured by the parameter b: if $b < 1$, there is a comparative disadvantage in learning a culture other than one's own; the disadvantage disappears for $b = 1$. Clearly the value of b can be affected by a variety of policies; I shall return to this point below. However, for now I shall assume that b is given exogenously, in order to focus on the state's role in the transmission of knowledge. Similarly the effort (opportunity) cost c is assumed to be given exogenously. Moreover, I assume that ex ante the cost is uniformly distributed over the interval $[0, 1]$ for both agents (i.e. both cultural groups), in order to have as much symmetry as possible between the two agents (groups). This will provide a clear benchmark analysis, and allow me to focus on the implications of asymmetric signals in an otherwise symmetric setting, as discussed below. Finally, the parameter $g > 0$ now captures the externality exerted by each agent on the other when it invests in the other's culture.

I shall assume that the state gives equal weight to each cultural group; this represents a natural benchmark case. The state's utility will be given by:

$$U_p = U_i + U_j + Vm_i x_{ii} + Vm_j x_{jj} \tag{6.2}$$

The state therefore maximizes the sum of the two agents' utilities, plus two terms reflecting the fact that each agent's decision to invest in his own culture exerts a positive externality, represented by $V > 0$, on other members of his cultural group. This is a convenient way of allowing for the intra-group positive externalities that were studied in section 3 without explicitly modelling the interaction of agents within the same cultural group as well as across cultural groups.

The information structure of the model is modified as follows. P (the state) now receives a two-dimensional signal, $s = [s_i, s_j]$, where s_i is informative about the value of m_i and s_j is informative about the value of m_j. I allow for the possibility of "bad news", "no news" and "good news"; thus $s_k \in [\emptyset, B, G]$ ($k = i, j$). The expected value of m_k ($k = i, j$), conditional on each possible realization of s_k, is given by:

$$m_L = E[m_k|s_k = B] < m_M = E[m_k|s_k = \emptyset] < m_H = E[m_k|s_k = G] \tag{6.3}$$

where $0 < m_L < m_H < 1$. I assume that "good news" and "bad news" are symmetric relative to "no news", in the sense that m_L and m_H are equidistant from m_M:

$$m_L + z = m_M = m_H - z \tag{6.4}$$

for some $z > 0$.

As noted in the introduction, I am particularly interested in studying the state's optimal communication strategy in the presence of "mixed news": that is, a signal which is good news about one culture but simultaneously bad news about the other. Disclosure of such signals clearly has an asymmetric impact on the two cultural groups, and is therefore an important issue to study in the context of multi-cultural societies.

To investigate the issue of mixed news, I shall focus on the case where s can take just four possible values: $s \in \{[\emptyset, \emptyset], [B, B], [B, G], [G, B]\}$. Thus the principal may receive no signal about either m_i or m_j; he may receive a bad signal about both, or he may receive a signal which is bad for one and good for the other. This is the simplest framework I can use to study the issues of interest. I continue to assume that the principal cannot simply manufacture a signal; on the other hand he can suppress a signal. Thus if the true value of s is $[\emptyset, \emptyset]$, the principal has no scope for manipulating the information he transmits to the agents: $\hat{s} = [\emptyset, \emptyset]$. However, if the principal receives a signal $s \in \{[B, B], [B, G], [G, B]\}$, he can either communicate the signal truthfully to the agents, or suppress it (in the latter case, $\hat{s} = [\emptyset, \emptyset]$).

The principal's communication strategy therefore consists of three probabilities, h_{BB}, h_{GB} and h_{BG}, defined by:

$$h_{BB} = \Pr\{\hat{s} = [B, B] \,|s = [B, B]\} \tag{6.5}$$

$$h_{BG} = \Pr\{\hat{s} = [B, G] \,|s = [B, G]\} \tag{6.6}$$

$$h_{GB} = \Pr\{\hat{s} = [G, B] \,|s = [G, B]\} \tag{6.7}$$

As for beliefs, I assume full symmetry between the agents (again, as a benchmark); that is, they share the same "uninformed" beliefs before they receive the principal's signal[13].

[13]Further details about this version of the model can be found in Appendix 2.

