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Abstract

Alcohol consumption patterns vary across Europe. Northern Europeans frequently engage in excessive drinking in social situations (EDSS), behavior less common in southern Europe. We develop a model to explore whether these behavioral differences could be rooted in genetic variations across Europe and then compounded by social reinforcement mechanisms. Our results suggest conditions exist in which EDSS can emerge as a strategy in a larger fraction of the population than is genetically predisposed to EDSS. Implications for the current effort to harmonize alcohol policy across the European Union are explored.

JEL codes: I12, Z13

Keywords, genetics, substance abuse, social norms, adaptive preferences.

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Introduction

A significant variation exists in alcohol consumption patterns across the world. In Europe, for instance, a distinguishing pattern is illustrated by the difference between drinking habitats in northern versus southern Europe. Northern Europeans frequently engage in excessive drinking in social situations (EDSS); a practice less common in southern Europe. Herein we examine whether the differences in behavior could be rooted in genetic variations across the European continent, compounded by social reinforcement mechanisms. We ask whether genetically induced behavior may aggregate into the formation of social norms; and whether spatially distributed genetic variations help explain observable variations in social norms. The genetically induced behavior we study is shyness. Shyness is in part hereditary and has a physiological and measurable manifestation in the chemistry of the brain. Our results suggest conditions exist in which EDSS emerges as a coping strategy in a larger fraction of the population than is genetically predisposed to EDSS. When social norms have genetic causation, these norms can then affect the behavior of people who do not share the genes that cause the behavior.

There is an emerging economic literature that uses results from neuroscience to explain both behavior and preferences (see Camerer *et al.* (2003) for a general overview of issues and results). This approach seems particularly pertinent when examining preferences for addictive substances as these preferences are formed by substances chemically affecting the production and functioning of neurotransmitters. Rangel and Bernheim (2003) have studied individual decision making in a model that explicitly recognizes how dopamine may lead to cue-dependent preferences for alcohol consumption and how such a process could lead to and sustain alcoholism. Our study differs from theirs in several respects. They are concerned with alcoholism and individual choice, along the tradition of

Becker and Murphy (1988). Our study is concerned with EDSS,¹ in which the neuro-chemical agent is norepinephrine. Norepinephrine is strongly associated with the physiological manifestation of anxiety and therefore relevant for shyness; whereas dopamine plays a role in the brain's perception of present and future pleasure derived from consumption. Furthermore, we focus on alcohol and neurochemistry in a social context with interacting agents, whereas Rangel and Bernheim focus on individual decision making. This does not mean that they disregarded social context; they consider how a person chooses an environment from a set of possible environments each with different implications for alcohol preferences. This set, however, is exogenous. In our model, the environment changes in response to changes in the aggregate of individual behavior.

Determinants of alcohol use in Southern & Northern Europe

A comprehensive study by Leifman (2002) confirms the mind-set that significant differences actually exist in drinking patterns across regions. The study finds that although the frequency of alcohol consumption occasions and average annual consumption figures are lower in the Nordic countries, excessive drinking in social situations (EDSS) is more predominant in northern Europe than in the South.² We now present our argument in five steps to explain how genetic variations translate into frequent EDSS in northern Europe. The link of causality follows:

1. In a comprehensive study of shyness, Kagan (1994) found an active norepinephrine system, originating in the part of the brain called amygdale, to be highly correlated with shyness. Remarkably, Kagan also observed a correlation between an active norepinephrine system and several external physiological characteristics, the most prominent being

¹ There is obviously a link between EDSS and alcoholism. However, many individuals engage frequently in EDSS over a number of years or even a lifetime without ever becoming alcoholics.

² Leifmann also finds signs of a convergence in drinking patterns between southern and northern Europe and suggests that this may be caused by increased cultural interaction.

blue eyes and tall ectomorphic bodies. The association between blue eyes and shyness has been replicated in male preschoolers by Coplan *et al* (1998) who found that 30 percent of blue eyed males fell into the category ‘socially wary’ whereas only three percent of the males without blue eyes did. These physiological features are more common in northern European countries than in the south. This suggests that one may reasonably expect that shyness is more common among people of northern Europeans decent than southern Europeans. Schwartz *et al.* (2003) observed that the shy individuals in an earlier study by Kagan had a tendency to remain shy; and this shyness continued to manifest itself in the amygdala. This point matters for our purposes since it indicates that observed variations in shyness among children will partially continue into the age when alcohol consumption starts.

2. Several coping strategies exist for shyness in social situations. The classic strategy is to use alcohol as self-medication, which can lead to excessive drinking, i.e., EDSS. Many studies confirm this view.³
3. Given steps 1 and 2, it follows a larger fraction of the population in northern Europe should have a greater genetic disposition for EDSS.
4. If the fraction of the population with EDSS genetic disposition is sufficiently large, social reinforcement mechanisms could come into play.

³ See, for example, Carrigan and Randall (2003) who review the social phobics literature and Thomas *et al.* (2003) who examine the case of socially anxious people. It should be pointed out that these studies also report rather mixed results in the effectiveness of self-medication. These studies are from the medical and psychology literature. Of course, the suggestion that self-medication has mixed results does not imply non-optimality in the economic sense. Alcohol as self-medication is the optimal strategy given the prices of alternative coping strategies. We are concerned with the idea that people actually use this strategy with the expectation that it will work, see Kushner *et al.* (2000). Also remember we are concerned with EDSS, not alcoholism. Although a relationship between shyness and alcoholism has been reported, the relationship is not straightforward, Lépine and Pélissolo (1998), and not addressed herein.

