CEPA DP No. 18

MAY 2020

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CEPA Discussion Papers

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ISSN (online) 2628-653X

CEPA Discussion Papers can be downloaded from RePEc
https://ideas.repec.org/s/pot/cepadp.html

Published online at the Institutional Repository of the University of Potsdam
https://doi.org/10.25932/publishup-46979

CEPA Discussion Paper No. 18 May 2020

Drinking is Different! Examining the Role of Locus of Control for Alcohol Consumption*

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ABSTRACT

Unhealthy behavior can be extremely costly from a micro- and macroeconomic perspective and exploring the determinants of such behavior is highly important from an economist's point of view. We examine whether locus of control (LOC) can explain alcohol consumption as an important domain of health behavior. LOC measures how much an individual believes that she is in control of the consequences of her own actions for her life's future outcomes. While earlier literature showed that an increasing internal LOC is associated with increased health-conscious behavior in domains such as smoking, exercise or diets, we find that drinking seems to be different. Using German panel data from the Socio-Economic Panel (SOEP) we find a significant positive effect of having an internal LOC on the probability of moderate and regular drinking. We suggest and discuss two likely mechanisms for this relationship and find interesting gender differences. While social investments play an important role for both men and women, risk perceptions are especially relevant for men.

Keywords: locus of control, alcohol consumption, health behavior, risk perception, social investment
JEL Codes: I12, D91

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* The authors are grateful to Deborah Cobb-Clark, Daniel Graeber, Jan Marcus, Ronnie Schöb, Nicolas Ziebarth and participants at the ESPE 2019 in Bath as well as research seminars at Victoria University of Wellington and University of Otago for helpful comments.

1 Introduction

Unlike other practices of unhealthy behavior such as smoking, physical inactivity, unhealthy diet, substance abuse or risky sexual behavior, alcohol consumption is still largely accepted within most societies. According to data from the World Health Organization, 71.7 percent of Americans and 79.4 percent of Germans over the age of 15 consumed alcohol in 2016. In the same year, the rate of lifetime abstainers was 9.2 percent and 7.9 percent, respectively, and thus vanishingly low. At the same time, a huge body of literature spanning multiple fields (including medicine and social sciences) has empirically identified severe negative direct and indirect effects of regular alcohol consumption and binge drinking on mental and physical health (see e.g. Marcus and Siedler, 2015; Carpenter and Dobkin, 2017; Grønbæk, 2009; Boffetta and Hashibe, 2006; Merikangas *et al.*, 1998; Corrao *et al.*, 2004) as well as social and economic outcomes (see e.g. Francesconi and James, 2019; Jones and Richmond, 2006; Macdonald and Shields, 2004; Terza, 2002; Ohsfeldt and Morrisey, 1997; Mullahy and Sindelar, 1993, 1996). Like behavior in other health domains, drinking can cause considerable micro- and macroeconomic costs, e.g. through the strain that it places on public healthcare and safety expenditures, as well as individual labor market outcomes. The estimated economic burden of excessive alcohol consumption in the US was $249 billion in 2010 (Sacks *et al.*, 2015).

Nevertheless, one notable distinction between alcohol consumption and other forms of unhealthy behavior is the important differentiation between different levels of "unhealthiness". The medical literature is much less united in the discussion about health effects of moderate drinking, with many studies finding positive effects of moderate drinking on especially cardiovascular diseases (Grønbæk, 2009; Rehm *et al.*, 2001; Renaud *et al.*, 1998; Peters *et al.*, 2008; Ronksley *et al.*, 2011). Moreover, the economic literature has also found a clear quadratic relationship between alcohol consumption and economic outcomes, with moderate levels of drinking being associated with higher earnings and employment probabilities (Ziebarth and Grabka, 2009; Peters and Stringham, 2006; Ours, 2004; Macdonald and Shields, 2001).

Hence, explaining the determinants of drinking as well as differentiating between different intensities of alcohol consumption is important in enabling policy-makers to tackle its unwanted costs. In this paper, we investigate the role of locus of control (LOC) on indi-

vidual alcohol consumption. LOC can be characterized as a *"generalized attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences"* (Rotter, 1966), describing whether individuals believe in the effects of their own actions on their life's future outcomes. While an individual with an internal LOC believes that she is in control of the consequences of her own actions, an external individual attributes her life's outcomes to luck, chance, fate or other external forces. LOC has already been shown to have an important effect on behavior and decision-making in areas such as human capital investment (Coleman and DeLeire, 2003; Caliendo *et al.*, 2020), job search effort (Caliendo *et al.*, 2015; McGee and McGee, 2016), labor force participation (Hennecke, 2020), savings (Cobb-Clark *et al.*, 2016), occupational attainment (Heywood *et al.*, 2017; Cobb-Clark and Tan, 2011), entrepreneurial activity (Caliendo *et al.*, 2014), labor market mobility (Caliendo *et al.*, 2019) and investment behavior (Salamanca *et al.*, 2016; Pinger *et al.*, 2018).

