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INSTITUTIONS AND THE PRESERVATION OF

CULTURAL TRAITS

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ABSTRACT

We offer a novel explanation for why some immigrant groups and minorities have persistent, distinctive cultural traits – the presence of a rigid institution. Such an institution is necessary for communities to not fully assimilate to the mainstream society. We distinguish between different types of institutions, such as churches, foreign-language media or ethnic business associations and ask what level of cultural distinction these institutions prefer. Any type of institution can have incentives to be extreme and select maximal cultural distinction from the mainstream society. If institutions choose positive cultural distinction, without being extremist, then a decrease in discrimination leads to reduced assimilation.

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Abstract

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1 INTRODUCTION

Assimilation of immigrant groups, that is cultural integration and the emergence of common values and norms, was seen as a natural process until the 1960's. However, by that time contradictory evidence surfaced. It was shown that assimilation failed along religious lines (Herberg (1983), Mayer (1979)) as well as ethnic dimensions (Glazer and Moynihan (1963)). This resulted in the emergence of multiculturalism. Under this doctrine the norms and values of immigrants were taken as given, their culture accepted without attempts of change (Glazer (1998)). This attitude has also influenced immigration policies. Recently, however, the problems associated with multiculturalism, such as fragmentation, lack of civic communality or the modalities and role of affirmative action policies have come to the forefront of the immigration debate. This has resulted in a reemergence of assimilationist policies in several countries. For example, the US, France and Germany have all adopted policies that aim at assimilating immigrants more than before (Brubaker (2001)). The most prominent example might be that of the Netherlands, though. Multiculturalism was adopted in the 1980s following immigration in the 1950s and 1960s Schalk-Soekar et al. (2004) but had been completely replaced by an assimilationist attitude by 2011.[1] The policies aimed at assimilating immigrants require a detailed understanding of the assimilation process and in particular of why assimilation often fails along *religious* and *ethnic* lines.

This paper proposes a novel explanation for this persistence of cultural traits amongst immigrant communities in a setting where they are exposed to assimilation pressures – the presence of an institution.[2] This institution is a social entrepreneur whose earnings depend both on the identity of the group members as well as their income and can be thought of as a church, foreign-language media, ethnic business association or even a foreign government. For example, religious leaders benefit from donations and also have an interest in the values and norms of their followers; foreign language media such as newspapers want immigrants to subscribe to their paper. This depends on the immigrant's knowledge of their original language and their valuation for media in this language.

We argue that such institutions are instrumental in preserving the boundaries of an immigrant community. To make our point we study a model of assimilation and consider the assimilation process of a community with and without an institution. In a next step, we allow the institution to foster or prevent assimilation depending on its payoff structure and resulting

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[1]See an article titled The Netherlands to Abandon Multiculturalism.

[2]Other complementary explanations are parent's preferences for cultural traits (Bisin and Verdier (2000)), ethnic and cultural distance to the host country (Alba and Nee (1997); Bisin et al. (2008)) or previous educational background (Borjas (1985)). It can also depend on the discrimination immigrants face, which might be affected by where exactly the new arrivals locate (Alba and Nee (1997)).

incentives.

In our model, immigrants decide how much to invest in host country specific skills, such as language skills and understanding of and adherence to customs and norms. Investment in these skills increases earnings,[3] but it is costly. In particular, it is more costly for immigrants who come from a more culturally different background that has shaped their identity.[4] Our notion of identity follows that of Akerlof and Kranton (2000, 2010) in that it is a sense of self that influences behavior. If an individual has been raised in an environment where norms and values are very different, then it is harder to adjust to the way of life in the host country as this is in violation to one's identity. However, different from Akerlof and Kranton (2000, 2010), our notion of identity is continuous and dynamic, that is, it changes with skill investment. Skill acquisition impacts identity as it affects the exposure to the host country, for example through the education system, to different language media and to different norms and values. An immigrant's assimilation process is thus two-pronged: he invests in skills, which dilutes his identity, that is, he identifies less with the norms and values of his original background and more with those of the host country. A change in identity, in turn, affects skills investment. Thus, our model explicitly captures the interaction of identity formation with the assimilation process and is to the best of our knowledge the first model to do so.

We show that without the presence of an institution, immigrants assimilate fully in the long run. They initially only invest to a very limited extent in skills. However, as this investment leads to a small adjustment of the identity, immigrants have an incentive to invest slightly more in skills, leading to further adjustment in identity and so on. This process continues until full assimilation is reached. In contrast, full assimilation will never occur in the presence of an institution that upholds the original values and norms and that has influence on the community. Instead, each group member's identity ends up as a strictly convex combination of the norms of the host society and those propagated by the institution, and it permanently remains there. The extent of assimilation depends on the strength of influence of the institution

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[3]An estimate of how important mastering the language of the host country is, is given by McManus (1990). He finds that after adjusting for education and other socioeconomic characteristics, learning English leads to a 17% wage increase for Hispanics in the US. This amounts to a $96,000 (in 1993 dollars) increase in lifetime income for a Hispanic immigrant who learns English. Further estimates of the impact on language skills on wages are given in McManus et al. (1983), Grenier (1984), McManus (1985), Chiswick (1991), Chiswick and Miller (1992), Aleksynska and Algan (2010) and Borjas (2013). Kossoudji (1988) states that "language assimilation, [as it] is translated into a job-usable skill." Meng and Gregory (2005) find that there is a wage premium for immigrants who married natives, even after controlling for language proficiency, an indicator of the importance of understanding norms. Their finding, based on Australian data, is in contrast to Kantarevic (2004). He shows for the US that there is no wage premium for marrying a native. The importance of understanding norms is also supported by the finding that immigrants who either immigrated as children or have lived in the host country for a significant amount of time have a higher wage than immigrants who only recently arrived, see Borjas and Freeman (1992), Nielsen et al. (2004).

[4]Some evidence of this provided in Glazer and Moynihan (1963, p.10).

on the immigrant group as well as how the immigrant group is connected.

Next, we allow the institution to choose the norms and values and the identity that it projects towards the community. As different institutions such as churches and ethnic business associations are fundamentally different in their goals, we distinguish between two types of institutions: an *altruistic* institution that cares about the identity per se as well as the economic success of the group and an *extractive* institution that is only interested in preserving a distinct identity in order to increase its monetary payoff from the group. Both types of institutions prefer their group members to be as culturally distinct and as wealthy as possible. Wealthier group member contribute more to the community and its institutions.[5] Further, expenditures, such as subscriptions or donations are *increasing in identity*.[6] Protestants, for example, are more generous than Catholics, which is said to be largely because of stronger social norms and their higher level of church attendance (Berger (2006), Zaleski and Zech (1992)). Similarly, the printers of national language newspapers can only be profitable if someone buys their newspaper, which in turn depends on how much the readership identifies as, for example, German as opposed to American Breton (1964). The institution faces a trade off between cultural distinction and financial wealth as group members with a higher income identify less with the group, whereas poorer group members identify more with the group.

We analyze when an institution will be extremist, that is, when it chooses norms that are maximally distinct from the those of the host society and under which circumstances partial or complete assimilation occurs. We find that both types of institutions may have incentives to be extremist. Further, altruistic institutions might allow full integration, whereas extractive institutions never do. Both institutions may also choose some cultural distinction from the host society without being extreme, resulting in an intermediate, if still incomplete, level of assimilation. For this intermediate outcome we consider the effect of an increase in discrimination on the optimal cultural distinction the institution chooses to project. Somewhat surprisingly we find that both types of institution choose more cultural distinction as discrimination decreases. This implies that an increase in discrimination will lead to higher assimilation. The intuition behind this effect is that higher discrimination will reduce the economic wealth available for the community, creating an incentive for the institution to counter it by fostering more assimilation. Last, the payoffs of the institutions depend on the community structure. Structures that are more densely connected are preferred by extractive institutions whereas altruistic institutions gain a higher payoff from less cohesive groups.

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[5]See Schervish (1993), Bekkers and Wiepking (2011) and Wiepking and Bekkers (2012) for charitable giving.

[6]Akerlof and Kranton (2000) mention that individuals are more willing to give to their alma mater than to other colleges, which is an indicator for identity influencing charitable giving. If only altruism mattered, individuals should contribute the charity that gives the greatest marginal benefit. But this clearly does not happen.

Our findings can help understand four distinct stylized facts about the integration of immigrants: (1) Religious leaders of immigrants are often recruited from the home country, instead of the host country.[7] Our model argues that this approach may be designed to ensure that the representatives uphold the norms and values of the home country more strongly. It thus provides a means to limit assimilation and for immigrants to hold on to their values and norms to a greater extent than they would if the leader was educated in the host country and had been influenced more by these norms and values. (2) Bisin et al. (2008), Constant et al. (2006) and Haug (2008) argue that Muslim immigrants are different from other immigrants in their assimilation experience. One source of difference might be that Imams face different incentives than other religious leaders. Ceylan (2010, p. 61) argues that a majority of Imams come to Germany with financial motives, that is, they see a position in a German congregation as way to earn a better living. In this case it is more plausible to think of the religious leader as an extractive institution, which leads to differences in the norms and values that are set and consequently to different assimilation outcomes. (3) Carvalho and Koyama (2011) show that Rabbis in high-wage environments will foster assimilation, but in low-wage environments will prevent it. We characterize circumstances in which our model can help understand differences in assimilation outcomes, depending on the environment. An altruistic leader, whose community consists of high ability members that face little discrimination will be inclined to choose assimilation and vice versa. (4) The investment of immigrants in host country language skills is surprisingly low given the high wage premium attached to it McManus (1990); Borjas (2013). We assume that costs of investment in language skills depend on identity, making the investment more costly than in a traditional model. Additionally, identity is affected by language skills through increased exposure to the host country, implying that language acquisition does not only result in higher wages, but also in a loss of identity.[8] Our model suggests that a community institution may therefore have an incentive to limit language acquisition to increase its payoffs.

Related Literature Our paper contributes to the vibrant literature on the transmission of cultural traits. The majority of this work argues that cultural traits of children are shaped by their parents, based on the seminal paper by Bisin and Verdier (2000). Parents have a paternalistic preferences for their children to have the same cultural trait. In case of discrete cultural traits this can explain why cultural integration remains incomplete. Our work assumes cultural traits to be continuous and builds upon the classical approach of Cavalli-Sforza and Feldman (1973).

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[7]See Ceylan (2010), Geaves (2008) as well as the Polish Catholic Mission in England and Wales.

[8]That better host country language skills increase exposure to host country media has been documented in Subervi-Velez (1986). This implies an increased exposure to norms and values of the host country, which can have an effect on an individual's identity.

Other papers based on this approach include Bisin and Verdier (2001), Vaughan (2013), Büchel et al. (2011) and Panebianco (2014). One key feature of all these papers is that with continuous cultural traits there is full assimilation in the long run unless there are persistent ties to the home country or subgroups are closed. Full assimilation occurs even if parents have preferences for the persistence of the cultural trait. We suggest that taking institutions into account might help understand why assimilation often remains incomplete and we see our approach as complementary to the emphasis on parents' preferences as a determinant of the persistence of cultural traits.[9] Our model can help understand differences in the assimilation processes of different immigrant groups Bisin and Verdier (2010). In particular, it is argued that there is a difference between European and non-European immigrants in the US, with European immigrants coming from Europe before 1930 being perfectly assimilated today Alba and Nee (1997). One possible difference between these groups might be the presence of a fixed institution.[10]

The importance of such an institution has also been documented in Carvalho and Koyama (2011). The key difference of ours to their work is that our model allows for different type of institutions, where they only look at religious institutions. Additionally, we take group structures into account. Empirically, Munshi and Wilson (2008) have also emphasized the importance of institutions.

Our model is also related to the more recent work on opinion dynamics, and in particular to Acemoglu et al. (2013). The main difference of our model is that in our setting the pattern of interactions changes with identities. In addition, we allow leaders to be strategic in their choice of identity.[11]

The remainder of this paper is structured as follows. Section 2 discusses in depths our notion of institutions and develops a selection of examples highlighting their importance. We then present the model in Section 3 and proceed to solve it in Section 4. We first solve a benchmark case, without the presence of an institution (Section 4.1). Section 4.2 introduces a rigid institution. In a next step, we allow this institution to be strategic (Section 5). Section 6 concludes.

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[9]Note that in one of examples that Bisin and Verdier (2000) provide there is indeed such an institution present. In the case of the Orthodox Jews, rabbis have an incentive to preserve the culture and norms of their community. In the other example, which discusses the transmission of cultural values among French aristocrats, it is the existence of the Bottin Mondain, a book which contains the names of the relevant families and specifies clear rules for who can be included in this listing, that serves as a means to prevent integration. Although a book differs from the institutions we have in mind, it seems that the book acts an essential factor in preventing integration.