People frequently adapt to the behavior of others, Banerjee (1992). If EDSS is atypical, it is considered anti-social. If EDSS is relatively common, it has a “legitimizing” effect and EDSS becomes socially acceptable. A fundamental property of humans is that social behavior is learned. The simplest way to learn social behavior is to mimic it. If EDSS is prevalent, it could spread to people without a genetic disposition for shyness. EDSS then becomes a norm for behavior of shy and non-shy people.

5. If steps 1-4 hold, we should observe a larger fraction of the population that engages in EDSS in northern Europe than in southern Europe. Our social norm hypothesis is that EDSS will emerge as a strategy in a larger fraction of the population than the fraction genetically predisposed to EDSS.

To prove the viability of our hypothesis in step 5, we now consider whether steps 1-4 are supported theoretically or empirically. Steps 1 and 2 follow from the referenced studies. Step 3 follows arithmetically from steps 1 and 2. The first part of step 5 is documented by Leifman (2002); large fractions of people in Scandinavia and Britain routinely engage in EDSS, whereas amongst people in Mediterranean countries the phenomenon is relatively rare. Finally, if we can establish a theoretical argument for step 4, one can construe our hypothesis is plausible. We now develop such a model.

A model of the emergence of EDSS as a social norm

Here we develop a model of how social interaction between people in a group leads to the formation of a social norm for excessive drinking. First, the analysis is done under the assumption that all individuals participate in social situations. Thereafter, we add realism to the model by assuming that some individuals may choose to exit from social situations if their drinking behavior is too removed from the social norm.

Suppose two types of people exist (type 1 and 2). The types are distinguished by the level of alcohol consumption that provides a “comfortable” level of intoxication in social situations, as measured by blood alcohol content (BAC). Type 1 drinkers are comfortable with a BAC of α ; type 2 drinkers prefers $\alpha + f(\alpha)$. Think of α as the physical “comfort” level of intoxication, and $f(\alpha)$ as the extra “buzz” required by a shy person to be comfortable in a social situation. Our modeling of the shyness effect is consistent with the dose-related effect of alcohol on reducing stress, Sher and Walitzer (1986).

Assume $f'(\alpha) < 0$, i.e., if α is large, $f(\alpha)$ is small. This assumption reflects the idea that if a shy person is comfortable with a high BAC, his need for an extra “buzz” to cope with the social situation is relatively small. To gain additional insight, assume $f(\alpha)$ has the functional form:

$$f(\alpha) = \max\left\{\frac{\beta}{\alpha + \varepsilon} - \pi, 0\right\} \quad (1)$$

Assume $\frac{\beta}{\varepsilon} > \pi$. If $\alpha = 0$ (i.e., the person is not physically comfortable with alcohol at all), then $\frac{\beta}{\varepsilon} - \pi$ captures the level of intoxication required to feel comfortable in social settings. We interpret $\beta/\varepsilon - \pi$ as a measure of the strength of the shyness effect. The larger β , the more alcohol a shy person needs to feel comfortable in social situations. If $\alpha > \pi^{-1}(\beta - \pi\varepsilon)$, the shyness effect vanishes. The physical comfort level of alcohol is so large such that if $c = \alpha$, no additional drinking is required to cope with the shyness.

Normalize the number of drinkers to unity, such that n is the non-shy fraction of the population of type 1 and $(1 - n)$ is the shy fraction of type 2. Both types have preferences for conformity in that they do not want to be perceived as different from the norm. This preference translates into a desire to not deviate from the drinking norm, here taken to be the average drinking levels, denoted σ . A parameterization of these preferences is:

$$U(c) = -(c - z)^2 - \gamma(c - \sigma)^2, \quad (2)$$

where z is α_1 for type 1 and $[\alpha_2 + f(\alpha_2)]$ for type 2 drinkers. Let $\gamma > 0$, measure of the desire for conformity with the crowd. The value of γ can reflect a desire to “be like the others” through real or perceived peer pressure. The peer pressure may be positive as in Bernheim (1994) or negative as in Akerlof (1980). Pressure can also reflect positive mutual externalities in conformity caused by something as prosaic as the belief it is less fun to be sober while others are not and vice versa. If $\gamma = 0$, a drinker does not care about conforming. If $\gamma > 0$, a drinker pays attention to the average level of intoxication.⁴ Denote c_i , $i = 1, 2$, as the optimal alcohol consumption of type i . Think of the model as a large population in which people continuously mixed with new people. The alcohol consumption levels that maximize utility as a function of α_i and σ are given by:

$$c_1 = \frac{\alpha_1 + \gamma\sigma}{1 + \gamma}, \quad c_2 = \frac{\alpha_2 + f(\alpha_2) + \gamma\sigma}{1 + \gamma} \quad (3)$$

By definition, $\sigma = nc_1 + (1 - n)c_2$, so in equilibrium σ is determined by:

$$\sigma = n \frac{\alpha_1 + \gamma\sigma}{1 + \gamma} + (1 - n) \frac{\alpha_2 + f(\alpha_2) + \gamma\sigma}{1 + \gamma} \quad (4)$$