Cobb-Clark *et al.* (2014) identify a positive relationship between LOC and "healthy" behavior in terms of reduced smoking, healthier diet and more exercise, but also a counter-intuitive relation between having an internal LOC and being more prone to participate in binge drinking. We extend their analysis by drawing a more detailed picture on the special case of drinking behavior: put simply, we ask whether drinking is different. We do this in two steps, first by showing empirically that an internal LOC is indeed associated with a higher probability of reporting moderate or regular drinking even if we control for an extensive list of control variables such as socio-economic information, health status and other personality and preference measures. Our estimations are based on extensive information available in the Socio-Economic Panel (SOEP, 2017), a large representative household panel from Germany. Men with a medium or high internal LOC are, on average, about 4% more likely to be moderate or regular drinkers compared with men with a low internal LOC. Women with a high internal LOC are even 7.8% more likely to be at least moderate drinkers compared with women in the lowest LOC category. While LOC increases the probability of moderated drinking similarly for men and women, the effect on regular drinking is only observable for men.

We use this stylized fact in a second step and hypothesize about the mechanisms behind this finding. On the one hand, LOC is likely to be highly predictive of individual investment in social networks and thus drinking opportunities, given that attending so-

cial gatherings is often inextricably linked with alcohol consumption. On the other hand, an increased perception of internal individual control might reduce the perceived importance of risk for life's outcomes. The future risks of alcohol consumption might thus be underestimated if individuals believe in their own ability to cope with or prevent the negative consequences of unhealthy behavior. Discussing and empirically identifying these two distinct channels is a major contribution of our paper as both channels can have very distinct medical and economic consequences based on the likely amounts and frequencies of consumption in which they result. Based on ancillary analyses, using information on individuals' leisure activities and reported risk attitude, we find indications for both mechanisms. While the social investment theory is similarly important for men and women, differences in risk perception seem to play a significant role for men only.

2 Previous Literature

Rational Choice Framework Motivated by medical literature on the adverse effects of unhealthy behavior, the drivers of such behavior have been relatively well explored in modern economic literature. The standard economic approach to study health-related behavior concentrates on a traditional rational choice model. This model assumes that individuals maximize the present discounted value of lifetime utility. In the well-known health-capital model by Grossman (1972, 2000), individuals are assumed to behave in an unhealthy manner (e.g. smoke or drink) if the resultant instantaneous pleasure is higher than the expected utility from investing in good future health by being health conscious, plus the monetary costs of the behavior (e.g. the price of alcohol). The rational choice approach is especially powerful in explaining moderate unhealthy behavior as it accounts for non-standard approaches of time discounting, i.e. present-biased and time-inconsistent preferences (see e.g. Cutler *et al.*, 2003; Gruber and Köszegi, 2001). With respect to drinking behavior, time-inconsistent preferences are most often discussed in the context of alcohol control policies (see e.g. Marcus and Siedler, 2015). Additionally, information constraints and cognitive limitations (see e.g. Kenkel, 1991), as well as bounded rationality, demonstrated by – for example – self-control failures (Schilbach, 2019), are discussed as important issues in the rational choice approach towards explaining alcohol consumption. Over the years, multiple other approaches within the rational choice approach have evolved. For example, peer effects have been found to be highly important, especially in

adolescence (see e.g. Duncan *et al.*, 2005; Argys and Rees, 2008; Lundborg, 2006).[1] A detailed discussion of the economics behind health-related behavior in general and alcohol consumption in particular as well as a profound literature review can be found e.g. in Cawley and Ruhm (2011) and Cook and Moore (2000).

Psychological Determinants and Locus of Control While the aforementioned rational choice framework attributes unexplained individual heterogeneity in unhealthy behavior to idiosyncratic shocks, behavioral economics has motivated modern empirical studies to investigate the psychological black box behind such behavior. In recent years, a growing body of literature has explored the psychological determinants of health-related behavior. Within early psychological and medical literature, small-scale empirical studies have found relationships between personality traits (such as susceptibility to peer pressure, self-esteem, extraversion and neuroticism) and substance use in both adolescents (Dielman *et al.*, 1987; Wijatkowski *et al.*, 1990) and adults (see e.g. Vollrath *et al.*, 1999; Booth Kewley and Vickers, 1994; Lemos-Giráldez and Fidalgo-Aliste, 1997). The early studies on the effects of LOC typically used very specific measures of individual perceived control in the health domain, finding important relationships between health-related LOC and substance use in adolescence (Carman, 1974; Dielman *et al.*, 1987), and decisions about diet, exercise, smoking and seat belt use in adulthood (see e.g. Wallston *et al.*, 1978; Wallston and Wallston, 1978; Furnham and Greaves, 1994; Lemos-Giráldez and Fidalgo-Aliste, 1997; Holt *et al.*, 2014).