[10]Alternatively, one can think of parents of different communities having varied preferences regarding their children's cultural traits.

[11]Other work on opinion dynamics includes Acemoglu et al. (2010), Golub and Jackson (2010), DeMarzo et al. (2003), Büchel et al. (2012), Lorenz (2005) and Lorenz (2006).

2 INSTITUTIONS AND THE ASSIMILATION PROCESS

We argue that the presence of an institution that is not susceptible to the influences of the host country is crucial for the preservation of separate identities of an immigrant group or minority. This is a novel idea in economics and it has received only limited attention elsewhere in the social sciences. We therefore discuss in some detail the notion that these institutions, or leaders, as they are also referred to in the sociology literature, have an impact on the assimilation outcomes of immigrant groups and minorities. In what follows we use the terms institutions and leaders interchangeably.

Examples of Institutions in Communities Imams and the Turkish Government in Germany can be seen as leaders. The majority of Turkish Imams are employed by the DITIB, an institution of the Turkish government (Yasar (2012)). The DITIB and thus the Turkish government select the imams and choose Imams that fit their ideological position. However, they do not only choose Imams, they also influence what is preached every Friday by sending them the sermon that is to be held (Ceylan (2010)). Through the Friday prayers the imams can influence their community, which also has an impact on the assimilation of Turkish immigrants. Ceylan (2010) argues that Turkish Imams are crucial for the assimilation of Turkish communities in Germany. He states that imams influence the religious orientation of muslim children and youths and thus have a large impact on the future of Islam in Germany as they influence whether young Muslims follow a liberal, conservative or extremist Islam. Each form of Islam comes with different norms and values which impact the assimilation of immigrants. He goes as far as to say that the political and religious orientation and the attitude of imams towards the German government *decide* whether Muslims will be integrated in the German society (Ceylan (2010, p. 17)).

A second example is that of family clans in San Francisco's Chinatown, a tightly knit community (Portes and Sensenbrenner (1993)). The family clans in the form of the Chinese Six Companies, a business associations formed by these clans, ruled the immigrant community. They regulated the business, but also the social life of the community, guaranteeing its normative order. Moreover, they regulated access to resources and gave privileges to some clans. This regulation took place through restrictions on most members' scope of action and access to the outside world. They were willing to exclude those who violated normative consensus by adopting a "progressive" stance. It is emphasized in Portes and Sensenbrenner (1993) how important the *preservation* of norms is. This can be seen best from the following quote.

"And not only the Moon Family Association, all the family associations, the Six

Companies, any young person who wants to make some changes, they call him a communist right away. He's redcapped right away. They use all kinds of tricks to run him out. You see, in old Chinatown, they didn't respect a scholarly person or an intelligent person . . . They hold on to everything the way it was in China, in Kwangtung. Even though we're in a different society, a different era. [Nee and Nee 1973, p. 190]"

Based on these two examples, we can draw several conclusions about the conditions under which these institutions emerge, about the way they profit from the community, and about how the leaders preserve community boundaries.

Emergence of Institutions A natural question to arise is why some communities have leaders and others do not. What seems crucial is a sufficiently large community as well as sufficient wealth. This is probably best documented for the Polish Catholic Mission. Since the earliest immigration of Poles to the UK around 1900, there was always demand for a Polish church. However, the creation of churches was prevented by the financial situation of the first emigrants and their dispersion. The situation changed only once sufficient funds were available and then the church arose.[12] Further, in the examples discussed here, there is a sufficiently large group to follow these leaders. San Francisco's Chinatown is one of the largest in the US. Further, there are more than 3 million individuals who are Turkish or of Turkish descent living in Germany.[13] Other cases where leaders have emerged are Cubans in Miami. Portes and Sensenbrenner (1993) argue that the Spanish-language media act as a leader to Cuban immigrants and that there are millions of cubans in Miami.

In all examples given, leaders benefit from their communities and in order to extract sufficient benefits, the communities have to be substantial in size. Even if the goal is not to maximize payoffs, as one can well imagine for religious leaders such as Polish priests and imams, they still require a minimum income to survive. Having only few followers will not guarantee this.

Thus, the presence of an institution or leader seems inevitable once a tight immigrant community has emerged. The formation of an immigrant community seems inevitable, though. Networks among immigrant groups emerge due to the adversity faced in the new host country and these networks are beneficial as they help find jobs or lead to access to credit. See Portes and Sensenbrenner (1993) for several examples that document this. There is also a strong persistence in immigrants flocking together. Immigrants not only live in enclaves upon first entering the country, they also continue to do so afterwards. Moreover, their within-country migra-

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[12]See the homepage of the Polish Catholic Mission http://www.pcmew.org/.
[13]See a report of the German statistics office from 2012.

tion decisions are much less sensitive to regional wage differentials than those of natives Bartel (1989).[14]

Institutions Profit from Community The leaders described in the examples profit from their role in the community. The family clans in Chinatown regulate business, access to resources, and give privileges to some clans. This clearly implies that the clans that were members in the business association profited enormously from their position in the community. The Spanish-language media of the Cuban community earns profits that are increasing in the number of consumers. The payoffs to the Turkish government are probably not in monetary terms. They do, however, have a strong influence on their communities, which benefits them. Last, religious leader want to spread their norms and values and therefore gain from a community that follows their teachings. At the same time, they also get monetary benefits. That religious leaders might care about money has been argued by Carvalho and Koyama (2011) for Rabbis, Ceylan (2010, p. 61) for imams and the Polish Catholic Mission emphasizes the necessity of funds.

Institutions Preserve Identity and Communities The importance of institutions in maintaining boundaries around immigrant groups is first documented by Breton (1964). He finds that religious institutions have the greatest effect in preserving the community, followed by group specific publications, such as newspapers or periodicals. The existence of welfare institutions has the least effect on group identity, which seems rather striking. Individuals seem to be kept within their group, not because of monetary benefits, but rather due to their identity. That identity and adherence to the norms and values propagated by the leaders are enforced can be seen from all the examples we document. The Chinese Business Association excludes individuals who do not follow the norms and values they have established. The Spanish-language media imposes censorship and fosters a climate of intolerance in order to retain community boundaries (Portes and Sensenbrenner (1993)). Another example that emphasizes the importance of the community's identification with the leader is that of the Korean community in New York. The Korean government, represented by its consulate general, plays a very prominent role in the development of the ethnic community and de factor takes on the role of the leader.[15]

> "Partly because Korean immigrants have a strong sense of nationalism and therefore identify with the home government, the Korean Consulate General in New York City . . . has determined the basic tone of community-wide politics (Kim 1981,

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[14]That enclaves and immigrant networks can be detrimental to education outcomes and wages is also documented in Munshi (2003); Hoff and Sen (2005).

[15]This example is described in Portes and Sensenbrenner (1993).

p. 227)."

Thus, the Korean government only has influence as Koreans tend to have a strong sense of nationalism. Religious leaders, that is Rabbis, Catholic Priests and Imams preach norms and values according to the norms and values established by their respective religions. What these examples are silent on are the types of norms that are transmitted by the leaders.

To be more precise we consider a specific well-studied example, namely the impact of being part of a Muslim community on the attitude to female labour force participation. Generally, those who identify with being Muslim, have a more traditional attitude towards female labor force participation, which in turn affects actual female labor force participation. Fortin (2005) shows that perceptions of women as homemakers are closely associated with women's labor market outcomes. Views that see men as the main breadwinners and women as homemakers are strongly influenced by religious ideology Algan and Cahuc (2006); Guiso et al. (2003); Vella (1994); Thornton et al. (1983). Imams, in particular, seem to uphold the view of women being first and foremost homemakers. An Algerian Imam, Abdelkader Bouziane, argued that women should not be allowed to share a workplace with men because they might be tempted into adultery. Imams in Oslo emphasize that Islam does not forbid women to work in the public sphere, but that if women were to take outside jobs it should be in education or medical care. Generally, there is a notion that women can work, if there is a financial need or if they want to work. Men, however, are required to work.[16] Another indicator that shows that Imams hold on to a traditional view of gender roles can be seen from their background. In the UK, a majority of Imams come from Pakistan, in Germany most Imams grew up in Turkey. In Arab countries on average 82% of individuals agree with the statement that a man has more right to a job than a woman compared to 63% for non-Arab countries Rizzo et al. (2007). It seems therefore plausible that the imams coming from such a background on average will support this statement and that they project their views on their community. Another indicator of Imams' views is the attitude towards burqas. A woman wearing a burqa has a difficult time integrating in the labor market. The riots that accompanied the ban on burqas in France and the heated discussions around this topic show that a strict Muslim identity is often at odds with the norms and customs proclaimed by the West, thereby limiting the potential earnings of immigrants.[17]

In sum, there seems to be a demand of immigrants to bond with other immigrants. They form a community, which is an attractive target for social entrepreneurs, with larger immigrant

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[16]The role of men and women and how this conforms to the expectations of religious leaders is outlined in Predelli (2004).

[17]Examples of clashes between the cultures can be found on http://www.pluralism.org/. An example that wearing a burqa leads to reduced employment opportunities is given in an article by The Guardian.

groups being more valuable. These social entrepreneurs have an interest in preserving the group boundaries, in particular through the enforcement of norms and values, which leads to incomplete assimilation. This result arises without an explicit preference of group members for preserving their own culture and would only be strengthened by such considerations.

Based on these observations of institutions and their interaction with communities, we construct a theoretical framework that clarifies the role of leaders and sheds light on their incentives. We first analyze the assimilation process of communities in order to then understand how the leader affects it. In our setting, immigrants assimilate due to their incentive to invest in skills, which increase their earnings and in turn affect their identity. The processes of investment in skills and identity adaptation interact in a self-reinforcing way such that greater investment leads to faster identity adaptation and vice versa. However, identity adaptation does not only depend on an individual's investment in skills, but also his exposure to other group members as well as the leader. We consider different leader payoff functions taking into account differences between e.g. religious leaders, business associations, foreign language media and governments.

3 A MODEL OF COMMUNITY ASSIMILATION

In our model, there are n *group members* who represent a community of immigrants. They interact with and are influenced by their *host society* S and the group's *leader* L. Note that the host society does not take any actions in our model; only the group members and the group leader are active players. Group members invest in skills and adapt their identity over time taking as given the leader's policy. The leader can set norms and values and takes into account how his choice influences the group member's decision to invest in skills. We first consider the assimilation process of the group members for a *given* group leader policy and then turn to the resulting incentives for the leader.

3.1 Assimilation and Identity Adaptation of Group Members

In every period t, each group member goes first through a process of identity adaptation and in a second step invests in skills. We discuss each of these processes in turn.

Identity Adaptation A group member's identity, $p_i^t \in [0, p^{max}]$, describes the attachment an individual has with his group, with higher p_i^t indicating higher levels of group attachment. We bound the space and assume that there is an upper level p^{max}. We fix $p_S^t = p_S = 0$ for the host society for all time periods and also take the leader's identity as fixed for all t, $p_L^t = p_L \in$

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$[0, p^{max}]$. Thus, $p_i^t = 0$ indicates full identification by group member i with the host country and $p_i^t = p_L$ full identification with the group leader. The upper bound p^{max} shows how different the group identity can be with respect to the host society.[18]

Group members do not actively choose their identity; instead it is adjusted passively. Our approach can be seen as a natural extension to the classical approach in the literature on continuous trait formation.[19] Instead of assigning weights to parents and the average society, as is commonly done, a group member's identity is given by a weighted average of values and norms of (i) the host society and (ii) the leader as well as (iii) the past identity of the group members themselves (including member i's past identity). The weights on these three sources of influence are determined as follows:

(i) Host Society Each group member is influenced by the host society, S. We denote the share of influence given to that source by $g(H_i^{t-1}) \in (0, 1)$ which is a strictly increasing function of the previous period's investment in skills, $H_i^{t-1} \in \mathbb{R}_0^+$. This captures the fact that with greater levels of investment, the group member is more exposed to the influence of the host society.

(ii) Leader Of the residual the leader captures a share $\lambda \in (0, 1)$. The overall weight on the leader is then given by $\lambda(1 - g(H_i^{t-1}))$. The parameter λ is an indicator measuring the influence of the leader compared to the group members, with a higher λ indicating more influence of the leader.

(iii) Group Members The weight group member i assigns to group member j is denoted by $d_{ij}(1 - \lambda)(1 - g(H_i^{t-1}))$, such that $\sum_{j=1}^n d_{ij} = 1 \ \forall \ i$. These weights between group members represent the strength of their social connections, their influence network.