Solving Equation (4) with respect to σ , yields the equilibrium value of average alcohol intoxication.

$$\sigma = n\alpha_1 + (1 - n)\alpha_2 + (1 - n)f(\alpha_2) \quad (5)$$

Inserting for σ into (3) gives the equilibrium level of intoxication for the two types:

⁴Assume nobody is a role model, and alcohol consumption levels are determined without strategic considerations and that inter-temporal strategic considerations do not affect the outcome. Alcohol price is excluded in our analysis. Although we recognize and appreciate that alcohol prices are important in any person’s decision problem, we suppress price effects to focus on the interaction between personality and consumption (see Becker, Grossman and Murphy, 1991).

$$c_1 = \frac{(1 + \gamma n)\alpha_1}{1 + \gamma} + \frac{\gamma(1 - n)(\alpha_2 + f(\alpha_2))}{1 + \gamma} \quad (6)$$

$$c_2 = \frac{\gamma n \alpha_1}{1 + \gamma} + \frac{(1 + \gamma(1 - n))(\alpha_2 + f(\alpha_2))}{1 + \gamma} \quad (7)$$

From Equation (6) we see the preference for conformity affects intoxication levels for both types of drinkers. Type 1s drink more than their comfort level, α_1 , and Type 2s drink less than their preferred level $\alpha_2 + f(\alpha_2)$. If $f(\alpha_2)$ is sufficiently large, this can translate into a considerable increase in average alcohol consumption per person in social situations.

We have so far assumed α_1 and $\alpha_2 + f(\alpha_2)$ constant. But the “feel-good” level of intoxication, α_i , responds to values of c_i consistently above or below α_i , NIAAA (2000). This adaptation occurs on a neuro-chemical level and is the reason why heavy drinkers exhibit high tolerance for alcohol. Thus preferences are adaptive as in von Weizsäcker (1971). We model this adaptation, which is physiological in nature, by assuming α_1 and α_2 are determined by the following differential equations.

$$\dot{\alpha}_i = f(c_i - \alpha_i)h(M - \alpha_i), \quad i = 1, 2 \quad (8)$$

where M is a physiologically determined upper bound for α_i . No drinker can achieve a comfort level of drinking when $\alpha_i > M$. Assume $f(0) = h(0) = 0$. Furthermore, let $f'(\cdot) > 0$ and $h(M - \alpha_i) > 0$ for all $\alpha_i < M$.

We now have all the pieces to model the dynamic interaction of people who engage in repeated social intercourse involving drinking. When analyzing the problem, we distinguish between two cases: $M > \pi^{-1}(\beta - \pi\varepsilon)$ and $M < \pi^{-1}(\beta - \pi\varepsilon)$. If $M > \pi^{-1}(\beta - \pi\varepsilon)$, two steady states exist. If $M < \pi^{-1}(\beta - \pi\varepsilon)$, one steady state exists. In both cases, there is only one stable steady state, which is given by $\alpha_1 = \alpha_2 = \min[M, \pi^{-1}(\beta - \varepsilon\pi)] = m$.