With respect to alcohol consumption, Steptoe and Wardler (2001) found that the perception of high, health-related external control is associated with a higher probability of frequent alcohol consumption in a sample of European university students.[2] Mendolia and Walker (2014) analyzed the effect of LOC and self-esteem on health-related behavior for a group of adolescents aged 15-16 years. With respect to alcohol consumption, they find a weak, positive link of having an external perception of control with the frequency of getting drunk when drinking, but no significant association with regular drinking.

[1] Based on earlier work from psychology (see e.g. Rachlin, 1997), a lot of research has also been conducted on addictions as an important driver of excessive unhealthy behavior. This literature assumes that current consumption is positively affected by past consumption, and thus it models addiction using autocorrelation within the demand functions for addictive goods (Becker and Murphy, 1988; Chaloupka, 1991).

[2] One should note the distinct difference between their health-related LOC variable and our general LOC measure. The general measure paints a much broader picture of individuals' personality and entails more complex behavioral implications. Concentrating on only one aspect of LOC might lead to neglecting similarly important but potentially conflicting behavioral consequences.

Lassi *et al.* (2019) find an association between external LOC and hazardous drinking for samples of teenagers in the UK. Chiteji (2010) analyses the effect of self-efficacy (which is strongly linked to LOC) on drinking and exercising, and finds a negative association with drinking using the 1972-sample of male household heads in the Panel Study of Income Dynamics (PSID). A more recent and closely related study to our work is the paper by Cobb-Clark *et al.* (2014). They discuss the role of LOC for individual health-related behavior on multiple dimensions including diet, smoking and exercise. Using data from the Household, Income and Labour Dynamics in Australia (HILDA) survey, they rely on a self-efficacy scale as a proxy for LOC. They find positive effects of their LOC measure on healthy habits such as healthy diet, abstaining from smoking and regular exercise. They also identify significantly positive effects of LOC on excess alcohol consumption (i.e. binge drinking). Although most existing literature finds a negative association between internal LOC and drinking, it is still rather inconclusive due to very selective samples and very heterogeneous measures for LOC and drinking. Additionally, most of these studies concentrated on excessive rather than moderate drinking. We will generalize and extend the analysis by examining a more representative sample of adults for whom a stable LOC can be assumed. We will also use more informative measures of moderate alcohol consumption and a more general measure of LOC.

3 Data and Empirical Approach

Building upon the existing literature, we estimate the relationship between an internal LOC and self-reported alcohol consumption. The estimations are conducted using the extensive information available from the Socio-Economic Panel (SOEP, 2017), a large representative longitudinal household panel from Germany (see Goebel *et al.*, 2018, for more information). The SOEP includes detailed socio-economic information and surveys individuals' LOC as well as their health behavior – including alcohol consumption – on a regular basis. While this is also true for other international surveys such as HILDA or NLSY79, the SOEP is the only data source that also enables us to observe important endogenous variables – such as risk and time preferences – as well as social interactions of individuals on a regular basis. This enables us to paint a more detailed picture

about potential channels behind the estimated relationship.[3] We restrict our sample to all observations for individuals between the age of 20 to 70 years[4] for the 2006, 2008 and 2010 waves, within which we observe the self-assessed and reported amount of alcohol consumption. The sample is further reduced by item non-response in the LOC and other explanatory variables. The final estimation sample comprises 34,629 observations for 14,937 individuals. Of these, 8,005 individuals are observed three times, while 3,250 and 3,682 are observed once and twice, respectively. The later estimations will always be reported separately for men (48% of the sample) and women (52%) to take care of important, gender-specific effects, as is common in personality and health literature (see e.g. Cobb-Clark *et al.*, 2014). Table A.1 in the Appendix provides an overview of the main summary statistics for the sample.

3.1 Locus of Control

For our sample, LOC is measured in 2005 and 2010, in which years SOEP respondents were asked how closely a series of ten statements (items) characterized their views about the extent to which they influence what happens in life. Responses were measured on a seven-point Likert scale ranging from 1 ('disagree completely') to 7 ('agree completely'). A list of the set of items used – derived from the original questionnaire module constructed by Rotter (1966) – as well as the means of the observed responses in the full sample and separated by gender can be found in Table 1.