6.2. Multi-cultural societies: mixed-news signals

This section investigates the issue of mixed-news signals discussed above. Suppose the principal receives such a signal; for example, $s = [G, B]$. If he communicates the signal truthfully to the agents, his expected utility is equal to:

$$SW_T(m_H, m_L) = \int_0^{m_H} [m_H(1+V) - c]\, dc + \int_0^{m_L} [m_L(1+V) - c]\, dc$$

$$+ \int_0^{bm_L} [(b+g)m_L - c]\, dc + \int_0^{bm_H} [(b+g)m_H - c]\, dc \tag{6.8}$$

If the principal suppresses the true signal, his expected utility is given instead by the following expression:

$$SW_S(m_H, m_L) = \int_0^{m_i(r^*)} [m_H(1+V) - c]\, dc + \int_0^{m_j(r^*)} [m_L(1+V) - c]\, dc$$

$$+ \int_0^{bm_j(r^*)} [(b+g)m_L - c]\, dc + \int_0^{bm_i(r^*)} [(b+g)m_H - c]\, dc \tag{6.9}$$

Thus the net gain from suppressing the mixed-news signal is equal to:

$$SW_S(m_H, m_L) - SW_T(m_H, m_L)$$

$$= - \int_{m_i(r^*)}^{m_H} [m_H(1+V) - c]\, dc + \int_{m_L}^{m_j(r^*)} [m_L(1+V) - c]\, dc$$

$$+ \int_{bm_L}^{bm_j(r^*)} [(b+g)m_L - c]\, dc - \int_{bm_i(r^*)}^{bm_H} [(b+g)m_H - c]\, dc \tag{6.10}$$

The first integral in expression (6.10) represents the effect on agent A_i's decision to invest in his own culture: suppressing the true signal, which was "good news" about the value of m_i, reduces A_i's incentives to invest, leading to an under-provision of effort. This term therefore represents a net loss from the suppression of the true signal. The second integral shows the effect on agent A_j's decision to invest in his own culture: suppressing the true signal, which was "bad news" about m_j, increases his incentives to invest, which mitigates the under-provision of effort due to the presence of positive externalities ($V > 0$) among members of A_j's cultural group. However, if $m_j(r^*) > (1+V)m_L$, there will be an over-provision of effort. The net gain from this second effect is therefore analogous to

the one examined earlier, in section 3, and is increasing in V, the magnitude of the intra-group externalities.

There are two additional "cross-cultural" effects. The last two terms of expression (6.10) show the effect on each agent's decision to invest in the other agent's culture. Suppressing the true signal increases A_i's cross-cultural investment and reduces A_j's cross-cultural investment. If we assume that $bm_j(r^*) > (b+g)m_L$, we can write these two terms as follows:

$$\int_{bm_L}^{(b+g)m_L} [(b+g)m_L - c]\, dc - \int_{(b+g)m_L}^{bm_j(r^*)} [c - (b+g)m_L]\, dc$$

$$- \int_{bm_i(r^*)}^{bm_H} [(b+g)m_H - c]\, dc \tag{6.11}$$

This makes clear the different effects at work. The first integral represents the gain from agent A_i's greater optimism about the other culture, which corrects the tendency to under-invest due to the presence of positive cross-cultural externalities. The second integral represents the loss from A_i's excessive optimism about the other culture, which leads him to over-invest. Finally, the last integral represents the loss from agent A_j's under-investment in the other culture.

The following result characterizes the state's optimal communication strategy:

Proposition 4 *Suppose the principal receives the signal $s = [G, B]$. Then he will always communicate the signal truthfully to the agents : $\hat{s} = [G, B]$* (i.e. $h_{GB} = 1$).

Proof: see Appendix 1.

Given the symmetry of the problem, the same obviously applies when the principal receives the signal $s = [B, G]$: in this case, $\hat{s} = [B, G]$. Thus the principal's optimal communication strategy when he receives a "mixed news" signal is to transmit the signal truthfully to the agents. It follows that the only circumstances in which there is a potential for beneficial manipulation of the information transmitted to the agents are those corresponding to receipt of a signal which is "bad news" for both cultures, i.e. $s = [B, B]$. In this case, as in the mono-cultural case analysed in section 3, suppression of the true signal can be welfare-enhancing, provided social externalities (within each cultural group and between cultural groups) are sufficiently important.

Interpretation and discussion

The intuition for the result summarised in Proposition 4 is that the marginal productivity of investment is higher for the culture with the higher value of m; thus under-investment in that culture is more costly in terms of social welfare than under-investment in the other culture. Accurate public transmission of the

true signal s is therefore needed to provide efficient investment incentives to both agents.