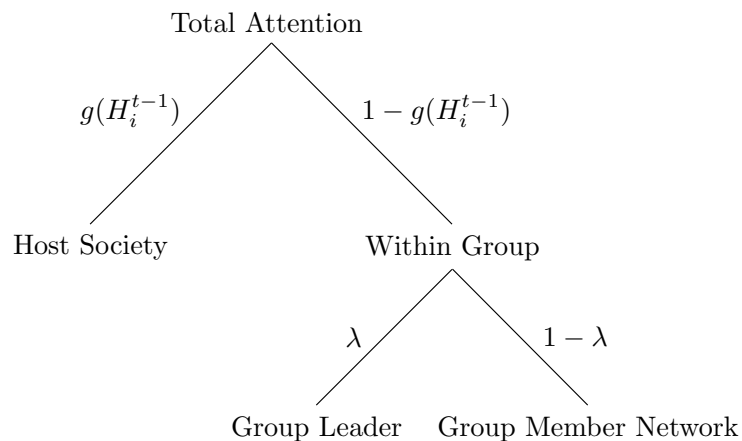An overview of the process is provided in Figure 1.

Figure 1: Attention Weights in Period t

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[18]The bound p^{max} can be seen as a restriction imposed country, e.g. a ban on burqas.

[19] Early work on this was done by Cavalli-Sforza and Feldman (1973); Cavalli-Sforza (1981). Their approach has been modified by Bisin and Verdier (2001), Vaughan (2013), Büchel et al. (2011) and Panebianco (2014).

To illustrate the workings of within group influence further consider the example depicted in Figure 2. The group consists of only two members, both of which are influenced by the host society and the group leader. The two members can influence each other to varying degrees. We consider the two extreme cases: (i) isolated group members where groups members do not influence each other at all, and (ii) connected group members who assign the same weight to each group member, including themselves. These two cases are depicted in Figure 2(a) and Figure 2(b), respectively. Additionally, Figure 2 emphasizes that the leader as well as the host society influence both group members, but the group members do not influence the leader or the host society. The leader and the host society also have no impact on each other.

In case of the isolated group members, we have $d_{11} = d_{22} = 1$ and $d_{12} = d_{21} = 0$. The identity adaption process is then given by

$$p_{[iso],i}^{t+1} = \left[1 - g\left(H_{[iso],i}^t\right)\right] \cdot \left\{\lambda p_L + (1 - \lambda)p_{[iso],i}^t\right\},$$

where we have used the fact that $p_S = 0$ so that the influence term for the host society disappears.

By contrast, in the second example, where group members are connected, both group members have equal weights, $d_{11} = d_{22} = d_{12} = d_{21} = \frac{1}{2}$, which results in the following identity adaptation process:

$$p_{[conn],i}^{t+1} = \left[1 - g\left(H_{[conn],i}^t\right)\right] \cdot \left\{\lambda p_L + (1 - \lambda)(\frac{1}{2}p_{[conn],i}^t + \frac{1}{2}p_{[conn],j}^t)\right\}.$$

(a) Isolated Group Members　　　　　(b) Connected Group Members
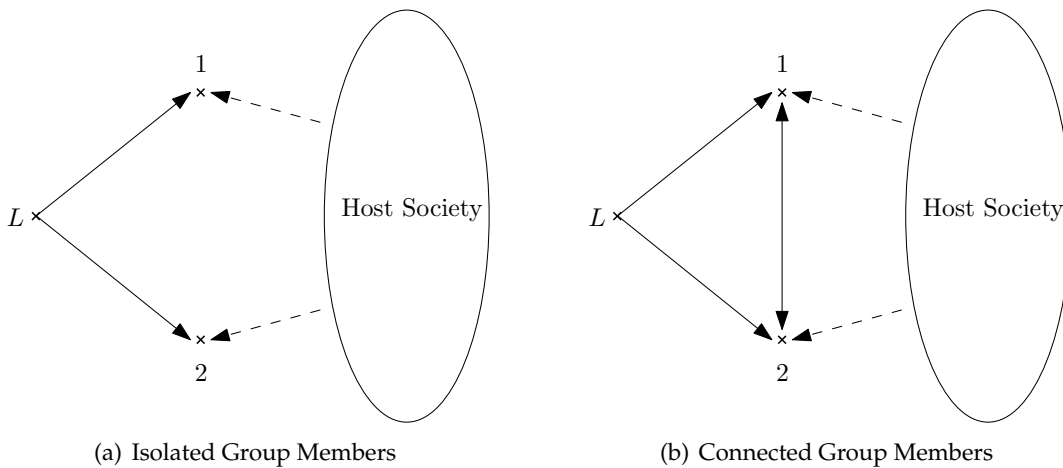
Figure 2: Example Social Structures

For a general network of connections, the identity adaptation process for group member i

from p_i^{t-1} to p_i^t can then be summarized as follows:

$$p_i^{t+1} = \left[1 - g\left(H_i^t\right)\right] \cdot \left\{\lambda p_L + (1-\lambda)\sum_{j=1}^{n} d_{ij}p_j^t\right\}.$$

Skills Investment Group members invest in skills $H_i^t \in \mathbb{R}_0^+$. This measures a group member's effort to learn the language, to understand the norms and cultures of the host society.

Each period every group member simultaneously selects how much to invest in skills. The payoff from investing is given by $\alpha f\left(H_i^t\right)$. The function $f(H)$ is strictly increasing and concave in H. We also assume that it is three times continuously differentiable. Additionally, payoffs from investment depend on a parameter $\alpha \in (0, 1)$, which can be interpreted globally or group member specifically: (i) At a global level, α captures the degree of discrimination immigrants face with lower α implying higher discrimination. (ii) At an individual level, α_i reflects ability, with higher α_i giving higher ability. In that case the parameter can differ between group members.

Investing in skills is costly with the cost depending on the identity of the group member. For ease of exposition we let this cost be linear in the investment level and specify it as $c\left(p_i^t\right) \times H_i^t$. Marginal costs are strictly increasing in p_i^t, $c'\left(p_i^t\right) > 0$, implying that immigrants who are more deeply rooted in their culture and whose norms and values are more different face higher costs understanding their new environment.

Finally, we assume that the marginal net return to additional investment at $H_i^t = 0$ is positive for all agents and levels of group identification, i.e. for all i and p_i^t, $\alpha_i f'(0) > c(p_i^t)$. This implies that all group members will choose a positive level of investment in skills for any given level of group identity.

In summary, in each period t, group members have an identity p_i^t and a stock of skills, H_i^t, which determines their wealth $\alpha_i f(H_i^t)$. These two variables now determine the leader's payoff.

3.2 The Leader's Decision Problem

We distinguish between two types of leader, namely a leader who cares about the norms and values of his group members per se, such as a religious leader, and a leader who is only interested in preserving group boundaries to the extent that this increases his profits such as foreign language media. We refer to the former as an *altruistic* leader (AL) and to the latter as an *extractive* leader (EL).[20] Both types of leaders would like their group to be as wealthy as possible,

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[20]Note that for the leader payoff specification chosen, Equations (1) and (2) can be seen as two special cases of a CES utility function. We believe that the two cases selected are of special interest and we highlight the difference

but at the same time as strongly identified with the norms and values of the group as possible. They therefore face a trade-off: if they advocate norms that differ greatly from those of the host society, they will have a poor community, but one that is strongly identified with these values. If, on the other hand, they choose norms that leads the community to assimilate more, then the group members will be less identified with their group.

The leader selects a level of identity $p_L \in [0, p^{max}]$ to maximize their payoffs. Their payoffs depend on the identity and the skill investment of all group members and we denote the identity and skill vector by, p^t and H^t, respectively. The payoff functions of the two leader types are then as follows.

Altruistic Leader We specify the altruistic leader's payoff function in period t as

$$\Pi_{AL}(p^t, H^t) = \sum_{i=1}^{n} \left(p_i^t + k\alpha_i f(H_i^t) \right), \tag{1}$$

where k denotes the weight the leader assigns to the wealth of the community relative to the identity. An altruistic leader sees wealth and identity of his community as direct substitutes within their overall wellbeing, an interpretation that is very similar to Carvalho and Koyama (2011).[21]

Extractive Leader Unlike the altruistic leader, the extractive leader derives benefits from the economic wealth of the community that is accumulated through skills investment. He only cares about identity to the extent that it increases his payoffs that are appropriated. The payoff function is then given by

$$\Pi_{EL}(p^t, H^t) = \sum_{i=1}^{n} \left(p_i^t \times \alpha_i f(H_i^t) \right), \tag{2}$$

In both cases, the leader can only set norms and values. He can neither set how much his community is influenced by the norms and values he chooses, nor can he influence the community structure. In reality, we would expect this to be possible, at least to some extent for some leaders.[22] Assuming that this is not feasible, restricts the influence of the leader. Even a leader with such a limited influence will be sufficient to prevent assimilation of its immigrant community.

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between them.

[21] In their model, Rabbis substitute between donations and time spent at the synagogue.

[22] The family clans in San Francisco's Chinatown could for example exclude group members.

4   ASSIMILATION WITH AND WITHOUT LEADER

We first study as a benchmark the assimilation process of a community without leader. This serves to document why a leader is crucial to preserve the identity of an immigrant group and to prevent their assimilation. We then turn to assimilation in the presence of a leader.

4.1   Benchmark Case: Assimilation without Leader

We consider in turn the optimal skill investment and identity adaptation.

Optimal Skills Investment Each period group members select a level of skills investment based on the level of group identity they have in this period. The optimal level of investment is given by the solution to the following maximization problem:

$$\max_{H_i^t \geq 0} \quad \alpha_i f\left(H_i^t\right) - c\left(p_i^t\right) H_i^t \tag{3}$$

We solve this via a first order condition, which is both necessary and sufficient given our assumptions and gives a unique interior solution.

$$\alpha f'(H_i^t) - c\left(p_i^t\right) = 0 \tag{4}$$

The solution depends on the level of identity p_i as well as the parameter α_i and we can therefore write it as a function $H^*(p_i; \alpha_i)$, implicitly defined by Equation (4). Comparative statics follow directly from the assumptions made in Section 3.

$$\frac{\partial H^*(p_i; \alpha_i)}{\partial p_i} = \frac{c'\left(p_i^t\right)}{\alpha f''[H^*(p_i; \alpha_i)]} < 0 \tag{5}$$

$$\frac{\partial H^*(p_i; \alpha_i)}{\partial \alpha} = -\frac{f'[H^*(p_i; \alpha_i)]}{\alpha f''[H^*(p_i; \alpha_i)]} > 0 \tag{6}$$

The optimal investment level is decreasing in p_i. As group members identify more with their home group, their desired level of skills investment decreases, reflecting the greater costs of such assimilation efforts. Furthermore, agents with higher α_i have higher investment levels for any given identity level p_i. As the returns to skills investment increase for immigrants due to reduced discrimination or higher ability, they find it beneficial to invest more.

Identity Adaptation Based on their skill investment in the last period, group members update their identity p_i^{t+1}. Recall that the weight given to the host society is given by $g(H_i^t)$ with H_i^t

chosen through function $H^*(p_i^t; \alpha_i)$. Taking this into account we define

$$\hat{g}(p_i; \alpha_i) \equiv g(H^*(p_i; \alpha_i)).$$

This function $\hat{g}(p_i; \alpha_i)$ maps every identity level p into $(0, 1)$ for a given α. It is *decreasing* in p as $H^*(p_i; \alpha_i)$ is a decreasing function in p and $g(H_i)$ is increasing in H. Furthermore, for every p_i it is increasing in α_i as a higher α implies a higher H^*, which leads to a higher weight on the host society.

Next period's identity, p_i^{t+1}, can then be written as a function of the previous period identity levels as follows:

$$p_i^{t+1} = \left[1 - \hat{g}\left(p_i^t; \alpha_i\right)\right] \cdot \left\{ \sum_{j=1}^{n} d_{ij} p_j^t \right\} \tag{7}$$

We focus here on the long run outcome, the steady state of the system. The steady state identity vector $\overline{p}$ is characterized by constant identity levels for each group member that satisfy: (8),

$$\overline{p}_i = \left[1 - \hat{g}\left(\overline{p}_i; \alpha_i\right)\right] \cdot \left\{ \sum_{j=1}^{n} d_{ij} \overline{p}_j \right\}. \tag{8}$$

The corresponding levels of steady state investment $\overline{H}_i$ can then be recovered from the first order condition in Equation (4). As investment is strictly positive for all identity levels, in the steady state group members put a strictly positive amount of weight on the host society. We now use this property to fully characterize the steady state identity vector for the benchmark case without leader.

Proposition 1 (Steady State without Leader). ˙
Without a leader, group members assimilate fully, with their long run identities converging to zero.