As a first step in constructing our LOC variable, we conduct an exploratory factor analysis in which we investigate the way in which these items load onto latent factors. The factor analysis reveals that items 1 and 6 have a negative loading and items 2, 3, 5, 7, 8 and 10 have a positive loading onto a first factor. The factor's eigenvalue is 1.84. A second factor has an eigenvalue of only 0.54 and can be neglected. Item 4 does not clearly load onto the first factor and item 9 has an unintuitive attribution, such that we exclude both in line with the earlier literature.

Subsequently, we use a two-step process to create a continuous, unidimensional LOC

[3]Nevertheless, sensitivity checks have also been conducted using the available information from these two alternative data sources and the results are strongly robust between data sources.

[4]The age restriction – which excludes very young adults as well as elderly people – is intended to leave us with a more homogeneous sample in the analyzed context. For both groups, alcohol consumption rates are distinctly different from those of all other adults. Additionally, the consequences of unhealthy behavior are arguably different for such groups compared with those of mid-aged adults in the working population, which would hamper the later theoretical considerations. Based on a sensitivity analysis that included both age groups, all estimated effects are robust in this respect.

Table 1: Components of Locus of Control in SOEP (2005 and 2010 waves)

No	Item	**All**	**Men**	**Women**
Q:	The following statements apply to different attitudes towards life and the future. To what degree do you personally agree with the following statements? *Scale: 1 (Disagree completely) - 7 (Agree completely)*			
I1:	How my life goes depends on me	5.45	5.47	5.42***
I2:	Compared to other people, I have not achieved what I deserve (-)	3.27	3.35	3.19***
I3:	What a person achieves is above all a question of fate or luck (-)	3.52	3.43	3.61***
I4:	If a person is soc. active, she can have an effect on soc. conditions[c]	3.60	3.61	3.59
I5:	Other people have a controlling influence over my life (-)	3.13	3.16	3.10***
I6:	One has to work hard in order to succeed	6.01	6.02	6.01
I7:	If I run up against difficulties in life, I doubt my own abilities (-)	3.29	3.02	3.54***
I8:	Opportunities in life are determined by social conditions (-)	4.52	4.43	4.60***
I9:	Inborn abilities are more important than any efforts one can make[c]	4.86	4.89	4.84***
I10:	I have little control over the things that happen in my life (-)	2.66	2.65	2.67
	Observations	34,629	16,674	17,955

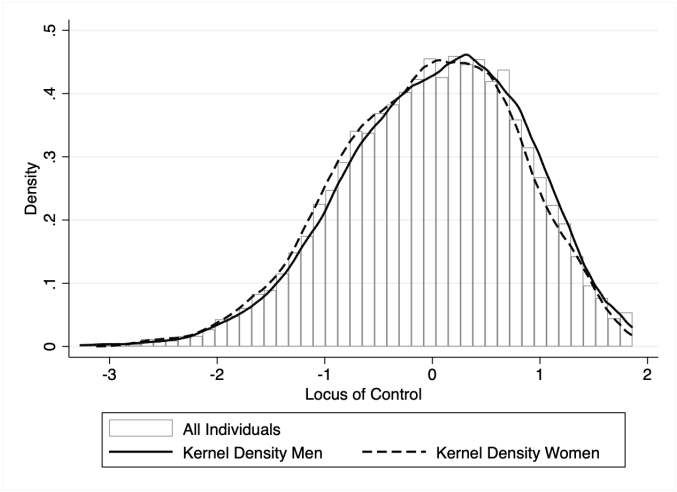
Source: SOEP, 2005 and 2010 waves, version 33, doi:10.5684/soep.v33.
Notes: Significance stars refer to the significance level of a t-test for mean equivalence between men and woman: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Items marked with a (-) are reversed prior to factor analysis.
[c] Items 4 and 9 are not included in the analysis.

factor variable, consistent with previous literature (see e.g. Piatek and Pinger, 2016). Based on the exploratory factor analysis, we first reverse the scores for the external items (items 2, 3, 5, 7, 8 and 10) such that all eight items are increasing in internality. Secondly, we use confirmatory factor analysis to extract a single factor for each year separately.[5] This has the advantage of avoiding equal weighting of all items and instead relies on the data to determine how each item is weighted in the overall index. As per Piatek and Pinger (2016), simply averaging the items risks measurement error and attenuation bias. The resulting factor is therefore increasing in internal LOC and its distribution is shown in Figure 1. Additionally, Figure 1 reports the kernel densities of the LOC factor separately for men and women. It can be seen from both the distribution in Figure 1 as well as most of the items in Table 1 that men are more internal than women (see Specht *et al.*, 2013, for a more detailed discussion of gender differences). We account for these gender differences in our empirical analysis by using fully separated estimation models and standardizing the continuous LOC factor as well as generating dichotomous indicators separately within both sub-samples.