What are the welfare implications for each cultural group? These can easily be seen by comparing the expected utility of each agent when the signal is $s = [G, B]$. Agent A_i's expected utility in this case is given by:

$$E[U_i] = \int_0^{m_H} [m_H - c]\, dc + \int_0^{bm_L} [bm_L - c]\, dc + \int_0^{bm_H} [gm_H] dc$$

while agent A_j's expected utility is equal to:

$$E[U_j] = \int_0^{m_L} [m_L - c]\, dc + \int_0^{bm_H} [bm_H - c]\, dc + \int_0^{bm_L} [gm_L] dc$$

If $b = 1$, the sum of the first two terms in each of the above expressions has the same value, but agent A_i is strictly better off because he obtains a higher benefit from the presence of positive cross-cultural externalities. If $b < 1$, there is an additional effect which further reduces A_j's expected utility relative to A_i's, due to the fact that A_i has a comparative advantage in investing in the culture with the higher value of m (hence higher marginal productivity of investment). It is easy to verify that the value of intra-group externalities will also be higher for cultural group i than for group j.

Thus the group whose culture has a lower value of m will be worse off than the other group. The state may therefore want to implement, for example, policies designed to increase the value of b (hence the returns from cross-cultural investments), together with various forms of transfers to help the disadvantaged group.

7. Conclusions

This paper studies the transmission of knowledge across generations. It investigates the role of the state in this process, and explains why some manipulation of the information transmitted to the young (the suppression of bad signals) may at times be beneficial, by fostering optimism about the value of existing norms and institutions and thereby encouraging investments which generate substantial positive social externalities. This may be seen as providing a rationale for certain biases documented by sociologists, psychologists and historians working on collective memory. However, manipulative strategies can also be very costly, by generating distrust of the state in equilibrium, which undermines the credibility of good signals and hence reduces socially beneficial investment and social welfare. Thus the presence of trustworthy sources of information, such as parents, can

have both positive and negative effects on social welfare, depending on whether the underlying signal is good or bad.

The scope for beneficial manipulation of information by the state is reduced in multi-cultural societies, where the truthful disclosure of "mixed-news" signals is needed to provide efficient own-cultural and cross-cultural investment incentives. The state may nevertheless be able to implement policies that increase social welfare and reduce cross-cultural inequality by facilitating cross-cultural investments.

What are the implications of these findings for the rich set of policy questions raised in the introduction? The analysis presented in this paper suggests that conventional answers should be treated with a degree of caution. For example, how should history be taught in schools? We have seen that there may be a case for the selective emphasis of good signals and suppression of bad signals; on the other hand, the suppression of "mixed news" signals is costly because it distorts investment incentives. Should the state support or discourage close ties between parents and children? Whilst many arguments are typically put forward to answer this question, the implications for the intergenerational transmission of knowledge are rarely discussed: this paper highlights the main tradeoffs involved from this perspective.

Clearly, the paper is only a first step, and much work remains to be done. For example, the analysis in the last section could be interpreted as favorable to a greater degree of centralization in the European Union, insofar as this would facilitate truthful communication of "mixed news" signals, and at the same time make it easier to coordinate transfers and promote cross-cultural investments. However, this would require centralized institutions motivated by a desire to maximize the welfare of the populations concerned. An important avenue for future research therefore concerns the "political economy" of memory and of the intergenerational transmission of knowledge, notably in the presence of asymmetric cultural groups.

8. References

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9. Appendix 1

Proof of Proposition 1

For all $r \in [q,1]$ and $g \geqslant 0$, define:

$$B(r,g) = \frac{1}{2}[SW_S(m_L,r) - SW_T(m_L)] = \int_{m_L}^{m(r)} \{(1+g)m_L - c\} dF(c) \qquad (9.1)$$

Lemma 1. For all $r \in [q,1]$, there exists a unique $G(r) > 0$ such that $B(r,G(r)) = 0$ and:

(i) $B(r,g) > 0$ for all $g > G(r)$, while $B(r,g) < 0$ for all $g < G(r)$;

(ii) $G(r) < \dfrac{r(m_H - m_L)}{m_L}$ and $G(r)$ is strictly increasing in r.