The proof of this proposition, as well as all others, is in the Appendix. The intuition is straightforward. Every group member has a positive level of investment in skills in each period, which leads to a strictly positive weight on the host society. A greater weight on the host society then leads step by step to a lower identification with the group. This might initially be countered by the network, as a group member might be connected to other group members that have a higher identity. Therefore, through the influence of peers, identity could initially increase. Nonetheless, in the long run, with everyone investing in skills and this becoming less costly as identification with the group falls, all immigrants will be fully assimilated. Note

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that our result is not driven by $\hat{g}(0, \alpha)$ approaching one but owed to the fact that gradually the identity of all group members decreases.

4.2   Assimilation with Leader

We now introduce a leader with some fixed p_L. This norm is not susceptible to the influences from either the host society or any of the group members. We are again interested in the properties of the steady state.

The updating process of group member i's identity is given by

$$p_i^{t+1} = \left[1 - \hat{g}\left(p_i^t; \alpha_i\right)\right] \left[\lambda p_L + (1 - \lambda) \sum_{j=1}^{n} d_{ij} p_j^t\right] \tag{9}$$

To guarantee uniqueness of steady state as well as global convergence of the system, we impose an additional assumption on the leader's identity p_L.

Assumption 1 (Leader's Identity).

$$p_L < \frac{\hat{g}(p_i; \alpha_i)}{\left|\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right|} \ \forall \ p_i, \alpha_i$$

The leader's identity is bounded above by the term $\hat{g}(p_i; \alpha_i) / \left|\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right|$, which is the weight a group member assigns to the host society, divided by the change in the weight at some identity level p_i. This term is larger, the higher the weight on the host society. This implies that the identity of the leader can be more extreme, i.e. more differentiated from that of the host society, the greater the weight a member assigns to the host society. The maximal group leader identity also depends on the change in the weight on the host society. If an increase in identity p leads to a large decrease in the weight assigned to the host society, then the maximal identity of the group leader will be lower. Put differently, the assumption requires that the weight that group members assign to the their group does not decline too rapidly in response to small decreases in their identity p_i for p_L to obtain a high value. This assumption guarantees that the identity adjustment process is sufficiently smooth and small changes in identity today do not have too large of an impact tomorrow.

We can then establish the following result concerning the long run outcome of the setting with a rigid leader.

Proposition 2 (Steady State with Rigid Leader).
In the model with a rigid leader:

1. *A steady state exists.*

2. *In every steady state, a group member's identity is a strictly convex combination of the position of the host society and that of the leader. There is no longer full assimilation into the host society.*

3. *If Assumption 1 holds the steady state is unique and the system converges globally.*

The presence of a leader, who is not susceptible to any influence, guarantees that there is no longer full assimilation. However, the group members will assimilate to some extent in *any* steady state. If the steady state is unique, we can establish some results on the extent of assimilation.

The extent of assimilation depends on various factors. To see this more clearly, we consider again the two examples specified in Section 3. In the "isolated" case, group members were influenced only by themselves, the leader and the host society. In the "connected" setting they were additionally influenced by all other group members. The two examples are therefore two extreme cases and provide a natural benchmark. We can readily extend them to n group members, who either only listen to themselves or to all other group members. Steady state identities for these cases then satisfy the following conditions:

$$\overline{p}_{[iso],i} = \frac{\lambda \left(1 - \hat{g}(\overline{p}_{[iso],i}; \alpha_i)\right)}{1 - (1 - \lambda)(1 - \hat{g}(\overline{p}_{[iso],i}; \alpha_i))} p_L \tag{10}$$

$$\overline{p}_{[conn],i} = \frac{\lambda \left(1 - \hat{g}(\overline{p}_{[conn],i}; \alpha_i)\right)}{1 - (1 - \lambda)\frac{1}{n} \sum_{j=1}^{n} \left(1 - \hat{g}(\overline{p}_{[conn],j}; \alpha_j)\right)} p_L \tag{11}$$

Details of the derivation can be found in the Appendix.

The expressions for the steady state identities show how the long run level of assimilation depends on the group member characteristics in terms of α_i as well as the social environment described by λ, g and the strength of connections between group members.

Consider first the "isolated" setting and Equation (10) as this shows the comparative statics the clearest. In this setting, the characteristics of others do not enter the steady state identity of any given group member. The level of assimilation is decreasing in α, such that higher individual ability or a lower level of discrimination lead to lower identity and thus a greater level of assimilation. Likewise, a general increase in the influence of the host society, described as $\hat{g}(p; \alpha)$ function that is higher everywhere, leads to greater assimilation. By contrast, an increase in the influence of the leader (a higher λ) or a stronger projection of norms and values (a higher p_L) both lead to a higher $\overline{p}_i$ and thus less assimilation.

The direction of these effects are all identical for the "connected" structure, as is immediate from the symmetry of Equations (10) and (11). However, the connections show up in the de-

nominator of Equation (11). Where previously only the term $1 - \hat{g}(p; \alpha)$ of the group member concerned appeared, the expression now shows the mean weight assigned to the group across all group members, $\frac{1}{n} \sum_{j=1}^{n} \left(1 - \hat{g}(\overline{p}_{[conn],j}; \alpha_j) \right)$. Whether this difference has an impact on the long run level of assimilation depends on the degree of heterogeneity across group members.

If all group members have the same α, that is, they face the same level of discrimination or have the same ability, then all group members will respond symmetrically and thus have the same $\hat{g}(p; \alpha)$ function. The idiosyncratic level of $\hat{g}(p; \alpha)$ and the average across group members are therefore the same. In consequence the long run identities of the group members are the same, independently of whether they are "isolated" or "connected". This insight readily carries over to any social structures.

Remark 3 (Ability $\alpha_i = \alpha \, \forall \, i$).
If all group members have the same level of ability, the steady state identity vector is invariant to the structure of the group network.

However, if there is heterogeneity in group members, in terms of heterogeneity in ability α, the individual and average $\hat{g}(p; \alpha)$ will differ. In consequence, there is now an attenuation in the spread of long run identities in the "connected" structure relative to the "isolated" case: for a group member i with high α_i and low $1 - \hat{g}(p_i, \alpha_i)$ the exposure to influence from another group member j with low α_j and high $1 - \hat{g}(p_i, \alpha_i)$ means an overall higher level of identity in the long run for i. We expand on the attenuation effect by comparing the level of long run assimilation when group members of different ability types assign more or less weight to each other in a simple example with two types of group members.

Example with Two Different Group Member Types Suppose there are two types of group members, A and B, such that A assigns a higher weight to the host society for a given identity. We can think of A as a high ability group member, whereas B could be considered as a low ability type. This implies that for a given identity level A invests more in skills than B resulting in a higher weight on the host society for A. We denote by $d \in [0, 1]$ the attention that A and B assign to themselves relative to the other type. The steady state identity levels for A and B are respectively given by:

$$\overline{p}_A = [1 - \hat{g}(\overline{p}_A; \alpha_A)] \left\{ \lambda p_L + (1 - \lambda) [d\overline{p}_A + (1 - d) \overline{p}_B] \right\} \tag{12}$$

$$\overline{p}_B = [1 - \hat{g}(\overline{p}_B; \alpha_B)] \left\{ \lambda p_L + (1 - \lambda) [d\overline{p}_B + (1 - d) \overline{p}_A] \right\} \tag{13}$$

Based on Equations (12) and (13) we can then analyze the effect of an increase in d and we find

that $\frac{\partial \overline{p}_A}{\partial d} > 0$ and $\frac{\partial \overline{p}_B}{\partial d} < 0$. This is summarized in Proposition 4.

Proposition 4 (Identity Spread for Different Types). *Suppose there are two types of group members, A and B such that A assigns a higher weight to the host society for a given identity. Then, the difference between their steady state identities is decreasing in the weight they assign to each other.*

Thus, our model also sheds light upon the effects of stratification according to ability. If group cohesion is low and high and low ability group members do not influence each other, then their levels of assimilation will differ greatly and we will observe very different outcomes according to ability type. If the community is more connected, then skill investment and identities are less dispersed and there is greater equality in outcomes.

Discussion We have shown how the presence of an institution can lead to incomplete assimilation outcomes, even in the long run, whereas without such an institution, we always obtain full assimilation of the immigrant group.

Our result hinges crucially on the fact that the leader is completely immune to any influence from the host society and the group. We argue that this is a feature that holds in many examples, such as that of the imams in Germany, which is discussed in depth in Halm et al. (2012) and Ceylan (2010). A majority of the imams in Germany are employed by the Turkish government and serve for only 4-5 years in Germany. Their knowledge of German is limited, with only 50% of the imams taking German classes. Sermons are traditionally held in Turkish. This sequence of imams a community is exposed to can be seen as such a rigid leader. By the time the imams have somewhat adjusted to life in Germany, they have to return to Turkey and a new imam arrives, one who is only familiar with the values and norms in Turkey. The situation is similar in the UK, as documented in Geaves (2008) where the vast majority of imams comes from abroad, namely more than 90%. Also, similar to the situation in Germany, the majority of imams has only arrived in the UK five years ago and has been educated and raised in an environment with very different norms and cultural values than those prevalent in the UK. There are in fact a few imams that have been raised and educated in Britain. Nonetheless, even those imams give sermons in Urdu, the prevalent language of Muslims in the UK. Our analysis sheds light on the question of why these imams are predominantly recruited from the home countries: they serve as a rigid institutions that preserves the values and norms of the home countries and keep the community together. It is also plausible to assume that the governments that try to influence their citizens abroad, such as the Korean or Turkish government, are not susceptible to the influence of the host society. Even foreign-language media is often produced in the home country, making it also little susceptible to influence from the host country Zhou

and Cai (2002); Subervi-Velez (1986). Furthermore, leaders have an incentive to uphold norms and values that are culturally distinct from the host country, as we will show in the next section.

In our setting, group members do not gain utility from belonging to a group. One could easily introduce this as an additive element in Equation (3), the maximization problem of each group member, that depends positively on identity. The outcome would remain exactly the same, with group members assimilating fully in the long run. This is a key point of departure from Bisin and Verdier (2000). In their model, parents have a preference regarding the cultural trait of their children. In our model, one can interpret the different time periods as generations. In this case, parents who are more identified with their group have children who will also be more identified with the group. But their identification will decrease over time or rather across generations as each generation keeps investing in skills. This is supported by evidence that second generation immigrants have a lower identity and are less identified with their cultural background than first generation immigrants Algan et al. (2012); Aleksynska and Algan (2010).

Group members invest in skills myopically, that is they assess the benefits of additional skills in the current period only, without taking into account that they also profit from the skills later on. If time periods are interpreted as generations, this approach seems appropriate. However, even for shorter interpretations of time periods, immigrants might act myopically if there is an expectation to return to their home country. Turkish immigrants in Germany are commonly referred to as "Gastarbeiter", guest workers who expected to settle temporarily and who were thought to return to Turkey. Under these circumstances, it might make sense to only invest a limited amount in skills. Last, even if the skill investment was not myopic, the long-run outcomes would be unaffected. Speed of convergence may be affected and our model would then give a lower bound on the speed of assimilation.

In the absence of an institution, there will be full assimilation based on the assumption that immigrants find it beneficial to invest in skills. We find this assumption natural. One of the most important determinants in migration is the hope of immigrants to increase their income. They will therefore have an incentive to educate themselves at least to some extent and to adjust to some of the norms and customs of their host country. Even if some group members might not find it beneficial to invest in skills for a sufficiently high level of identity, there will be full assimilation without a leader as long as they are connected and thus influenced by another group member, who finds it beneficial to invest in skills. Then their identity will still adjust until they also invest in skills. Thus, in the long run, there will be full assimilation, as long as each group member who is not investing initially is connected to someone who does invest.

Last, it is worth noting that one can adjust the model such that the host society is also

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influenced by the immigrant group. This would simply result in different identity levels, but would not change our main results: there is full assimilation in the absence of a leader and incomplete assimilation in the presence of an institution.

5 STRATEGIC LEADER

Up to this point, the norms and the values of the leader have been taken as given and we have not distinguished between the two types of leaders we introduced previously, the *altruistic* and the *extractive* leader. In this section we will consider the strategic choice a leader faces. We show that leaders have an incentive to choose norms and values that result in incomplete assimilation. We consider first what norms and values the leader selects, depending on his type and then continue to look at the impact of the community structure on a leader's choice, payoff and assimilation outcomes.

Leader Identity Choice

For the leader identity choice we focus on payoffs in the steady state and we further assume that $\alpha_i = \alpha$ for all i. In addition we simplify the marginal cost function of investment in skills such that $c(p^t) = c_0 + c_1 p^t$ with $c_0 > 0$ and $c_1 > 0$.