There is evidence that LOC is relatively stable for the working-age population (see e.g. Preuss and Hennecke, 2018; Cobb-Clark and Schurer, 2013) and thus reverse causal-

[5]For the estimation of the factor loadings within the confirmatory factor analysis, the information from all available LOC observation years is used simultaneously to minimize the risk of temporary measurement error issues affecting the factor loadings. Thus, the factor loadings are constant over time but the item values and thus the LOC factor are still time variant.

Figure 1: Distribution of Locus of Control



Source: SOEP, 2005 and 2010 waves, version 33, doi:10.5684/soep.v33, own illustration.

ity is unlikely. With respect to alcohol consumption, potential endogeneity concerns are additionally likely to apply to excessive consumption only. Such consumption occurs seldomly in our sample. To further minimize these concerns, we ensure that the LOC factor is never measured after the period in which we measure alcohol consumption. Thus, if necessary, the information is then imputed forward into the years in which we observe alcohol consumption, i.e. the LOC from 2005 is used as the explanatory variable for alcohol consumption in 2006 and 2008 and LOC from 2010 is used for consumption in 2010. Given that we observe LOC only once for 34% of the sample and keeping in mind that variation for the remaining part is likely to arise from temporary measurement inaccuracy (see e.g. Preuss and Hennecke, 2018), we will not be able to use a fixed-effects framework later on. We test the robustness of our results to different specifications of the LOC indicator in Section 4.3.

3.2 Alcohol Consumption

In 2006, 2008 and 2010, individuals were asked to rate their consumption of four different types of alcoholic beverages (beer, wine, spirits, and mixed drinks) on a scale from 1 (regularly) to 4 (never). Based on a combination of all those answers and guided by the work of Ziebarth and Grabka (2009), we generate an ordinal measure of alcohol consumption.[6]

[6] As already noted by Ziebarth and Grabka (2009), the main drawback of this measurement is the rather vague and subjective character, as no concrete information about the exact quantity of alcohol consumption is collected. We conduct a sensitivity check to test our measures and results in this respect and show the robustness of our results against the use of a more objective measure of alcohol consumption (see Section 4.3 for more detail).

Table 2: Summary Statistics and Descriptive Analysis – Alcohol Consumption

	All	**Men**			**Women**		
		All	External	Internal	All	External	Internal
Alcohol Consumption							
Abstainers	0.12	0.09	0.11	0.06***	0.15	0.17	0.12***
Rare Drinkers	0.29	0.21	0.22	0.19***	0.36	0.37	0.34***
Moderate Drinkers	0.42	0.44	0.41	0.46***	0.40	0.37	0.43***
Regular Drinkers	0.18	0.27	0.26	0.29***	0.09	0.08	0.11***
Observations	34,629	16,674			17,955		

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Individuals are grouped into internals and externals based on whether their LOC is lower/equal (external) or higher (internal) than the median. Significance stars refer to the significance level of a t-test for mean equivalence between externals and internals: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The variable categorizes individuals into the following four groups:

1) **Abstainers**: No consumption of all four types,

2) **Rare Drinkers**: Seldom drinking of at least one type, no occasional drinking,

3) **Moderate Drinkers**: Occasional drinking of at least one type, no regular drinking,

4) **Regular Drinkers**: Regular drinking of at least one type.

Table 2 provides an overview of the shares of alcohol consumption in the sample. In the full sample, 60% of the individuals are counted as being moderate (42%) or regular (18%) drinkers and 12% can be characterized as abstainers (no alcohol consumption at all). In line with expectations, the share of drinkers is distinctly lower for women (40% moderate drinkers and 9% regular drinkers) than for men (44% moderate drinkers and 27% regular drinkers). 15% of all women are abstainers compared with 9% of men.[7]

Additionally, Table 2 summarizes the results of a first descriptive analysis of the relationship between LOC and alcohol consumption. The results of the t-tests for mean equality indicate that for both men and women, the share of individuals who indicate that they are moderate or regular drinkers is significantly higher in the group of internal individuals (individuals with a LOC larger than the sample median). The share of moderate drinkers in the internal men category is 46%, while the share in external men is 41%. Internal men are also more likely to be regular drinkers (29% as opposed to 26%) and less likely to be abstainers (6% as opposed to 11%). All differences hold similarly for women.

[7]Men and women also differ with respect to the beverage types that they consume: while 60% (15%) of men consume beer (spirits) at least occasionally, only 20% (6%) of women do so. As opposed to this, the share of moderate wine drinkers is higher for women (41% as compared to 37%). Descriptive statistics by alcohol types are available from the authors on request.