Proof of Lemma 1. For any given r, it is clear from (9.1) that $B(r,g) > 0$ for $g \geqslant \dfrac{r(m_H - m_L)}{m_L}$, while $B(r,0) < 0$. Moreover, for all $g \geqslant 0$, we have

$$\frac{\partial B(r,g)}{\partial g} = \int_{m_L}^{m(r)} m_L dF(c) > 0 \qquad (9.2)$$

This establishes that there is a unique value $G(r)$ such that $B(r,G(r)) = 0$, and that $0 < G(r) < \dfrac{r(m_H - m_L)}{m_L}$. Moreover, it establishes part (i) of Lemma 1. It remains to establish that $G'(r) > 0$. We have:

$$\frac{\partial B(r,g)}{\partial r} = (m_H - m_L)[(1+g)m_L - m(r)]f(m(r)) \qquad (9.3)$$

Moreover, for all $G(r)$ such that $0 < G(r) < \dfrac{r(m_H - m_L)}{m_L}$, we have:

$$m(r) > m_L(1 + G(r)) \qquad (9.4)$$

implying that $\dfrac{\partial B(r,g)}{\partial r} < 0$. Therefore, by the implicit function theorem, $G'(r) > 0$. $\square$

To prove Proposition 1 using Lemma 1, note that:

(i) for all $g > G(1)$ we have, for all $r \in [q,1]$, $G(r) < g$, and therefore $B(r,g) > 0$. Thus the principal's optimal strategy is $h = 0$;

(ii) for all $g < G(q)$ we have, for all $r \in [q,1]$, $G(r) > g$, and therefore $B(r,g) < 0$. Thus the principal's optimal strategy is $h = 1$;

(iii) for $G(q) \leqslant g \leqslant G(1)$, there exists by the lemma a unique inverse function $R(g) \equiv G^{-1}(g)$, such that $B(R(g),g) = 0$. Moreover, the function R is increasing, and for any $r \in [q,1]$, $B(r,g)$ has the sign of $R(g) - r$. This implies that the only

equilibrium with $r > R(g)$ is $r = 1$ ($h = 1$), with $B(1, g) < 0$; the only equilibrium with $r < R(g)$ is $r = q$ ($h = 0$), with $B(q, g) > 0$; and finally $r = R(g)$ is an equilibrium, with $h = h(g) \equiv \dfrac{1 - \dfrac{q}{R(g)}}{1 - q}$, and $B(R(g), g) = 0$.

To complete the proof, define $g_H \equiv G(1)$ and $g_L \equiv G(q)$. $\square$

Proof of Proposition 3

(a) Suppose $g > g_H$. Then for each value of g, the unique equilibrium in the single-principal case has $h^* = 0$, and the unique equilibrium in the multi-principals case has $j^* = 0$.

(i) If $s = \emptyset$, social welfare is given by:

$$SW_S(m_H, r^*) = \int_{c_L}^{m(r^*)} 2\{(1+g)m_H - c\}dF(c) \tag{9.5}$$

in the single-principal case, and by:

$$SW_S(m_H, r_j^*) = \int_{c_L}^{m(r_j^*)} 2\{(1+g)m_H - c\}dF(c) \tag{9.6}$$

in the multi-principals case, where $r^* = q$ and $r_j^* = \dfrac{q}{q + (1-q)(1-w)}$. Thus social welfare is strictly higher with multiple principals.

(ii) If $s = B$, social welfare is given by

$$U^S = SW_S(m_L, r^*) = \int_{c_L}^{m(r^*)} 2\{(1+g)m_L - c\}dF(c) \tag{9.7}$$

in the single-principal case, and by

$$U^M = wSW_T(m_L) + (1-w)SW_S(m_L, r_j^*) \tag{9.8}$$

which is equal to

$$w\int_{c_L}^{m_L} 2\{(1+g)m_L - c\}dF(c) + (1-w)\int_{c_L}^{m(r_j^*)} 2\{(1+g)m_L - c\}dF(c) \tag{9.9}$$

in the multi-principals case, where again $r^* = q$ and $r_j^* = \dfrac{q}{q + (1-q)(1-w)}$.