The leader's payoff is a function of both identity and group members' earnings $\alpha f(\overline{H})$. The steady state skill investment is again determined by the steady state identity and so we rewrite income as $\alpha \hat{f}(\overline{p}; \alpha) \equiv \alpha f(H^*(\overline{p}; \alpha))$. Note that $\hat{f}(\overline{p}; \alpha)$ is *decreasing* in $\overline{p}$. This derives from the fact that $f(\overline{H})$ is increasing in $\overline{H}$ and $H^*(\overline{p}; \alpha)$ is decreasing in $\overline{p}$.

The leader sets p_L, which then has an impact on $\overline{p}$ as

$$\overline{p} = [1 - \hat{g}(\overline{p}; \alpha)] \{\lambda p_L + (1 - \lambda) \overline{p}\}, \tag{14}$$

Given Assumption 1, $\frac{\partial \overline{p}}{\partial p_L}$ is strictly positive. We then write $\overline{p}(p_L)$ to emphasize that the steady state identity depends on the norms and values the leader sets.

The altruistic and extractive leader's maximization problem, respectively, is given by:

$$\max_{p_{AL}} \quad \Pi_{AL}(p_{AL}) = n \left[\overline{p}(p_{AL}) + k\alpha \hat{f}(\overline{p}(p_{AL}); \alpha) \right],$$

$$\max_{p_{EL}} \quad \Pi_{EL}(p_{EL}) = n \left[\alpha \overline{p}(p_{EL}) \hat{f}(\overline{p}(p_{EL}); \alpha) \right]$$

We first consider the possible assimilation outcomes under an altruistic leader.

Proposition 5 (Altruistic Leader). *The optimal level of identity projected by the altruistic leader depends on the shape of the function $\hat{f}(p; \alpha)$:*

1. *If $\hat{f}(p;\alpha)$ is a convex function, the altruistic leader selects either the most extreme norms and values, p^{max}, or full assimilation.*

2. *If $\hat{f}(p;\alpha)$ is a concave function, the altruistic leader chooses an intermediate level of group identity. The implemented level of group identity depends positively on α. Thus, having group members with a higher ability or facing lower discrimination leads to lower levels of assimilation.*

Whether the leader is willing to support assimilation of the group depends on the properties of $\hat{f}(p;\alpha)$. If the earnings function is convex, then this implies that a small decrease in p away from p^{max} has only a small impact. In order to realize high earnings with a convex $\hat{f}(p;\alpha)$, the identity has to decrease significantly. Therefore, if the earnings function is convex, the altruistic leader chooses either full assimilation or no assimilation at all, depending on which extreme identity yields the highest payoff. This depends on p^{max} as well as on α. If p^{max} is sufficiently large, then the altruistic leader will always prefer the highest possible cultural distinction. But for a smaller p^{max}, a higher α makes full assimilation more likely. If the group member's payoff function is a concave function in p, then this implies, that a small decrease at p^{max} leads to a large increase in investment in skills and thus to a large increase in earnings. The leader can increase the community's income drastically by reducing cultural distinction. Thus, with a concave earnings function the leader will prefer the community to assimilate to some extent, assuming that the bound p^{max} is sufficiently large to guarantee an interior solution. The level of assimilation depends positively on ability or negatively on discrimination. This implies that with an altruistic leader who finds it beneficial to assimilate to some extent, an environment that provides opportunities for the immigrant community will lead to worse assimilation of said community.

Similar to the altruistic leader, the extractive leader might also choose the most extreme level of norms and values or an intermediate value.

Proposition 6 (Extractive Leader). *Unlike the altruistic leader, the extractive leader will never choose full assimilation. The optimal level of identity projected by the extractive leader depends on the shape of the function $\hat{f}(p;\alpha)$:*

1. *If the elasticity of $\hat{f}(p;\alpha)$ is below one, the extractive leader selects p^{max}.*

2. *If $\hat{f}(p;\alpha)$ is a concave function, the extractive leader chooses an intermediate level of group identity. In case of an interior maximum, an increase in α leads to an increase in the group identity.*

Note first that it is never optimal for the extractive leader to set $p_L = 0$. If he were to do so, he would earn zero profits. A small increase in identity would yield a strictly positive payoff. It is on the other hand possible that the extractive leader will choose p^{max}. This is the case whenever investment in skills is not affected too much by a change in identity, that is, if

the elasticity of $\hat{f}(p; \alpha)$ is smaller than one, formally $1 > -\frac{\partial \hat{f}(p;\alpha)}{\partial p} \frac{p}{\hat{f}(p;\alpha)}$. The leader being an extremist can also occur, if the earnings function is convex. Note that this is only a necessary, but not a sufficient condition.

Last, the leader might set norms and values that are not extreme, but that still prevent full assimilation. A sufficient condition for this to occur is the concavity of $\hat{f}(p; \alpha)$ and again, that p^{max} is sufficiently large so as to have an interior solution. But even if the earnings function is convex, positive cultural distinction can emerge. Similar to the altruistic, an increase in α is associated with an increase in group identity.

The effect of a decrease in discrimination depends on the type of leader and the properties of the earnings function. In case of an altruistic leader, who faces a convex function $\hat{f}(p; \alpha)$, a decrease in discrimination or having higher ability group members is beneficial and makes integration more likely. In this case, a restriction on p^{max} also makes assimilation more likely. But the impact of an increase of discrimination is very different when considering an altruistic leader who faces an concave earnings function. In this case, a reduction in discrimination will lead to lower assimilation, less investment in skills and a more distinct identity. In case of an extremist extractive leader, a reduction in discrimination simply increases payoffs of the leader, without having an impact on the actual norms and values chosen. If the extractive leader chooses cultural distinction without being extreme, then lower discrimination or higher ability group members lead to higher cultural distinction.

Which type of leader leads to higher levels of assimilation in the case of interior solutions depends on the parameter k, the weight assigned by the altruistic leader to wealth relative to identity. The level of assimilation that the leader chooses is increasing in k and for sufficiently high k, will approach complete assimilation. Likewise for sufficiently low k, the altruistic leader will favour a level of assimilation that is approaching the extremist position. As a consequence, the altruistic leader may implement a level of assimilation that is higher or lower than that of the extractive leader for different k.

Impact of Network on Leader Payoffs We are interested in whether it is better for each type of leader to have a more or less connected group. To see the impact of different network structures on the leader payoffs, we again return to the structures in Figure 2, namely "isolated" and "connected" social structures, and consider an example with fixed functional forms. The parameters used in our specifications are given in Table 1.

Based on these assumptions on the functional forms and parameters we can show that the impact of the network structure is very different for the two types of leader as can be seen in

Table 1: Baseline Specification

$f(H)$	$c(p, H)$	$g(H)$	p_L	α_1	α_2	k
$\sqrt{H}$	$\left(\frac{1}{2} + \frac{p}{2}\right) H$	$\sqrt{H}$	1	0.1	0.9	2

Figure 3.

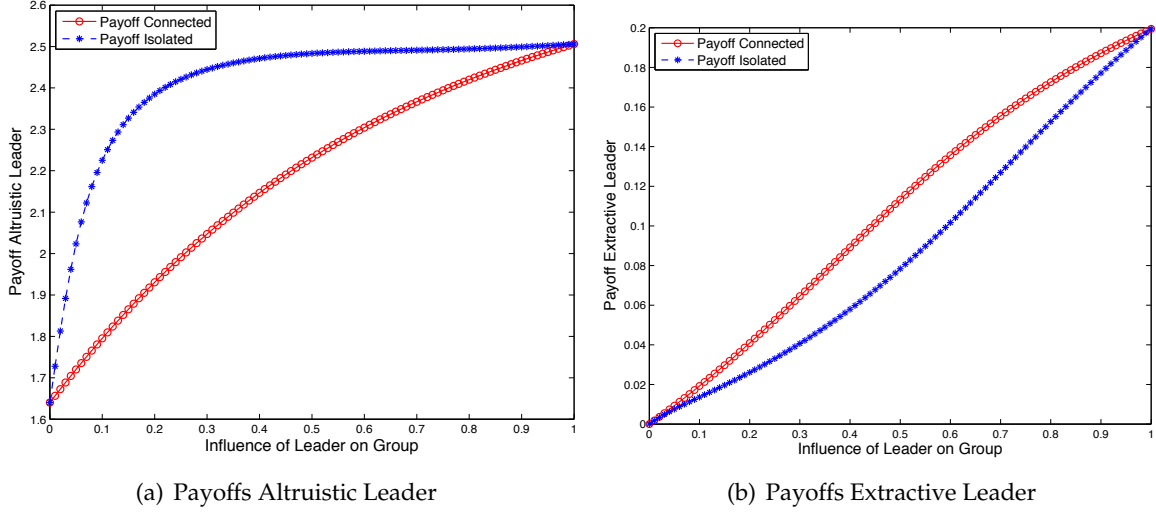(a) Payoffs Altruistic Leader

(b) Payoffs Extractive Leader

Figure 3: Leader Payoffs and Networks

For an altruistic leader, it is beneficial if group members are not connected to each other, whereas for an extractive leader the opposite is the case. To gain some intuition for this result, recall that if group members assign less weight to each other, then their steady state identities are more dispersed and the same holds for their investment in skills. The group member with a high α will end up with a much lower identity than the group member with the low α. And the difference in the identities is lower if the group members are influenced by each other. A high ability group member will invest less in skills in the connected network as his identity is also shaped by the low ability group member and vice versa. This also has an impact on the leader's payoff. In case the group members identities and earnings are very dispersed, i.e. one group member with high earnings, but low identification and another one with low earnings and high identity, an extractive leader will never be able to gain a high payoff. The high ability group member has the earnings to pay for the service of the leader, but is not interested in it, whereas the low ability group member would like to buy the service, but he cannot afford it. In the end an extractive leader will earn very little from both types of agents and therefore he prefers them to be connected so that they can influence each other. But this is different for the altruistic leader. An altruistic leader benefits both from his community being wealthy as well as identified with the norms and values. He therefore prefers both types of group members, the high and low ability group members to do what they want. Namely, the high ability type

specializes in acquiring skills and has therefore high earnings, whereas a low ability type will focus on fulfilling the norms and values that the leader prescribes. If they influence each other, then the identity of the low ability group member falls more than his earnings increase, which drives this result, as can be seen in Figure 4.
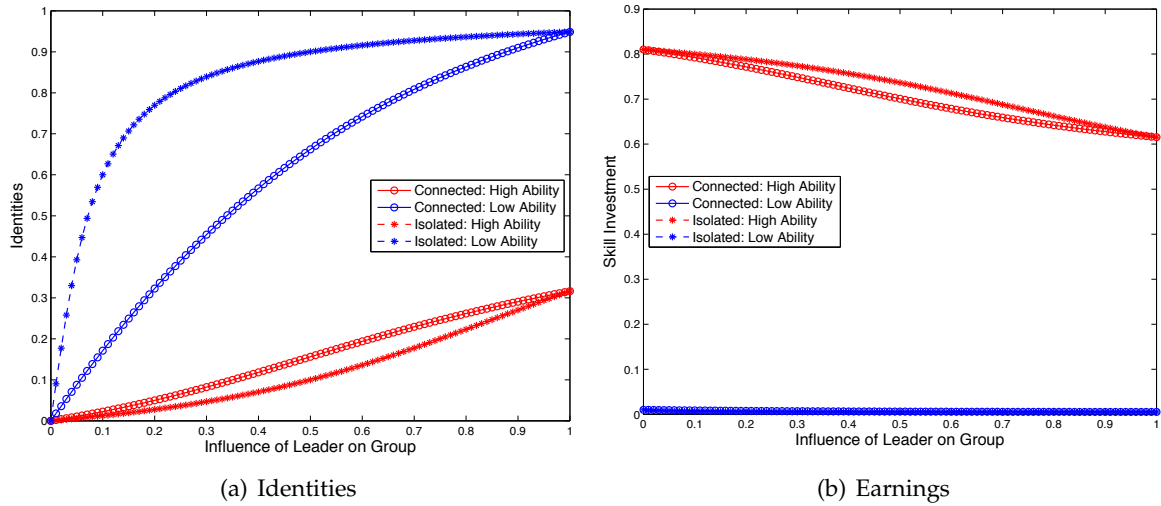

(a) Identities

(b) Earnings

Figure 4: Network, Identity and Earnings

Figure 4(a) shows that the identity of the high ability type increases only modestly compared to the decrease in identity of the low ability type. On the other hand, the earnings of the low ability types are almost zero and they almost do not differ, whereas the earnings of the high ability types decrease somewhat when they are influenced by a low ability group member (Figure 4(b)).