3.3 Estimation Strategy

Based on the available data, the obvious modeling choice would be to estimate an ordered response model. However, this model is based on the proportional odds assumption, which can be easily tested with a Brant (1990) test. The statistics of the Brant test for parallel regressions indicate a strong violation of the proportional odds assumption in the full model for men and women in our case, such that we refrain from using an ordered response model.[8] Instead, we estimate four separate binary choice models based on the four drinking indicators D_j with $j = \{1, 2, 3, 4\}$ summarized in Table 3.

Table 3: Dependent Variables in the Estimation

Drinking Indicator	**Never**	**Rare**	**Moderate**	**Regular**
Main Indicator *(Section 4.1)*				
D_1 Moderate + Regular	$D_1 = 0$	$D_1 = 0$	$D_1 = 1$	$D_1 = 1$
Supplementary Indicators *(Section 4.2)*				
D_2 Moderate	$D_2 = 0$	$D_2 = 0$	$D_2 = 1$	missing
D_3 Regular	$D_3 = 0$	$D_3 = 0$	missing	$D_3 = 1$
D_4 Regular (Intensive)	missing	missing	$D_4 = 0$	$D_4 = 1$

As our main indicator – D_{1it} – we estimate the average marginal effects of an individual's LOC on her probability of being a moderate or regular drinker as opposed to be an abstainer or rare drinker in Section 4.1. We choose this indicator as our main explanatory variable as it can be roughly interpreted as the choice at the extensive margin.[9] In a further step in Section 4.2, we take a closer look at potential differences at the intensive margin by also estimating the relationship between LOC and the probability of being a moderate drinker as opposed to being an abstainer or rare drinker (D_{2it}), a regular drinker as opposed to being an abstainer or rare drinker (D_{3it}), as well as a regular drinker as opposed to being an moderate drinker (D_{4it}). Indicators D_{2it}, D_{3it} and D_{4it} enable us to make statements about the effects of LOC on the probabilities of moderate and regular consumption independent from each other. Nevertheless, it should be noted that the estimated effects using those outcome variables are at risk of sample selection bias. Therefore, the estimated results should be interpreted with care and only serve as

[8] We conduct the Brant test as an omnibus test for the entire model, and separately for each of the independent variables. The test statistics indicate a strong violation of the proportional odds assumption in the full model for men and women, as well as for the LOC factor for men. The results are available from the authors upon request.

[9] Abstainers and rare drinkers are always grouped into one reference group, i.e. rare drinkers are simplified as non-drinkers. An additional analysis revealed that abstainers and rare drinker do not significantly differ with respect to their LOC, which is why pooling them into one reference group is suitable. The results are available from the authors upon request.

ancillary evidence, additional to the main indicator.

All estimations are conducted using the following estimation equation:

$$P(D_{jit} = 1) = P(\beta_1 + \beta_2 loc_{it} + \beta_3 D_{it} + \beta_4 LM_{it} + \beta_5 P_i + \beta_6 H_{it} + \beta_7 T + \epsilon_{it} > 0), \quad (1)$$

where D_{jit} is one of the four indicators for alcohol consumption $j = \{1, 2, 3, 4\}$ of individual i at time t and loc_{it} is the (imputed) LOC of individual i in t. Each model pools observations from the 2006, 2008, and 2010 waves and contains an extensive list of sociodemographic controls D_{it}, such as demographic information (gender, age, nationality, region of residence, number of children in the household, an indicator for expecting parents as well as young children (aged 0-1 and 1-7) in the household, family status, net household income and religious affiliation) and educational controls (school degree, vocational degree and university degree), as well as current individual labor market controls LM_{it}, which are gross labor income, labor force status and occupational autonomy. Averaged and standardized personality and preferences measures P_i (i.e. the Big Five personality traits, general and health-related risk aversion as well as patience and impulsiveness as a proxy for individual time preferences) are also included. Finally, the individual health status (indicator for officially assessed, severe disability or working incapability, subjective health and body mass index) as well as health-related behavior (smoking, healthy diet and exercise) H_{it} is included and T captures time-fixed effects such as the interview year, interview season as well as the day of the week.[10] See Table A.1 for the full list of controls.

Equation 1 is estimated using binary logit models and average marginal effects are reported in the following. LOC is always standardized and categorized within the subsamples such that e.g. having a high LOC corresponds to a high LOC compared to all other individuals within the selected consumption categories and within the same gender. Standard errors are clustered at the personal level to account for serial correlation in the error terms, which occurs due to the panel nature of the data.

[10]The majority of interviews (approximately 90%) are conducted between February and June, which is why interview month controls cannot be used in the model and interview months are grouped into interviews conducted in spring (March-May), summer (June-September) and autumn/winter (October-February).