We can define $Z(w) \equiv (U^S - U^M)/2$; i.e.

$$Z(w) = w\int_{m_L}^{m(r^*)} \{(1+g)m_L - c\}dF(c) - (1-w)\int_{m(r^*)}^{m(r_j^*)} \{(1+g)m_L - c\}dF(c) \tag{9.10}$$

Clearly $Z(0) = 0$, while $Z(1) = \int_{m_L}^{m(r^*)}\{(1+g)m_L - c\}dF(c) > 0$. Moreover,

$$Z'(w) = \int_{m_L}^{m(r_j^*)}\{(1+g)m_L - c\}dF(c) - (1-w)[(1+g)m_L - m(r_j^*)]dF(m(r_j^*))\frac{\partial m(r_j^*)}{\partial r_j^*}\frac{\partial r_j^*}{\partial w} \tag{9.11}$$

which can be written as follows:

$$\int_{m_L}^{m(r_j^*)}\{(1+g)m_L - c\}dF(c) - a[(1+g)m_L - m(r_j^*)]dF(m(r_j^*))[m(r_j^*) - m_L] \tag{9.12}$$

where the constant a is defined by $0 < a \equiv \dfrac{(1-w)(1-q)}{q + (1-q)(1-w)} < 1$.

There are two cases to consider.

Case 1. Suppose $m(r_j^*) \geqslant (1+g)m_L$. Then clearly $Z'(w) > 0$ for $0 < w < 1$. Hence $U^S > U^M$.

Case 2. Suppose $m(r_j^*) < (1+g)m_L$. I first show that if c is uniformly distributed over the interval $[c_L, c_H]$, $Z'(w) > 0$. We have:

$$Z'(w) = (\frac{1}{c_H - c_L})\{\int_{m_L}^{m(r_j^*)}[(1+g)m_L - c]dc - a[(1+g)m_L - m(r_j^*)][m(r_j^*) - m_L]\} \tag{9.13}$$

But we know that:

$$\int_{m_L}^{m(r_j^*)}\{(1+g)m_L - c\}dc > \int_{m_L}^{m(r_j^*)}\{(1+g)m_L - m(r_j^*)\}dc \tag{9.14}$$

and

$$\int_{m_L}^{m(r_j^*)}\{(1+g)m_L - m(r_j^*)\}dc = [(1+g)m_L - m(r_j^*)][m(r_j^*) - m_L] \tag{9.15}$$

Hence $Z'(w) > 0$ for $0 < w < 1$, and $U^S > U^M$.

To show that there exist distributions $F(c)$ such that $U^M > U^S$, consider expression (9.10). Clearly the value of the first integral can be made very small by having very little probability mass in the range $[m_L, m(r^*)]$, while the value of the second integral can be made large by having sufficient probability mass in the range $[m(r^*), m(r_j^*)]$.

(b) Suppose $g_L \leqslant g < G_L$. Then there is a unique equilibrium in the multi-principals case, with $j^* = 1$. In the single-principal case, there are three equilibria:

(a) $h^* = 0$, (b) $h^* = 1$, and (c) $h^* = h(g)$. The equilibrium with $h^* = 1$ is equivalent, in terms of social welfare, to the equilibrium with $j^* = 1$ in the multi-principals case: in both cases the bad signal is always communicated truthfully to the agents.

(i) To show that social welfare is weakly higher with multiple principals when $s = \emptyset$, we just need to show that in the single-principal case, social welfare is (weakly) higher in the equilibrium with $h^* = 1$ than in the other two equilibria. Social welfare is given by

$$SW_T(m_H) = \int_{c_L}^{m_H} 2\{(1+g)m_H - c\}dF(c) \tag{9.16}$$

in the $h^* = 1$ equilibrium; it is equal to

$$SW_S(m_H, q) = \int_{c_L}^{qm_H+(1-q)m_L} 2\{(1+g)m_H - c\}dF(c) \tag{9.17}$$

in the $h^* = 0$ equilibrium. Clearly $SW_T(m_H) > SW_S(m_H, q)$. Moreover, social welfare in the third equilibrium is given by

$$SW_S(m_H, r^*(h(g))) < SW_T(m_H) \tag{9.18}$$

(ii) To see that social welfare is weakly higher with the single principal P when $s = B$, note that social welfare is given by

$$SW_S(m_L, q) = \int_{c_L}^{m(q)} 2\{(1+g)m_L - c\}dF(c) \tag{9.19}$$

in the $h^* = 0$ equilibrium, and by

$$SW_T(m_L) = \int_{c_L}^{m_L} 2\{(1+g)m_L - c\}dF(c) \tag{9.20}$$

in the $h^* = 1$ equilibrium. Moreover, we know from the proof of Proposition 1 that $B(q, g) > 0$; i.e.

$$B(q, g) = \frac{1}{2}[SW_S(m_L, q) - SW_T(m_L)] > 0 \tag{9.21}$$

(c) Suppose $g < g_L$. Then the unique equilibrium in the single-principal case and the unique equilibrium in the multi-principals case both entail truthful communication, yielding the same social welfare. □