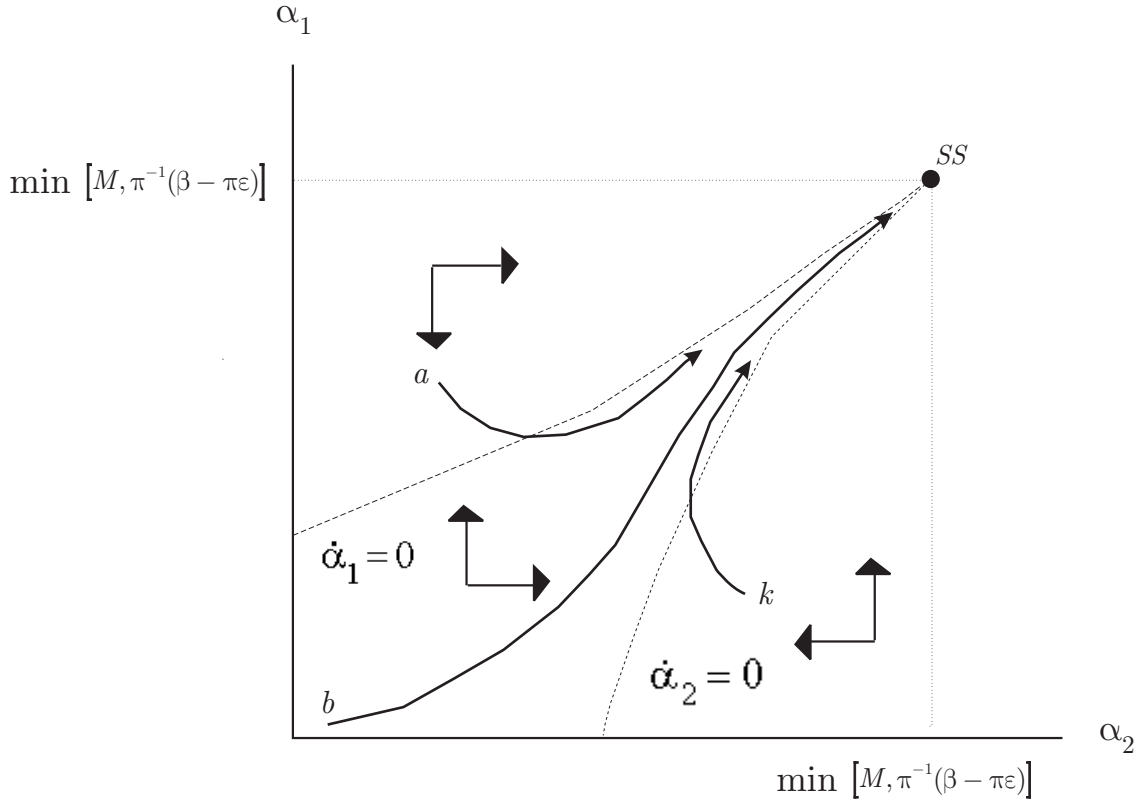


Figure 1, Phase diagram for α_1 and α_2

Figure 1 is a phase diagram for possible time path of α_1 and α_2 , in which we illustrate three paths, a , b and k . In Figure 1, we see every path in the state-space defined by $[0, m] \times [0, m]$ terminates in the one steady state, point SS . It should be noted that lines $\dot{\alpha}_1 = 0$ and $\dot{\alpha}_2 = 0$ cannot intersect except at the point SS .

This is a striking result. If $m = M$, everyone will, in the long run, adapt to a level of intoxication that is the maximum physical level at which it is possible to be comfortable. If $m = \pi^{-1}(\beta - \epsilon\pi)$, the shy fraction of the population adapts to the level in which the shyness effect disappears, and the rest of the population also adapts to this level. In the long run for both cases, the shyness effect equilibrium implies that the non-shy population mimics the drinking habits of shy people (i.e, $c_1 = c_2 = m$). Moreover, this result holds for all positive

parameter values.⁵ Now assume $\alpha_1 = \alpha_2 = \bar{\alpha}$, where $\bar{\alpha}$ is some common low initial comfort level. Figure 2 now illustrates the development of c_1 and c_2 . We see c_2 starts out at a higher level than c_1 . This is the initial shyness effect. Then c_2 increases at an initially faster rate than c_1 , which is caused by feedback from the effect of c on α . Since $c_2(0) > c_1(0)$, α_2 initially increases more rapidly than α_1 . This effect causes the path starting in point b in Figure 1 to initially “bulge” towards the α_2 -axis. Faster growth in α_2 than α_1 initially feeds back into higher growth rates in c_2 than c_1 . As α_2 approaches its saturation point, growth in c_2 diminishes and c_1 catches up.

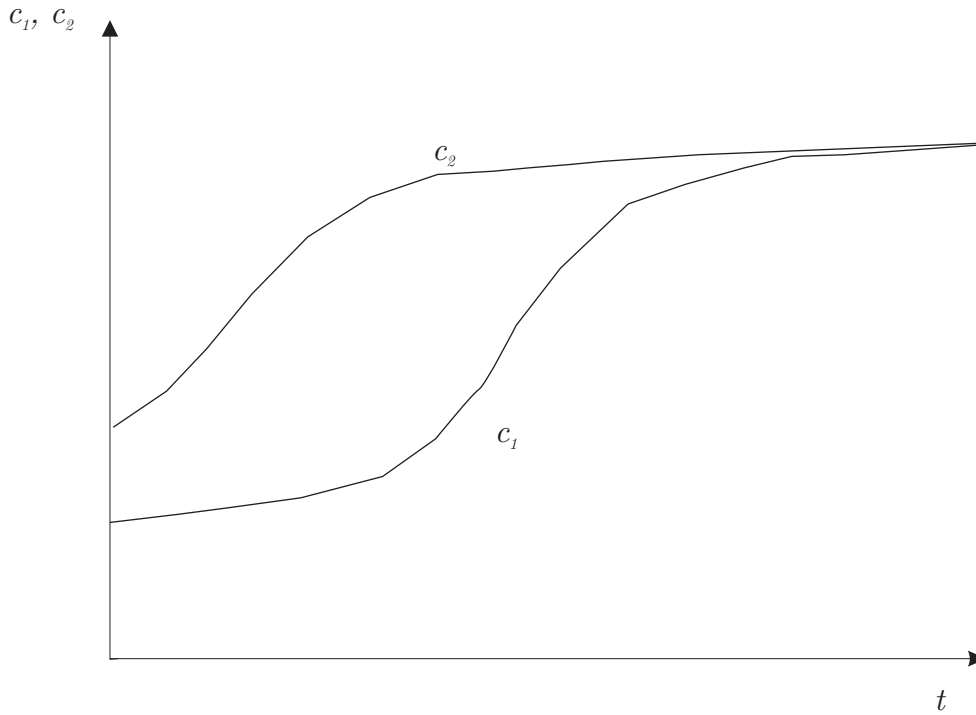


Figure 2, Alcohol consumption time paths

⁵ In contrast, if no shyness effect exists (e.g. if $n = 1$ or $\beta = 0$) or there is no preference for conformity ($\gamma = 0$), we know any initial level of α_1 represents a steady state and consumption for the non-shy fraction of the population remains at this level.