4 Results

4.1 Main Indicator – Extensive Margin

Table 4 summarizes the average marginal effects based on the logit model using the binary indicator of moderate or regular drinking (D_1) as the dependent variable. Column (1) shows the descriptive raw difference when we only control for time effects such as the year, season, and day of week. Consistent with the descriptive differences in Table 2, the estimates show a positive raw gap in the probability of moderate and regular drinking between internals and externals. The more internal that an individual is, the higher the probability of reporting at least moderate drinking. We can see that this descriptive raw difference between internals and externals becomes smaller but remains significantly positive when we include additional sets of control variables in columns (2) to (5). The largest part of the raw difference can be explained by underlying differences in demographics and educational background (column 2) for both men and women. Including labor market information in column (3) and other personality measures in column (4) only marginally decreases the estimated effects, while including health information in column (5) has a slightly larger effect especially for women.[11] Column (5) contains the results for the full specification and is our preferred specification to which we will refer in the following.[12] An increase in an individual's LOC by one standard deviation on average increases the probability of moderate or regular drinking by 1.3 percentage points for men as well as women, holding all other variables constant. This corresponds to a relative effect of 1.8% for men and 2.7% for women based on the sample means of 71% and 49%, respectively (see Table 2). While we observe a substantial decrease in the estimated effect on D_1 from column (1) to column (5), it is important to note that our data contain a very rich set of control variables. The evolution of the estimated effect from column (3) to column (5) can be interpreted as evidence that the relationship between LOC and moderate/regular drinking is robust and likely not driven by personality or health characteristics. However, we will analyze the sensitivity of our results with respect to omitted variables following Oster (2019) in Section 4.3.

Although these effects appear to be rather small, concurrent with the low overall

[11] It should be noted that the controls for health behavior in other health domains are endogenous explanatory variables. The inclusion of these variables moderates the effects of LOC on alcohol consumption therefore are a conservative estimate of the true effect.

[12] The full estimation results for the specification in column 5 can be found in Table A.2.

Table 4: Main Results (Logit, Marginal Effects) – Main Drinking Variable

	Outcome Variable: Moderate or Regular Drinking D_1									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Men										
LOC Factor (cont.)	0.036***	0.020***	0.018***	0.016***	0.013***					
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)					
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)										
$(LOC_{P33}, LOC_{P66}]$						0.069***	0.043***	0.040***	0.036***	0.029***
						(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
$(LOC_{P66}, LOC_{max}]$						0.080***	0.043***	0.041***	0.034***	0.028**
						(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Pseudo R^2	0.006	0.035	0.039	0.044	0.057	0.006	0.036	0.039	0.044	0.057
Observations	16,674	16,674	16,674	16,674	16,674	16,674	16,674	16,674	16,674	16,674
Women										
LOC Factor (cont.)	0.051***	0.025***	0.024***	0.020***	0.013**					
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)					
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)										
$(LOC_{P33}, LOC_{P66}]$						0.071***	0.037***	0.034***	0.029***	0.017
						(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
$(LOC_{P66}, LOC_{max}]$						0.121***	0.063***	0.060***	0.053***	0.038***
						(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
Pseudo R^2	0.009	0.056	0.057	0.064	0.083	0.008	0.056	0.057	0.065	0.083
Observations	17,955	17,955	17,955	17,955	17,955	17,955	17,955	17,955	17,955	17,955
Time-Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Demographics		✓	✓	✓	✓		✓	✓	✓	✓
Education		✓	✓	✓	✓		✓	✓	✓	✓
Labor Market			✓	✓	✓			✓	✓	✓
Personality				✓	✓				✓	✓
Health					✓					✓

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Full estimation results for column (5) can be found in Table A.2 in the Appendix. All other full results are available from the authors upon request.

explained variability of alcohol consumption in the model (see pseudo R^2 in Table 4), they hold considerable economic relevance. The magnitude of the effect is of a similar size to the marginal effects of knowingly important preference measures such as the willingness to take risks (general and health-related) and patience (as a proxy for time preferences), which can be found in Table A.2.

To identify potential non-linearities, we consider indicators for being in a different tercile of the LOC distribution as explanatory variables in columns (6) to (10). The results show a similar picture to that of the continuous LOC measure. For men, having a medium LOC ($(LOC_{P33}, LOC_{P66}]$) on average increases the probability of occasional or regular consumption by 2.9 percentage points (4.1%) compared to having a low LOC ($[LOC_{min}, LOC_{P33}]$). Having a high LOC ($(LOC_{P66}, LOC_{max}]$) increases men's probability of occasional or regular consumption in a similar magnitude by 2.8 percentage points

Table 5: Main Results (Logit, Marginal Effects) – Intensive Margin Drinking Variables