Discussion Our findings for the altruistic leader with a convex function $\hat{f}(p; \alpha)$ are in line with Carvalho and Koyama (2011). As mentioned previously, they have a similar payoff function for rabbis in Eastern Europe and Germany. They document that Jewish communities in Germany assimilated to German customs. Rabbis changed the religious procedures such that less time was required to be spent at the Synagogue. Additionally, organ music was introduced, traditionally a Christian custom. Sermons started to be held in German instead of Hebrew. All these changes can be seen as increased assimilation to German customs and traditions. However, the assimilation took place at the same time as the building of many new synagogues. During that period, German communities became very wealthy and invested in the construction of many new synagogues.[23] But on the other hand, the communities in Hungary started creating norms

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[23]Note that we are only interested in assimilation as far as it concerns economic outcomes or affects similarities in preferences regarding public goods. So, even though the Jewish community persisted it was on many important issues not that different from Christian communities.

and customs that required their followers to spend more time at the synagogue. They also imposed dress codes that emphasized the difference between the Jewish community and the Hungarian society. Carvalho and Koyama (2011) argue that these difference in development stems from the diverse economic environments: Germany was further developed, making it easier to find well-paid employment. Assimilation was therefore more profitable in such an environment.

However, it is not clear that religious leaders are in fact always altruistic. Ceylan (2010, p. 61), argues that for the majority of Imams coming from Turkey to Germany the most important driving force is money. The imams can earn more in Germany, than they could ever make in Turkey. This then is more likely to make them an extractive leader than an altruistic leader. If this is the case, then Turkish Imams face very different incentives from other religious leader, which might explain why the assimilation of Muslims seems to be different from that of other religious groups.[24] Foreign-language media and ethnic business associations also seem to fall into the category of extractive leaders. In all the examples given in Section 2, observers note how strict the leaders were, how much control they exerted on the respective communities. These type of leaders establish a regime of total intolerance and punish any deviant behavior, which is understandable given their payoff function. They cannot sustain their position if the community fully assimilates. And one way to prevent full assimilation is to reduce profits from investment in skills, profits from learning the language. The Chinese-language media in the US has been instrumental in the reduced payoff from learning English. They advocate education, but at the same time help build and improve ethnic networks in order to prevent assimilation. What has emerged is a very well educated, wealthy parallel society of Chinese immigrants who often only speak insufficient English, but still have high incomes from their networks, see Zhou and Cai (2002). In a similar spirit, Latin American media outlets have contents that tend towards socialization into Spanish society Subervi-Velez (1986). This clearly makes investment in host country language more costly and at least in case of Hispanic immigrants decreases their earnings McManus (1990); Borjas (2013).

Additionally, it is of interest to see the impact of the community structure on the leader payoffs and how the community structure preferred by leader differs. Altruistic leaders have higher payoffs from their community if the members are more isolated, whereas extractive leaders benefit more if the community is more connected. We argue that collectivist societies are more likely to have connected social structures, whereas individualistic societies have a more isolated networks structure.[25] According to a standard classification based on the work

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[24]See Bisin et al. (2008), Constant et al. (2006) and Haug (2008) for evidence of this.

[25]For a formal definition of collectivism and individualism see Hofstede (1984).

of Hofstede (1984), China, Turkey, Mexico and South Korea are considered to be collectivist societies. On the other hand, Western European countries and especially the US are individualistic societies. It might be the case that the assimilation failure along religious lines that occurred in the US and which was mainly of Western European groups was due to the interaction of an isolated network and an altruistic leader who would especially profit from such a community. On the other hand, we have shown the presence of extractive institutions for Chinese, Turkish, Mexican as well as Korean immigrants. Again, this emergence might be due to the fact that extractive leaders profit more from these connected social structures.

In our setting, a reduction in discrimination will lead to an increase in payoffs for an extremist leader. Additionally, lower discrimination leads under most circumstances to an increase in cultural distinction. The exception is an altruistic leader who decides between full assimilation and the maximal cultural distinction: in this case lower discrimination makes full assimilation more likely. It is often argued in policy debates that lower discrimination leads immigrants to assimilate more. In our model, the opposite is true. It highlights that lowering barriers to the job market will not lead to cultural assimilation in the presence of leaders, but instead – through the response of leaders who capture some of the gains from lower barriers – may create higher level of cultural distinction.

Last, note that in our model, the higher exposure to the host society does not lead to an increase in identity. Bisin et al. (2010) argues that higher cultural distinction is chosen in a neighborhood where host society and immigrant groups are more mixed.[26] In our model, exposure to the host country should rather be interpreted as consuming media of the host country or having obtained education in the host country. All these factors are associated with a lower identity Bisin et al. (2010); Subervi-Velez (1986); Zhou and Cai (2002).

6 CONCLUSION

We develop a model of the assimilation process of an immigrant community with a strategic leader capturing the evolution of the skills and identities of community members. In the absence of an institution, our setting predicts complete assimilation. A rigid institution can prevent this and leads to persistent differences in norms and values between the immigrant group and the host society.

Furthermore, we study the incentives for leaders to prevent assimilation under two payoff specifications that both value the economic success and identification of community members

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[26]In a similar spirit, Currarini et al. (2009) show that racial groups show more homophily if the groups are of equal size.

with the group. We find that both under altruistic and extractive leaders extremist outcomes are possible. This means the institutions distance themselves as much as possible from the norms and values of the host society. However, altruistic leadership payoffs may also result in full assimilation, if the benefits that this outcome generates for the community can be captured to a sufficient extent by the leadership. This outcome is never possible for extractive leaderships, who rely on the continued identification of the group members with their origin culture to generate payoffs.

In addition to these extreme outcomes, both types of leadership may find it optimal to create the conditions for intermediate, but still incomplete assimilation. The effect of an increase in discrimination on identity depends on the type of leader as well as on the properties of the earnings function. Whether the community is tightly knit also has an impact on a leader's payoff. In particular, an altruistic leader benefits more from a community that is less connected, whilst an extractive leader prefers a community that is more connected.

Our model helps understand why there seems to be a strong preference for religious leaders that come from the home country, why leaders prefer to limit investment in skills, why Muslim leaders might be different from other religious leaders. We additionally analyze the impact of the economic environment on leader's incentive regarding assimilation or the lack thereof.

We do not address the question of competition between groups, but rather focus on small minorities that have a negligible impact on the host society. Additionally if groups are competitors such as described in Munshi and Wilson (2008), then we would expect outcomes to differ.

We have argued that institutions are instrumental in preventing assimilation and keeping the community together. However, it might very well be that only individuals who are of a certain type are influenced by the institution, that is, there is self-selection of group members. Suppose for example that Chinese immigrants who consume more Chinese language media are of a certain type. This type is more likely to go to consume home country media and they have different values. This will not imply that the language media is instrumental in promoting these values. In our model, a Chinese immigrant will only be able to hold onto different values if the media is present, either because it shapes his views or simply because it affirms them. We have provided several case studies which argue that the leaders are indeed instrumental. In the end, this question is an empirical one. To test our hypothesis rigorously, it would require to have randomly allocated leaders, community members that cannot leave their group and will be influenced by the leader no matter his position and assimilation and integration variables that measure the impact of leader characteristics on the group.

In closing, we highlight the importance of leaders for shaping norms and values in the policies pursued by Atatürk. He initially used Imams to mobilize the Turkish people in the Turkish War of Independence and later founded an institution to control the preaching of Imams. Imams were employed by this institution and were forced to teach a state conform and moderate Islam, often against the wishes of the leaders themselves. Still, the incentive structur created by Atatürk had an impact and it affected the change in communities he aimed for Ceylan (2010).

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APPENDIX

Proof of Proposition 1 - Steady State in the Benchmark Case without Leader

We can verify by inspection that $\bar{p}_i = 0 \; \forall \; i$ is a solution to the steady state condition in Equation (8). It remains to be shown that this is the unique such steady state and that the system described by Equation (7) converges towards it.

We first rewrite Equation (7) in matrix form as follows:

$$p^{t+1} = \left[I - G\left(p^t\right)\right] D p^t \tag{15}$$

where p^t is the vector of identities. I is the identity matrix and we define $G\left(p^t\right)$ to be the $n \times n$ matrix with diagonal elements $G_{ii}\left(p^t\right) = g(p_i^t; \alpha_i)$ and zeros elsewhere. D is the group member influence matrix defined by $D_{ij} = d_{ij}$. Note that for this proof a superscript t applied to a matrix such as D denotes D taken to the tth power whilst a superscript on a vector such as p refers to the vector p in period t.

Solving backwards yields

$$p^t = \prod_{s=0}^{t-1} \left\{\left[I - G\left(p^s\right)\right] D\right\} p^0$$
$$= \prod_{s=0}^{t-1} \left[I - G\left(p^s\right)\right] D^t p^0.$$

Now, the long run behavior of p^t as $t \to \infty$ depends on the behavior of $\lim_{t \to \infty} \prod_{s=0}^{t-1} \left[I - G\left(p^s\right)\right]$ and $\lim_{t \to \infty} D^t$.

Consider first $\lim_{t \to \infty} \prod_{s=0}^{t-1} \left[I - G\left(p^s\right)\right]$. This is a diagonal matrix with element (i, i) given by

$$\lim_{t \to \infty} \prod_{s=0}^{t-1} \left[1 - g(p_i^s; \alpha_i)\right] = 0$$

as $g(p_i^s; \alpha_i) \in (0, 1)$ by assumption. Thus,

$$\lim_{t \to \infty} \prod_{s=0}^{t-1} \left[I - G\left(p^s\right)\right] = 0.$$

Furthermore, as D is row stochastic $\lim_{t \to \infty} D^t$ is bounded so that we have

$$\lim_{t \to \infty} \prod_{s=0}^{t-1} \left[I - G\left(p^s\right)\right] D^t p^0 = 0.$$

Proof of Proposition 2 - Steady State with Leader

Existence and Characterization as Convex Combination

The updating process maps a vector of group member identities into a new identity vector, $p' = \Phi(p)$, where p' is next period's identity vector, which is a function of today's identity p. A steady state identity vector is a fixed point of $\Phi(\cdot)$.

The domain and co-domain of $\Phi(\cdot)$ are both $[0, p^{max}]^n$, which are compact convex subsets of Euclidean space. Continuity of $\Phi(\cdot)$ follows from its definition in Equation (9). Therefore by Brouwer's Fixed Point Theorem, $\Phi(\cdot)$ has a fixed point and there exists a steady state.

Next we show that at any fixed point the identity of every group member is a strict combination of the leader's payoff and the host society, that is

$$p_i \in (0, p_L) \qquad \forall i.$$

We proceed by contradiction. Support first $\tilde{p}$ is a fixed point of $\Phi(p)$ and the exists a player such that $\tilde{p}_i = 0$. Then $\Phi_i(\tilde{p}) = [1 - g(\tilde{p}_i; \alpha_i)] \left[\lambda p_L + (1 - \lambda) \sum_{j=1}^n d_{ij} p_j \right]$ which is strictly greater than zero because $g(\tilde{p}_i; \alpha_i) < 1$, $\lambda > 0$ and $p_L > 0$. $\tilde{p}$ thus is not a fixed point, delivering the contradiction.

Now suppose that there was a player for which $\tilde{p}_i \geq p_L$. Label the player with the highest $\tilde{p}_i$ as i_{max}. Then $\tilde{p}_{i_{max}} \geq p_L$. Again $\Phi_{i_{max}}(\tilde{p}) = [1 - g(\tilde{p}_{i_{max}}; \alpha_{i_{max}})] \left[\lambda p_L + (1 - \lambda) \sum_{j=1}^n d_{ij} p_j \right]$ which is strictly less than $\tilde{p}_{i_{max}}$ as $g(\tilde{p}_i; \alpha_i) > 0$. This implies $\tilde{p}$ is not a fixed point, delivering the contraction.

Uniqueness and Convergence

To show uniqueness and convergence of the fixed point we will show that under Assumption 1 the updating process with a leader described by Equation (9) is a contraction under a suitable norm and then use Blackwell's contraction mapping theorem. The proof implies existence and uniqueness of the steady state as well as global convergence towards the steady state.