Norm Formation given Exit

We now consider the case in which people can exit from the social situation, i.e., too much drinking might cause non-shy people to leave a party; too little might cause shy people to stay home.⁶ We model exit by providing shy people an outside option, e.g. staying at home on Saturday nights watching TV.⁸ Assume exercising this option gives a utility $-A$. A shy person's maximization problem is:

$$\max \left[\max_{c_2} \left(- \left(c_2 - \left(\alpha_2 + f(\alpha_2) \right) \right)^2 - \gamma (c_2 - \sigma)^2 \right), -A \right] \quad (9)$$

Inserting σ and c_2 from (5) and (7) into (9), we derive values for (α_1, α_2, n) that makes a shy person indifferent between the social activity and exiting:

$$\phi(\alpha_1, \alpha_2, n, A) = 0 \quad (10)$$

If $\phi(\alpha_1, \alpha_2, n, A) > 0$, shy people participate; otherwise, they exit.⁹ Figure 3 illustrates the condition in (α_1, α_2) space. For given values of n and A , the value of α_1 that makes a shy person indifferent is a concave function of α_2 .

⁶ We do not incorporate exit as an option for Type 1 individuals as this case does not seem to be empirically relevant.

⁸ We do not specify the behaviour of shy people after they have exited social situations. We assume their behaviour outside the social context does not affect behaviour of individuals that remain on the social scene.

⁹ To simplify, we assume if $\phi = 0$, shy people do not participate.

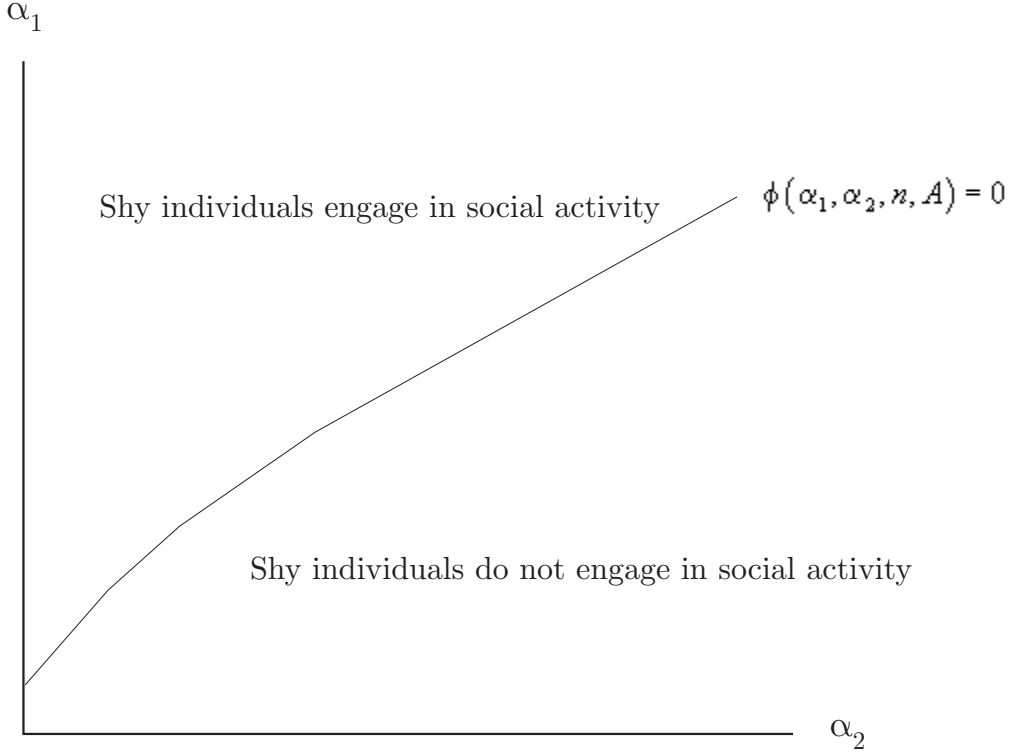


Figure 3, Participation constraint for shy individuals.

Recall at any instant in time, α_1 and α_2 determine c_1 and c_2 . If (α_1, α_2) lies above the curve $\phi(\alpha_1, \alpha_2, n, A) = 0$, shy people exit.¹⁰ The dynamics of α_1 and α_2 depend on whether $(\alpha_1(t), \alpha_2(t))$ falls below or above $\phi(\alpha_1, \alpha_2, n, A) = 0$.

To illustrate how exit affects behavior, assume $\alpha_1 = \alpha_2 = \bar{\alpha}$ (as point b in Figure 2). If $(\alpha_1(t), \alpha_2(t))$ is above ϕ , $(\alpha_1(t), \alpha_2(t))$ traces a path similar to k in Figure 1. If $(\alpha_1(t), \alpha_2(t))$ is below ϕ , shy people exit. Non-shy people still socialize, without the pressure to conform since all shy people are gone. Non-shy people all choose $c_1 = \alpha_1$. Thus below the curve, the dynamics of α_1 is:

¹⁰ We draw the curve $\phi(\alpha_1, \alpha_2, n, A) = 0$ in Figure 3 such that the curve intersects the α_1 - axis for a positive value of α_1 . This is not always the case. For sufficiently large values of A , the cost of exiting is too large and shy people participate for any value of α_1 . This implies the curve intersects the α_1 axis with a positive value of α_1 . In contrast, if $A = 0$, for all sufficiently low values of α_1 , shy people exit and the curve intersects the α_2 axis.

$$\dot{\alpha}_1 = f(c_1 - \alpha_1)h(M - \alpha_1) \quad (11)$$

If $(\alpha_1(t), \alpha_2(t))$ crosses ϕ , this implies a discrete jump in alcohol consumption for both groups. If $(\alpha_1(t), \alpha_2(t))$ crosses the ϕ from above, alcohol consumption in both groups has a discrete jump downwards and vice versa.