Proof of Proposition 4

For all $r \in [q_N, 1]$, $r_{BB} \in [0, \frac{q_B}{q_N + q_B}]$, $r_{BG} \in [0, \frac{q_M}{q_N + q_M}]$, $r_{GB} \in [0, \frac{q_M}{q_N + q_M}]$, $V \geqslant 0$, $b \geqslant 0$ and $g \geqslant 0$, define the net gain from suppressing the signal $s = [G, B]$:

$$\Re = \Re(r, r_{BB}, r_{BG}, r_{GB}, V, b, g) = SW_S(m_H, m_L) - SW_T(m_H, m_L)$$

$$= -\int_{m_i}^{m_H} [m_H(1+V) - c]\, dc + \int_{m_L}^{m_j} [m_L(1+V) - c]\, dc$$

$$+ \int_{bm_L}^{bm_j} [(b+g)m_L - c]\, dc - \int_{bm_i}^{bm_H} [(b+g)m_H - c]\, dc \tag{9.22}$$

where

$$m_i = \frac{q_N m_M + q_M(1-h^*_{BG})m_L + q_M(1-h^*_{GB})m_H + q_B(1-h^*_{BB})m_L}{q_N + q_M(1-h^*_{BG}) + q_M(1-h^*_{GB}) + q_B(1-h^*_{BB})} \tag{9.23}$$

and

$$m_j = \frac{q_N m_M + q_M(1-h^*_{BG})m_H + q_M(1-h^*_{GB})m_L + q_B(1-h^*_{BB})m_L}{q_N + q_M(1-h^*_{BG}) + q_M(1-h^*_{GB}) + q_B(1-h^*_{BB})} \tag{9.24}$$

Letting $x \equiv m_j - m_L$ and $y \equiv m_H - m_i$, some manipulation yields:

$$\Re = (V + bg)(m_L x - m_H y) - \frac{1}{2}(1+b^2)(y^2 + x^2) \tag{9.25}$$

It is straightforward to verify that $x \leqslant y$. Hence $\Re < 0$, and the principal never suppresses the signal. $\square$

10. Appendix 2

This appendix provides some of the details that were left out of the exposition in the main text, and referred to in footnotes (4), (6) and (13).

(i) Section 3.1: the benchmark model

The principal's optimal choice of communication strategy, h, given the agents' beliefs h^* (or equivalently r^*), is obtained by solving:

$$h \in \arg\max[hSW_T(m_L) + (1-h)SW_S(m_L, r^*)] \tag{10.1}$$

The first-order condition for this problem (which is necessary and sufficient for the solution) is given by:

$$SW_T(m_L) - SW_S(m_L, r^*) \geqslant 0; \qquad h = 1$$

$$SW_T(m_L) - SW_S(m_L, r^*) \leqslant 0; \qquad h = 0$$

$$SW_T(m_L) - SW_S(m_L, r^*) = 0; \qquad 0 < h < 1 \tag{10.2}$$

Thus, as might be expected, if the net gain from signal manipulation, equal to $SW_S(m_L, r^*) - SW_T(m_L)$, is strictly positive, the principal will always suppress the bad signal; if the net gain is strictly negative, he will always tell the truth; finally, if the net gain is equal to zero, the principal is indifferent, and h can take any value in the interval $[0, 1]$.

I focus on Perfect Bayesian equilibria, which satisfy the following conditions:

$$h^* \in \arg\max[hSW_T(m_L) + (1-h)SW_S(m_L, r^*)] \tag{10.3}$$

$$r^* = \frac{q}{q + (1-q)(1-h^*)} \tag{10.4}$$

(ii) Section 4: the model with multiple principals and identical agents

The analysis proceeds as in section 3. Each agent will provide effort if, and only if

$$E[m|\hat{s}, \hat{s}_p] \geqslant c \tag{10.5}$$

If P transmits the bad signal accurately ($\hat{s} = B$), his expected utility is equal to

$$SW_T(m_L) = \int_{c_L}^{m_L} 2\{(1+g)m_L - c\}dF(c) \tag{10.6}$$

If on the other hand P_i, P_j have not received the bad signal and P suppresses the bad signal ($\hat{s} = \emptyset$), his expected utility is given by:

$$SW_S(m_L, r_j^*) = \int_{c_L}^{m(r_j^*)} 2\{(1+g)m_L - c\}dF(c) \tag{10.7}$$

where $m(r_j^*) = r_j^* m_H + (1 - r_j^*)m_L$. The net gain from (successfully) suppressing the bad signal is therefore equal to:

$$SW_S(m_L, r_j^*) - SW_T(m_L) = \int_{m_L}^{m(r_j^*)} 2\{(1+g)m_L - c\}dF(c) \tag{10.8}$$