Label again $\Phi(p)$ the one period updating process of group member identity vector p yielding next period vector p'. Then for $\Phi(p)$ to be a contraction we need to show that for every two n-dimensional identity vectors $p \neq q$ and for some norm $\|\cdot\|$ and scalar $c < 1$:

$$\|\Phi(p) - \Phi(q)\| \leq c \|p - q\| < \|p - q\|$$

Now, from Equation (9) and assumptions on $g(\cdot)$ we know that $\Phi(p)$ is continuous and differen-

tiable everywhere. The condition for a contraction can then be expressed in terms of a property on the Jacobian $J\left(\Phi(p)\right)$ as follows.[27] $\Phi(p)$ is a contraction if there exists a matrix norm $\|\cdot\|$ of J and scalar $c < 1$ such that for every p

$$\|J\left(\Phi(p)\right)\| \le c$$

The matrix norm we use is the norm induced by the ∞-vector norm defined as

$$\|A\|_\infty = \max_i \left[\sum_j A_{ij}\right]$$

A sufficient condition for $\Phi(p)$ to be a contraction is thus:

$$\max_i \left[\sum_j J_{ij}\left(\Phi(p)\right)\right] < 1$$

Computing the elements of the Jacobian

$$\frac{\partial \Phi_i(p)}{\partial p_i'} = [1 - \hat{g}(p_i; \alpha_i)]\,(1-\lambda)D_{ii} + \left\{\lambda p_L + (1-\lambda)\sum_j (D_{ij}p_j)\right\}\left[-\alpha_i \frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right]$$

$$\frac{\partial \Phi_i(p)}{\partial p_j'} = [1 - \hat{g}(p_i; \alpha_i)]\,(1-\lambda)\sum_{j\neq i} D_{ij}$$

we then derive the following condition:

$$\|\mathbf{J}\left(\Phi(p)\right)\|$$

$$= \max_i \left[[1 - \hat{g}(p_i; \alpha_i)]\,(1-\lambda) + \left\{\lambda p_L + (1-\lambda)\sum_j (D_{ij}p_j)\right\}\left[-\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right]\right]$$

$$\le \max_i \left[[1 - \hat{g}(p_i; \alpha_i)]\,(1-\lambda) + p^{max}\left[-\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right]\right]$$

$$< \max_i \left[[1 - \hat{g}(p_i; \alpha_i)] + p^{max}\left[-\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}\right]\right]$$

$$< 1.$$

The line following the first $\le$ provides an upper bound for all network structures and all initial values of p. The subsequent step then ensures the condition holds for all λ, in particular as

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[27]See Judd (1998, Theorem 5.4.1) for the approach adopted here.

$\lambda \to 0$. This condition further simplifies to

$$p^{max} < \frac{g(p_i; \alpha_i)}{|\frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i}|} \ \forall \ i \in N \text{ and } \ \forall \ p_i \in [0, p^{max}]$$

which delivers Assumption 1. It then follows from the contraction mapping theorem that $\Phi(\cdot)$ has a unique steady state and the system converges globally to the steady state.

Derivation of Steady State Identities in Equations (10) and (11)

Recall the matrix notation from the proof of Proposition 1. Using this notation and Equation 9, the system of equations characterizing the steady state can be written as

$$\bar{p} = [I - G(\bar{p})][\lambda p_L \mathbf{1} + (1 - \lambda) D\bar{p}]$$

where $\mathbf{1}$ stands for the $n \times 1$ vector of ones . We solve for the vector of steady state identities p

$$\bar{p} = [I - (1 - \lambda)[I - G(\bar{p})] D]^{-1} [I - G(\bar{p})] \mathbf{1} \lambda p_L$$

The network structure enters this expression in the inverse on the right hand side only. We define:

$$A \equiv [I - (1 - \lambda)[I - G(\bar{p})] D]$$

such that $\bar{p} = A^{-1} [I - G(\bar{p})] \mathbf{1} \lambda p_L$. Note that $[I - G(\bar{p})]$ is a diagonal matrix. We can then proceed to solve for the identity vector for the two structures in our example.

Isolated Case: Group member puts no weight on other group members

In the "isolated" structure, D is equal to the identity matrix I. Thus:

$$\bar{p}_{[iso]} = \left[I - (1 - \lambda)\left[I - G\left(\bar{p}_{[iso]}\right)\right]\right]^{-1} \left[I - G\left(\bar{p}_{[iso]}\right)\right] \mathbf{1} \lambda p_L$$

and $A_{[iso]}$ is a diagonal matrix with element $\{i, i\}$ given by $1 - (1 - \lambda)[1 - \hat{g}(\bar{p}_i, \alpha_i)]$. The inverse $A_{[iso]}^{-1}$ is thus also a diagonal matrix with element $\{i, i\}$ equal to $\frac{1}{1 - (1 - \lambda)[1 - \hat{g}(\bar{p}_i, \alpha_i)]}$. It follows that

$A_{[iso]}^{-1} \left[I - G\left(\overline{p}_{[iso]}\right) \right]$ is a diagonal matrix with element $\{i, i\}$ equal to

$$\frac{1 - \left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right) \right]}{1 - (1 - \lambda) \left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right) \right]}$$

Adding the remaining elements we can derive an expression for $\overline{p}_{[iso],i}$ as required:

$$\overline{p}_{[iso],i} = \frac{1 - \left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right) \right]}{1 - (1 - \lambda) \left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right) \right]} \lambda p_L$$

Connected Case: Group member puts weight on other group members

In the "connected" structure, D is an $n \times n$ matrix with every element equal to $\frac{1}{n}$. Thus $A_{[conn]}$ is a matrix with diagonal element $\{i, i\}$ given by $1 - \frac{1 - \lambda}{n} \hat{g}\left(\overline{p}_i, \alpha_i\right)$ and off diagonal element $\{i, j\}$ given by $-(1 - \lambda)\left[1 - \hat{g}\left(\overline{p}_i, \alpha_i\right) \right]$ for all $j \neq i$. We use the shorthand $a_i = (1 - \lambda)\left[1 - \hat{g}\left(\overline{p}_i, \alpha_i\right) \right]$ to simplify the next steps.

The inverse $A_{[conn]}^{-1}$ can be computed from the definition:

$$A_{[conn]}^{-1} A_{[conn]} = I$$

which describes a system of $n \times n$ equations. Multiplying out the left hand side and collecting terms we get for the diagonal elements

$$A_{[conn],[i,i]}^{-1} - \sum_{k=1}^{n} A_{[conn],[i,k]}^{-1} a_k = 1 \tag{16}$$

and for the off diagonal elements in position $\{i, j\}$

$$A_{[conn],[i,j]}^{-1} - \sum_{k=1}^{n} A_{[conn],[i,k]}^{-1} a_k = 0 \tag{17}$$

for all $j \neq i$. Note that any two expressions corresponding to row i share the term with the sum. Thus subtracting the expressions for two off diagonal elements in the same row yields:

$$A_{[conn],[i,j]}^{-1} = A_{[conn],[i,k]}^{-1} \ \forall \ j, k \neq i \tag{18}$$

Subtracting any off diagonal from the diagonal element of the same row yields:

$$A_{[conn],[i,i]}^{-1} = 1 + A_{[conn],[i,j]}^{-1} \tag{19}$$

Substituting Equations (19) and (19) into Equation (17) then yields:

$$A^{-1}_{[conn],[i,j]} \left(1 - \sum_{k=1}^{n} a_k \right) - a_i = 0$$

and therefore $A^{-1}_{[conn],[i,j]} = \frac{a_i}{\left(1-\sum_{k=1}^{n} a_k\right)}$. It follows that $A^{-1}_{[conn],[i,j]} = 1 + A^{-1}_{[conn],[i,j]} = 1 + \frac{a_i}{\left(1-\sum_{k=1}^{n} a_k\right)} = \frac{1-\sum_{k=1,k\neq i}^{n} a_k}{\left(1-\sum_{k=1}^{n} a_k\right)}$ Some algebra computing $A^{-1}_{[conn]} \left[I - G\left(\overline{p}_{[conn]}\right)\right]$ shows that many elements cancel and the steady state identities are then given by

$$\overline{p}_{[conn],i} = \frac{\lambda\left(1 - \hat{g}(\overline{p}_{[conn],i}; \alpha_i)\right)}{1 - (1-\lambda)\frac{1}{n}\sum_{j=1}^{n}\left(1 - \hat{g}(\overline{p}_{[conn],j}; \alpha_j)\right)} p_L$$

Comparative Statics on Steady State Identities

Comparative statics are can be computed by the implicit function theorem. We start with the "isolated" case and rewrite Equation (10) as:

$$F(\overline{p}_{[iso],i}; \alpha_i; \lambda; p_L) = \overline{p}_{[iso],i} \left\{ 1 - (1-\lambda)\left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right)\right]\right\} - \left\{ 1 - \left[1 - \hat{g}\left(\overline{p}_{[iso],i}, \alpha_i\right)\right]\right\}\lambda p_L = 0$$

The partial derivative with respect to $\overline{p}_{[iso],i}$ is:

$$\frac{\partial F}{\partial \overline{p}_{[iso],i}} = \left\{ 1 - (1-\lambda)\left[1 - \hat{g}(\overline{p}_{[iso],i}; \alpha_i)\right]\right\} \qquad + \frac{\partial \hat{g}(\overline{p}_{[iso],i}; \alpha_i)}{\partial p_i}\left\{ \lambda p_L + (1-\lambda)\overline{p}_{[iso],i}\right\}$$
$$> \hat{g}(\overline{p}_{[iso],i}; \alpha_i) \qquad\qquad + \frac{\partial \hat{g}(\overline{p}_{[iso],i}; \alpha_i)}{\partial p_i} p_L$$
$$> 0$$

where the final inequality follows from Assumption 1. The remaining partial derivatives can be signed directly:

$$\frac{\partial F}{\partial \alpha_i} = \frac{\partial \hat{g}(\overline{p}_{[iso],i}; \alpha_i)}{\partial \alpha_i}\left[\lambda p_L + (1-\lambda)\overline{p}_{[iso],i}\right] \qquad\qquad > 0$$
$$\frac{\partial F}{\partial \lambda} = \left[1 - \hat{g}(\overline{p}_{[iso],i}; \alpha_i)\right](p - p_L) \qquad\qquad < 0$$
$$\frac{\partial F}{\partial p_L} = -\lambda\left[1 - \hat{g}(\overline{p}_{[iso],i}; \alpha_i)\right] \qquad\qquad < 0$$

The signs of the effects of parameters α_i, λ and p_L then follow directly from the implicit function theorem.

For the "connected" case the derivation and signs of comparative statics are analogous to the case with "isolated" group members and omitted here.

Proof of Proposition 4

The result follows from the implicit function theorem applied to the system of equations describing the steady state (Equations (12) and (13)). We first rewrite the system in terms of $F(\overline{p}_A, \overline{p}_B; d, p_L) = 0$:

$$[1 - \hat{g}(\overline{p}_A; \alpha_A)] \{\lambda p_L + (1 - \lambda) [d\overline{p}_A + (1 - d) \overline{p}_B]\} - \overline{p}_A = 0$$

$$[1 - \hat{g}(\overline{p}_B; \alpha_B)] \{\lambda p_L + (1 - \lambda) [d\overline{p}_B + (1 - d) \overline{p}_A]\} - \overline{p}_B = 0$$

Next take the partial derivatives that form the Jacobian for the endogenous variables (p_A, p_B) as well as the derivatives with respect to the parameter d. The effect of a change in the parameter d can then be computed using the implicit function theorem as:

$$\frac{\partial p_i}{\partial d} = \frac{-|J_i(d)|}{|J|}$$

where J is the Jacobian of F with respect to endogenous variables and $J_i(\theta)$ is the same matrix with column i replaced by the vector of partial derivatives with respect to parameter θ. We compute $|J|$ and $|J_A(d)|$. The necessary partial derivatives are given by:

$$\frac{\partial F_i}{\partial p_i} = [1 - \hat{g}(p_i; \alpha_i)] (1 - \lambda)d - \frac{\partial \hat{g}(p_i; \alpha_i)}{\partial p_i} \{\lambda + (1 - \lambda) [dp_i + (1 - d) p_j]\} - 1 < 0 \qquad (20)$$

$$\frac{\partial F_i}{\partial p_j} = [1 - \hat{g}(p_i; \alpha_i)] (1 - \lambda)(1 - d) > 0 \qquad (21)$$

$$\frac{\partial F_i}{\partial d} = [1 - \hat{g}(p_i; \alpha_i)] (1 - \lambda) (p_i - p_j) = (+) \cdot (p_i - p_j) \qquad (22)$$

Equation (20) can be signed using Assumption 1. The sign of Equation (21) follows directly from $\hat{g}(p_i; \alpha_i) \in (0, 1)$. Equation (22) adopts the sign of $(p_i - p_j)$ which for our setting and $\frac{\partial F_A}{\partial d}$ is negative.