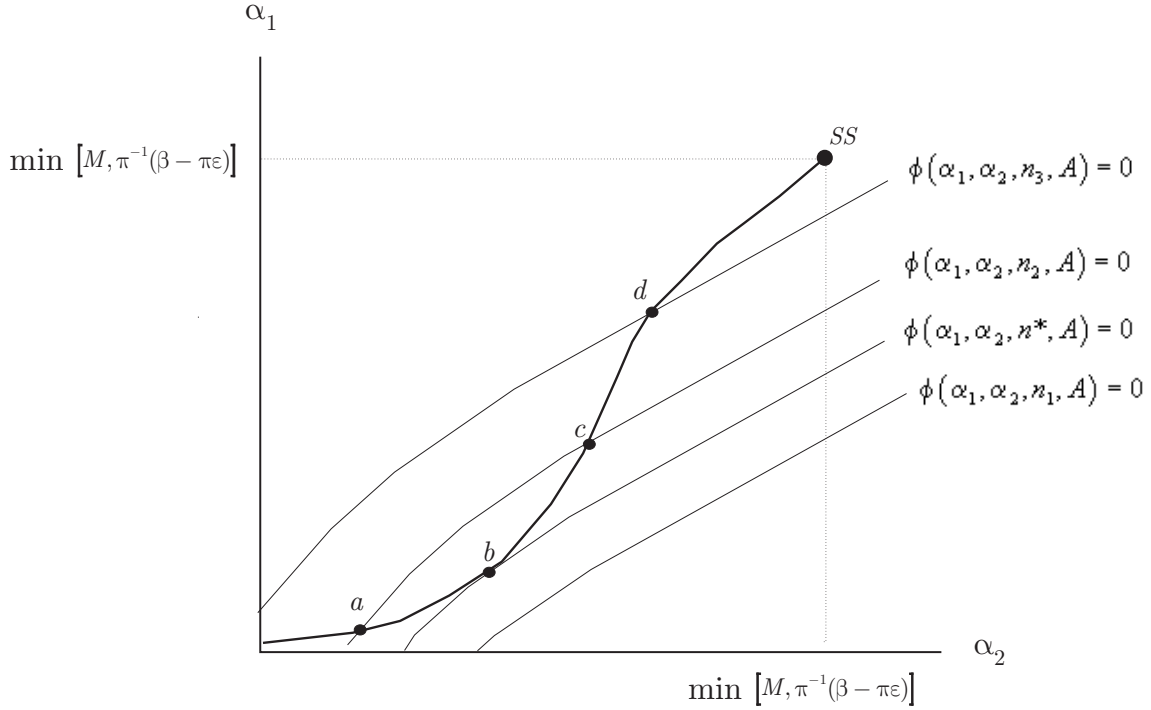


Figure 4, The dynamics of α_1 and α_2 for different values of n

Given exit, consider the comparative static on how the fraction of non-shy people (n) affects the formation of drinking norms. In Figure 4, the thick line from origin to the point SS references the benchmark no-exit path of $(\alpha_1(t), \alpha_2(t))$ for a starting point close to origin. There are four lines illustrating the ϕ -curve for different values of n . The figure is drawn so $n_1 < n^* < n_2 < n_3$. The curve $\phi(\alpha_1, \alpha_2, n_3, A) = 0$ corresponds to the case with the smallest fraction of shy people; $\phi(\alpha_1, \alpha_2, n_1, A) = 0$ corresponds to the largest fraction.

Consider first the largest fraction of shy people, $\phi(\alpha_1, \alpha_2, n_3, A) = 0$. Since $(\alpha_1(0), \alpha_2(0))$ lies below the ϕ -curve, shy people never enter social situations.

Non-shy people have no pressure to conform, and consume $c_1 = \alpha_1$. It follows that $\dot{\alpha}_1 = 0$. This can be dubbed the *sober/temperate society*.¹¹

Second, consider the smallest fraction of shy people ($n = n_1$). Here we see the path of $(\alpha_1(t), \alpha_2(t))$ lies in its entirety above the path 0-SS. $(\alpha_1(t), \alpha_2(t))$ proceeds along the path towards *SS*, and is identical to the no-exit path—the *binge society*.

Third, the intermediate case ($n = n_2$) reveals an interesting pattern. Here shy people do not exit immediately. But since α_1 and c_1 grows slower than α_2 and c_2 , shy people acquire drinking habits that diverge from non-shy people. After an initial period, $(\alpha_1(t), \alpha_2(t))$ reaches point *a*, and shy people then exit. Non-shy people remain and without incentive to adapt to non-shy drinking habits, they reduce their alcohol consumption, $\dot{\alpha}_2 = 0$ —the *tipsy society*, since we see a small increase in alcohol consumption among non-shy people.

Finally, consider the threshold case, $n = n^*$. For $n < n^*$, alcohol consumption approaches a steady state with excessive drinking (point *SS*). For $n \geq n^*$, there are moderate or no increases in the long run steady state drinking levels among non-shy people. Figure 5 shows the relationship between n and steady state values of α_1 .¹²

¹¹ If $(\alpha_1(0), \alpha_2(0))$ had values of α larger than point *d* in Figure 4, this implies a path towards *SS*. But this result could only occur if circumstances outside the model forced $(\alpha_1(0), \alpha_2(0))$ there. The historical role of alcohol as an extremely practical medium to store calories could possibly have brought this about in some societies.