Given the agents' beliefs, P will choose its communication strategy j so that:

$$j \in \arg\max[(w + (1-w)j)SW_T(m_L) + (1-w)(1-j)SW_S(m_L, r_j^*)] \qquad (10.9)$$

The first-order condition for this problem is analogous to the one for the single-principal problem:

$$SW_T(m_L) - SW_S(m_L, r_j^*) \geqslant 0; \qquad j = 1$$

$$SW_T(m_L) - SW_S(m_L, r_j^*) \leqslant 0; \qquad j = 0$$

$$SW_T(m_L) - SW_S(m_L, r_j^*) = 0; \qquad 0 < j < 1 \qquad (10.10)$$

(iii) Section 6: the model with heterogeneous agents

I use the following notation for uninformed beliefs: each agent believes that $s = [\emptyset, \emptyset]$ with probability q_N, $s = [B, B]$ with probability q_B, $s = [B, G]$ with probability q_M, and $s = [G, B]$ with probability q_M, where the subscript N stands for "no news", the subscript B for "bad news", and the subscript M for "mixed news".Given our assumptions about preferences, agent A_i will invest in his own culture ($x_{ii} = 1$) if, and only if,

$$E[m_i|\hat{s}] \geqslant c \qquad (10.11)$$

Moreover, he will invest in the other agent's culture ($x_{ij} = 1$) if, and only if,

$$bE[m_j|\hat{s}] \geqslant c \qquad (10.12)$$

The same applies to agent A_j.

To compute the conditional expected values of m_i and m_j, it is again useful to define the "reliability" of a "no news" signal, which is given by:

$$r^* = \Pr[s = [\emptyset, \emptyset] \,|\hat{s} = [\emptyset, \emptyset] \,; h_{BB}^*, h_{GB}^*, h_{BG}^*]$$

$$= \frac{q_N}{q_N + q_M(1 - h_{BG}^*) + q_M(1 - h_{GB}^*) + q_B(1 - h_{BB}^*)} \qquad (10.13)$$

We shall also need the following notation:

$$r_{BB}^* = \Pr[s = [B, B] \,|\hat{s} = [\emptyset, \emptyset] \,; h_{BB}^*, h_{GB}^*, h_{BG}^*] \qquad (10.14)$$

$$r_{BG}^* = \Pr[s = [B, G] \,|\hat{s} = [\emptyset, \emptyset] \,; h_{BB}^*, h_{GB}^*, h_{BG}^*] \qquad (10.15)$$

$$r^*_{GB} = \Pr[s = [G, B] \,|\hat{s} = [\emptyset, \emptyset] \,; h^*_{BB}, h^*_{GB}, h^*_{BG}] \tag{10.16}$$

where each probability is obtained applying Bayes' rule.

The agents' expected value of m_i conditional on each possible signal $\hat{s}$ transmitted by the principal is then given by:

$$E\{m_i|\hat{s} = [\emptyset, \emptyset]\} = r^* m_M + r^*_{BB} m_L + r^*_{BG} m_L + r^*_{GB} m_H \equiv m_i(r^*) \tag{10.17}$$

$$E\{m_i|\hat{s} = [B, B]\} = m_L \tag{10.18}$$

$$E\{m_i|\hat{s} = [B, G]\} = m_L \tag{10.19}$$

$$E\{m_i|\hat{s} = [G, B]\} = m_H \tag{10.20}$$

The expected value of m_j conditional on each possible signal $\hat{s}$ is similarly given by:

$$E\{m_j|\hat{s} = [\emptyset, \emptyset]\} = r^* m_M + r^*_{BB} m_L + r^*_{BG} m_H + r^*_{GB} m_L \equiv m_j(r^*) \tag{10.21}$$

$$E\{m_j|\hat{s} = [B, B]\} = m_L \tag{10.22}$$

$$E\{m_j|\hat{s} = [B, G]\} = m_H \tag{10.23}$$

$$E\{m_j|\hat{s} = [G, B]\} = m_L \tag{10.24}$$