The determinant of the Jacobian is then given by

$$|J| = \frac{\partial F_A}{\partial p_A} \frac{\partial F_B}{\partial p_B} - \frac{\partial F_A}{\partial p_B} \frac{\partial F_B}{\partial p_A}$$

$$> 0$$

The inequality follows by recognising that Assumption 1 implies that $|\frac{\partial F_i}{\partial p_i}| > |\frac{\partial F_i}{\partial p_j}|$ for both $i = A$ and $i = B$. To see this note that the partial derivatives of $F(\cdot$ used are connected to the

Jacobian of the updating operator $\Phi(p)$ used in the proof of Proposition 2 above:

$$\frac{\partial F_i}{\partial p_i} + 1 = \frac{\partial \Phi_i}{\partial p_i}$$
$$\frac{\partial F_i}{\partial p_j} = \frac{\partial \Phi_i}{\partial p_j}$$

Furthermore, the proof to Proposition 2 also established that Assumption 1 ensured that $\frac{\partial \Phi_i}{\partial p_i} + \frac{\partial \Phi_i}{\partial p_j} < 1$ which implies here that $\frac{\partial F_i}{\partial p_j} + \frac{\partial F_i}{\partial p_j} < 0$. Given the signs on the partial derivatives of $F(\cdot)$ it follows that $|\frac{\partial F_i}{\partial p_i}| > |\frac{\partial F_i}{\partial p_j}|$. It is then immediate that the first part of the expression for $|J|$ is larger than the second and thus the over sign is positive.

The determinant of the modified Jacobian $J_A(d)$ can be signed as follows:

$$
\begin{aligned}
|J_A(d)| =& \frac{\partial F_A}{\partial d} \frac{\partial F_B}{\partial p_B} - \frac{\partial F_A}{\partial p_B} \frac{\partial F_B}{\partial d} \\
=& \left[1 - \hat{g}(p_A; \alpha_A)(p_A)\right] (1 - \lambda)(p_A - p_B) \cdot \\
& \left\{ \left[1 - \hat{g}(p_B; \alpha_B)\right] (1 - \lambda)d - \frac{\partial \hat{g}(p_B; \alpha_B)}{\partial p_B} \left\{\lambda p_L + (1 - \lambda)\left[dp_B + (1 - d)p_A\right]\right\} - 1 \right\} \\
& - \left[1 - \hat{g}(p_A; \alpha_A)\right] (1 - \lambda)(1 - d) \cdot \left[1 - \hat{g}(p_B; \alpha_B)\right] (1 - \lambda)(p_B - p_A) \\
=& \left[1 - \hat{g}(p_A; \alpha_A)\right] (1 - \lambda)(p_A - p_B) \cdot \\
& \left\{ \left[1 - \hat{g}(p_B; \alpha_B)\right] (1 - \lambda) - \frac{\partial \hat{g}(p_B; \alpha_B)}{\partial p_B} \left\{\lambda p_L + (1 - \lambda)\left[dp_B + (1 - d)p_A\right]\right\} - 1 \right\} \\
>& \left[1 - \hat{g}(p_A; \alpha_A)\right] (1 - \lambda)(p_A - p_B) \cdot \\
& \left\{ \left[1 - \hat{g}(p_B; \alpha_B)\right] - \frac{\partial \hat{g}(p_B; \alpha_B)}{\partial p_B} \left\{p_L\right\} - 1 \right\} \\
=& \left[1 - \hat{g}(p_A; \alpha_A)\right] (1 - \lambda)(p_A - p_B) \cdot \\
& \left\{ \left[-\hat{g}(p_B; \alpha_B)\right] - \frac{\partial \hat{g}(p_B; \alpha_B)}{\partial p_B} \left\{p_L\right\} \right\} \\
>& \; 0
\end{aligned}
$$

The final inequality is due to the multiplication of two negative components: The first part has the sign of $p_A - p_B$, which is negative as $\alpha_A > \alpha_B$. The second part is negative by Assumption 1, applied here to p_B.

Reassembling, we can now sign the effect of d:

$$\frac{\partial p_A}{\partial d} = \frac{-|J_A(d)|}{|J|}$$

$$= -\frac{(+)}{(+)}$$

$$< 0$$

Thus with $p_A < p_B$ an increase in d decreases p_A and thus implies greater differences.

Proof of Proposition 5 and 6: Altruistic and Extractive Leader

We establish first that $\overline{p}(p_L)$ is an increasing function in p_L. To see this recall Equation (14)

$$\overline{p} = [1 - \hat{g}(\overline{p}; \alpha_i)] \left\{ \lambda p_L + (1 - \lambda) \overline{p} \right\}.$$

Differentiating with respect to p_L yields

$$\frac{\partial \overline{p}}{\partial p_L} = \frac{\lambda \left(1 - \hat{g}(\overline{p}; \alpha)\right)}{1 + \frac{\partial \hat{g}(\overline{p}; \alpha)}{\partial \overline{p}} \left(\lambda p_L + (1 - \lambda)\overline{p}\right) - (1 - \lambda)\left(1 - \hat{g}(\overline{p}; \alpha)\right)}$$

which is strictly positive under Assumption 1. This strictly monotonously increasing relationship between p_L and $\overline{p}$ allows us to study the leader problem from the perspective of $\overline{p}$. Note also that the above conditions imply that if $p_L = p^{max}$, the resulting $\overline{p}$ is generally below p^{max}.

Altruistic Leader

Recall the payoff function of the altruistic leader

$$\Pi_{AL}(\overline{p}) = n \left[\overline{p} + k \hat{f}(\overline{p}; \alpha) \right]$$

The FOC is given by the first derivative of the payoff function

$$1 + \alpha k \frac{\partial \hat{f}(\overline{p}; \alpha)}{\partial \overline{p}} = 0 \tag{23}$$

$$\iff 1 + k \alpha f' \left[H^*(\overline{p}; \alpha) \right] \frac{\partial H^*(\overline{p}; \alpha)}{\partial \overline{p}} = 0 \tag{24}$$

with the sign of the second order condition equal to

$$f''\left(H^{*}\right)\left[\frac{\partial H^{*}(\overline{p};\alpha)}{\partial \overline{p}}\right]^{2} + f'\left(H^{*}\right)\frac{\partial^{2}H^{*}(\overline{p};\alpha)}{\partial \overline{p}^{2}}$$

$$= \left(\frac{c_{1}^{2}}{\alpha^{2}f''(H)}\right)\left\{1 - f'\left(H^{*}\right)\frac{f'''\left(H^{*}\right)}{[f''\left(H^{*}\right)]^{2}}\right\}$$

As $\frac{\partial H^{*}(\overline{p};\alpha)}{\partial \overline{p}} < 0$ (see Equation (5)) the altruistic leader objective function is thus strictly concave if

$$1 - f'\left(H^{*}\right)\frac{f'''\left(H^{*}\right)}{[f''\left(H^{*}\right)]^{2}} > 0 \tag{25}$$

A sufficient condition is $f'''(H) < 0$. If $f'''(H) > 0$, then the condition remains valid if $f'''(H)$ is not "too high".

We can then distinguish two cases:[28]

Case 1 If Equation (25) is positive over the domain of p that can be achieved with $p_{L} \in [0, p^{max}]$, then if there exists a p_{L} for which the FOC holds, it is a global interior maximum.

Case 2 If Equation (25) is negative over the domain of p, then the global maximum is either $p_{L} = 0$ or $p_{L} = p^{max}$.

If Case 1 is satisfied, we can study the comparative statics of the solution with respect to the parameter α. Defining F as the left hand side of the FOC in Equation (24) the effect of α on the optimal level of $\overline{p}$ is given by

$$\frac{\partial \overline{p}}{\partial \alpha} = -\frac{\frac{\partial F}{\partial \alpha}}{\frac{\partial F}{\partial \overline{p}}}$$

We have

$$\frac{\partial F}{\partial \alpha} = f''(H^{*}) + \alpha f'''(H^{*})\frac{\partial H^{*}}{\partial \alpha}$$

$$= f''\left(H^{*}\right) - f'''\left(H^{*}\right)\frac{f'\left(H^{*}\right)}{f''\left(H^{*}\right)}$$

$$= f''\left(H^{*}\right)\left\{1 - f'\left(H^{*}\right)\frac{f'''\left(H^{*}\right)}{[f''\left(H^{*}\right)]^{2}}\right\}$$

$$< 0$$

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[28]There is also the third case if Equation (25) is equal to zero. But this is knife edge and therefore we deemphasize it at here.

where the inequality follows from Equation (25) being positive in Case 1. Further

$$\frac{\partial F}{\partial p} = c_1^2 k + \alpha f''(H^*) \frac{\partial H^*}{\partial \overline{p}} > 0$$

Reassembling terms yields

$$\frac{\partial p}{\partial \alpha} = -\frac{(-)}{(+)} > 0$$

as required.

Extractive Leader

Recall the payoff function of the extractive leader

$$\Pi_{AL}(\overline{p}) = n \left[\overline{p} \hat{f}(\overline{p}; \alpha) \right]$$

In terms of $\hat{f}(\overline{p}; \alpha)$, the first derivative of the payoff function is

$$n \left\{ \hat{f}(\overline{p}; \alpha) + \overline{p} \frac{\partial \hat{f}(\overline{p}; \alpha)}{\partial \overline{p}} \right\}$$

This is always positive if the elasticity of $\hat{f}(\overline{p}; \alpha)$ is sufficiently small for any p:

$$-\frac{p}{\hat{f}(\overline{p}; \alpha)} \frac{\partial \hat{f}(\overline{p}; \alpha)}{\partial p} < 1$$

In this case the leader sets the $p_L = p^{max}$.

In case of an interior solution, the second order condition is of interest:

$$f'(H^*) \frac{c_1}{\alpha f''(H^*)} + \overline{p} \frac{c_1^2}{\alpha^2 f''(H^*)} (1 - \frac{f'(H^*) f'''(H^*)}{[f''(H^*)]^2}) \tag{26}$$

$$= \frac{c_1}{\alpha f''(H^*)} \left(f'(H^*) + \overline{p} \frac{c_1}{\alpha} \left(1 - \frac{f'(H^*) f'''(H^*)}{[f''(H^*)]^2} \right) \right) \tag{27}$$

For the second order condition to be negative,

$$f'(H^*) + \overline{p} \frac{c_1}{\alpha} \left(1 - \frac{f'(H^*) f'''(H^*)}{[f''(H^*)]^2} \right) > 0 \tag{28}$$

Note that equation (28) contains expression (25). Thus, the expression here is positive – and the objective function concave – whenever it is the case of the altruistic leader.

The two case distinction can then be applied as for the altruistic leader with the proviso that

$\overline{p} = 0$ is never optimal as the first derivative of the payoff function is strictly positive at zero. Thus, if a corner solution is optimal, it is $\overline{p} = \tilde{p}^{max}$.

Again, in case of an interior solution we are interested in the impact of α on the optimal weight set by the leader. The impact of α on $\overline{p}$ is determined by

$$\frac{\partial \overline{p}}{\partial \alpha} = -\frac{\frac{\partial \hat{f}(\overline{p};\alpha)}{\partial \alpha} + \overline{p}\frac{\partial^2 \hat{f}(\overline{p};\alpha)}{\partial \overline{p}\partial \alpha}}{2\frac{\partial \hat{f}(\overline{p};\alpha)}{\partial \overline{p}} + \overline{p}\frac{\partial^2 \hat{f}(\overline{p};\alpha)}{\partial \overline{p}^2}}$$

We know that the denominator is negative and so

$$sign\left(\frac{\partial \overline{p}}{\partial \alpha}\right) = sign\left(\frac{\partial \hat{f}(\overline{p};\alpha)}{\partial \alpha} + \overline{p}\frac{\partial^2 \hat{f}(\overline{p};\alpha)}{\partial \overline{p}\partial \alpha}\right).$$

Recall that

$$\frac{\partial H^*}{\partial \alpha} = -\frac{f'(H^*)}{\alpha f''(H^*)}.$$

The numerator can then be written as

$$f'(H^*)\frac{\partial H^*}{\partial \alpha} + \overline{p}\left\{f''(H^*)\frac{\partial H^*}{\partial \overline{p}} + f'(H^*)\frac{\partial^2 H^*}{\partial \overline{p}\partial \alpha}\right\}$$

$$=\frac{[f'(H^*)]^2}{\alpha f''(H^*)} + \overline{p}\left\{\frac{c_1}{\alpha}\frac{-f'(H^*)}{\alpha f''(H^*)} + f'(H^*)\frac{-c_1}{[\alpha f''(H^*)]^2}\left[f''(H^*) + \alpha f'''(H^*)\frac{\partial H^*}{\partial \alpha}\right]\right\}$$

$$=-\frac{[f'(H^*)]^2}{\alpha f''(H^*)}\left\{f'(H^*) + \overline{p}\frac{c_1}{\alpha}\left[2 - \frac{f'(H^*)f'''(H^*)}{f''(H^*)^2}\right]\right\}.$$

For this term to be positive it has to be the case that

$$f'(H^*) + \overline{p}\frac{c_1}{\alpha}\left(2 - \frac{f'(H^*)f'''(H^*)}{[f''(H^*)]^2}\right) > 0. \tag{29}$$

We know from equation (28) that equation (29) holds for any interior solution, which implies $\frac{\partial \overline{p}}{\partial \alpha} > 0$ as required.