¹² We do not shown the relationship between n and steady state values of α_2 , because we have left unspecified the drinking behaviour of shy people if they exit.

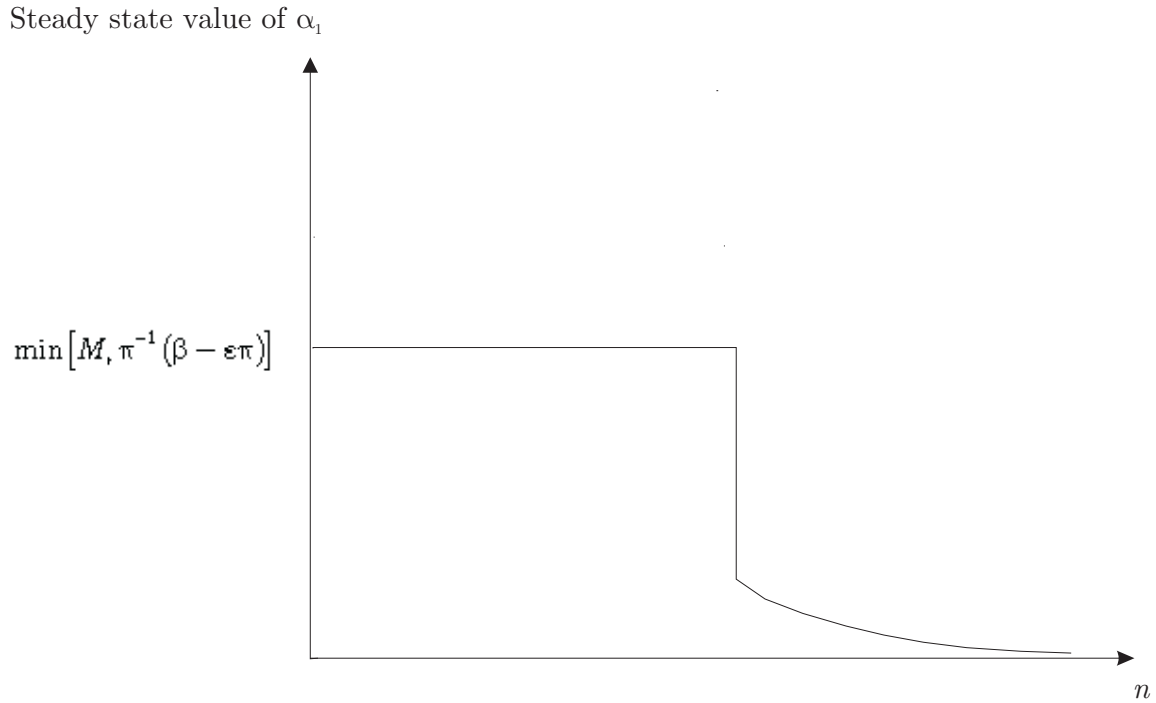


Figure 5, Relationship between n and steady state values of α_1 .

Mixing Populations – Convergence in Drinking Patterns

It is the ambition of the European Union to harmonize alcohol policy across member countries (e.g., Economist, 2003). This policy has in part been implemented through raising the limit of the maximum allowed amount a traveler may transport between member countries (see for example, Rehn, 2001). This particular choice of policy explains why northern European countries in the last decade have repeatedly lowered alcohol taxes. Reduced prices have predictably led to higher consumption. The open question is how European alcohol consumption in social situations will be affected by increased northern European exposure to more “civilized” Mediterranean drinking culture. We explore this question by introducing a third type of person. As before, two types live in a culture with shyness: type 1 is non-shy, type 2 is shy. Assume both types start from a steady state, in which $\alpha_1 = \alpha_2 = \min[M, \pi^{-1}(\beta - \epsilon\pi)]$. This culture has reached a state in which EDSS is the social norm.

The new type, 3, comes from a culture in which shyness does not affect drinking in social situations and bingeing is not the social norm. For simplicity, assume the cost of exiting social situations is large enough to prohibit exit when the two cultures meet. Let the steady state value of α_3 prior to exposure to type 1 and 2 be $\bar{\alpha}_3 < \min[M, \pi^{-1}(\beta - \varepsilon\pi)]$.

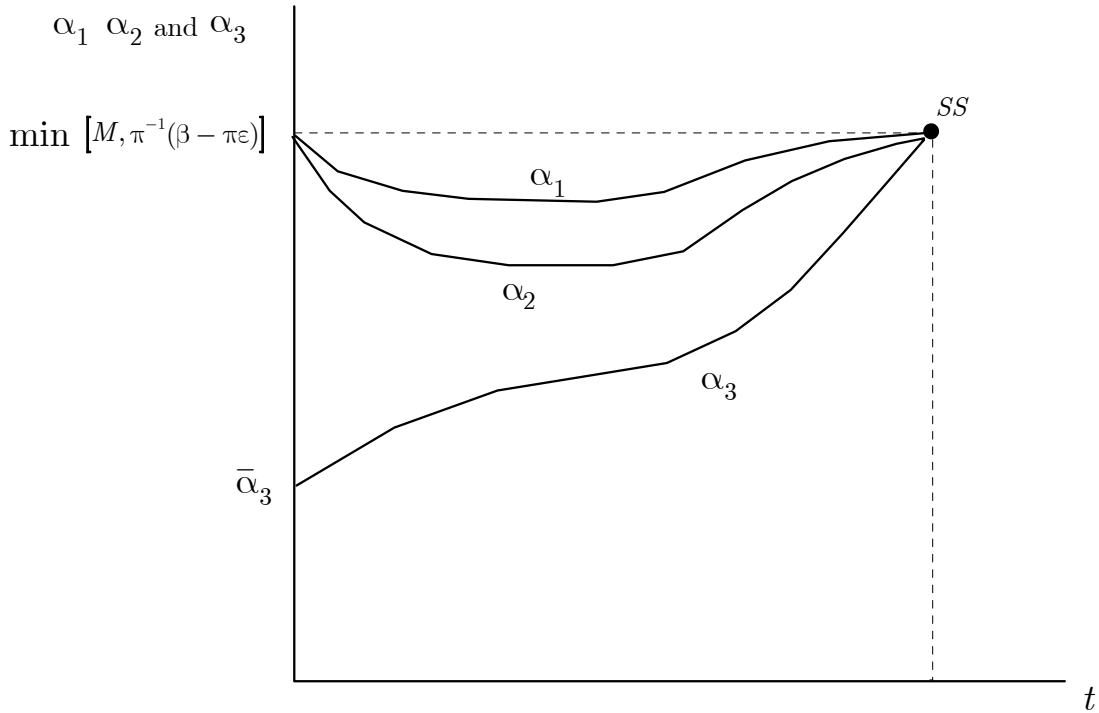


Figure 6, Paths of α_i when mixing populations

Our model predicts the initial response of cultural mixing is for the high-drinking culture to reduce drinking and therefore also show decreasing values of α . This initial response is consistent with Leifmann's finding of a convergence with reduced levels of EDSS in northern countries and increased EDSS in southern countries. But our model predicts that over time this initial effect is fully reversed. One can show if these two cultures are mixed, the development of α_1 , α_2 and α_3 is qualitatively similar to the paths in Figure 2. We still see convergence, but the low-drinking culture monotonously increases consumption and also α_3 until it fully mimics the high-drinking culture, i.e., southern European countries could have levels of EDSS similar to northern countries.

How drinking patterns play out over time in the EU remains to be established empirically. It has been reported that teenagers in Spain are starting to mimic drinking behavior of northern European teenagers (see Gual and Colom, 1997). If our predictions are valid, current EU policy and the cultural integration of Europe could in conjunction lead to EDSS as a norm for more of Europe. A formal welfare analysis of such a change is beyond the scope of this paper. But it should be noted that binge drinking is associated with certain types of crime and accidents. The spread of EDSS as a norm is therefore expected to be socially costly.

Genetics and the Emergence of a Social Norm

Our model has treated the higher frequency of shyness among northern Europeans as a given, without explaining why. The model is built on the assumption that a fraction of shy people exists within a population and the cause of shyness is not required to get our results. Several studies, however, have related shyness to genetic factors, even down to reporting correlations with specific variants of genes (see Arbelle *et al.*, 2003). The correlation between shyness and external physiological features also seems to indicate that genetics at least plays a part. A link between personality and pigmentation has been reported in certain animals, strengthening the argument for a genetic link in humans.

Kagan, for instance, suggests northern Europeans have an active norepinephrine system due to the cold climate. In a cold climate, there is a fitness gain to physiological adaptations that encourage high metabolic rates. One such adaptation is an active norepinephrine system caused by neuro-chemical processes in the amygdala. This explanation suggests an evolutionary genetic selection process explains why shyness is more frequent in northern Europe. Furthermore, shyness in itself is not the trait selected for, but rather a side effect to a high metabolic rate.

If genes are responsible for geographical variations in shyness, our results have some intriguing implications. First, our model suggests variations in the

frequency of certain genes may explain geographical variations in individual behavioral as adaptation to genetic baggage. Second, these adaptations may aggregate into social norms and provide a genetic explanation for variations in social phenomena. Third, the social norm is only loosely connected to the trait that has an advantage in an evolutionary selection process. In this perspective it is somewhat ironic that southern Europeans often attribute the EDSS behavior in northern Europe to “living in a cold climate”. The argument is living in the cold makes people drink too much. If Kagan is correct in his hypothesis of how a high frequency of shy individuals in northern Europe has evolved, this may, in a roundabout sort of way, actually be supportable. It is an open question whether the emergence of EDSS in itself provides some evolutionary advantage. At a first glance the answer appears to be “no” since mortality risk arises with EDSS. Alternatively, the short term gains from applying a social lubricant that promotes interaction between people in a population with many shy individuals may outweigh the long term costs of mortality risk on both a social and a personal level. This remains to be established in future work.

Concluding remark

We show by example how geographical variations in the distribution of personality may be compounded by social reinforcement mechanisms to affect behavior of all individuals in a social group. The example we study is variations in drinking patterns in social situations. Our findings have implications on many levels. Our study is the first that we know of to report a plausible link between genetically founded individual preferences and social norms governing behavior of all individuals. Further, we show this link is not smooth but may exhibit threshold effects. Our findings have potential implications for alcohol policy in individual European countries and for the notion of an integrated policy for the European Union.

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