	Moderate Drinking D_2 *(vs. Non/Rare)*		Regular Drinking D_3 *(vs. Non/Rare)*		Regular Drinking D_4 *(vs. Moderate)*	
	(1)	(2)	(3)	(4)	(5)	(6)
Men						
LOC Factor (cont.)	0.016***		0.008		-0.006	
	(0.006)		(0.007)		(0.006)	
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)						
$(LOC_{P33}, LOC_{P66}]$		0.030**		0.043***		0.014
		(0.013)		(0.015)		(0.013)
$(LOC_{P66}, LOC_{max}]$		0.031**		0.026		-0.008
		(0.014)		(0.017)		(0.014)
Observations	12,138	12,138	9,380	9380	11,830	11,830
Women						
LOC Factor (cont.)	0.013**		0.006		-0.001	
	(0.005)		(0.005)		(0.005)	
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)						
$(LOC_{P33}, LOC_{P66}]$		0.015		0.006		0.006
		(0.011)		(0.010)		(0.011)
$(LOC_{P66}, LOC_{max}]$		0.040***		0.016		0.002
		(0.012)		(0.011)		(0.013)
Observations	16,317	16,317	10,736	10736	8,857	8,857
Time-Fixed Effects	✓	✓	✓	✓	✓	✓
Demographics	✓	✓	✓	✓	✓	✓
Education	✓	✓	✓	✓	✓	✓
Labor Market	✓	✓	✓	✓	✓	✓
Personality	✓	✓	✓	✓	✓	✓
Health	✓	✓	✓	✓	✓	✓

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Full estimation results for column (1) can be found in Table A.2 in the Appendix. All other full estimation results are available from the authors upon request.

(3.9%). Thus, the effect appears to be non-linear for men. For women, having a high LOC increases their probability of occasional or regular consumption on average by 3.8 percentage points (7.8%), while the effect of a medium LOC is not significant when compared to having a low LOC.

4.2 Supplementary Indicators – Intensive Margin

As the results from the Brant test already indicated, the effect of LOC is likely to differ between different intensities of alcohol consumption. To further investigate this, we devote some further attention to how the effect might differ at the intensive margin, i.e. whether LOC has a particularly strong effect on moderate or regular drinking. Table 5 summarizes the estimated average marginal effects of LOC using the three supplementary binary indicators $D_{j=\{2,3,4\}}$ as dependent variables.

If we abstract from potential sample selection bias discussed in Section 3.3, the results reveal that for men having an internal LOC increases the probability of reporting occasional drinking (columns 1 and 2) as well as to some extent also the probability of reporting regular drinking (columns 3 and 4). Having a medium (high) LOC on average increases a man's probability of being a moderate drinker by 3.0 (3.1) percentage points. The marginal effect of a medium LOC on regular drinking is 4.3 percentage points, while the effect of a high LOC is smaller and not significant, revealing a potential non-linearity in the effect of LOC on regular drinking. In columns (5) and (6), we do not find a significant influence of LOC on the intensive margin between regular and moderate drinking.

The overall picture is slightly different for women: while especially a high LOC increases the probability of moderate drinking even more strongly for women than for men, no significant relationships can be observed for women's regular drinking. Women with a high LOC are on average more likely to drink moderate amounts by approximately 4.0 percentage points compared to abstain or drink only rarely, although internal and external women do not significantly differ in their probabilities of being regular drinkers.

4.3 Robustness Checks

We test the robustness of our results with respect to both the definition of our main explanatory variable and our outcome variable as well as with respect to potentially omitted variables.

Explanatory Variable In a first step, we check the robustness of our estimated effects with respect to the construction and imputation of the LOC measure. Thus, we construct two alternative LOC measures and re-estimate our main model for these alternative explanatory variables. The results can be found in Table A.3. First, we find that our estimated effects are robust against the use of a simple average over all eight LOC items (panel 1a), which assumes equal weights for each item on the latent factor. Second, we check whether our estimated effects are sensitive to the use of an averaged LOC imputed over all available observations, which wipes out all within-variation in LOC for those individuals whom we observe more than once. This adjustment is expected to reduce measurement inaccuracies in the situational measurement of LOC. The estimated effects presented in panel 1b are also robust in this respect.

Outcome Variable – Definitions In order to test the robustness of the estimated effects with respect to the choice of the drinking indicators as the main outcome variables, we construct alternative measures of consumption and re-estimate the effects for these alternative dependent variables. To investigate whether effects are driven by differences at the extensive or intensive margin, they are re-estimated using an indicator for being an abstainer as abstainers and rare drinkers were pooled in all main drinking indicators. In line with the main results, the effects in panel 2a of Table A.3 are significantly negative, indicating a reduced probability of being an abstainer for internal men and women.

Outcome Variable – Objective Amounts The estimated results might also be biased by the subjective nature of the alcohol consumption variable used. As our main dependent variable is based on the self-assessed amount of consumption, it not only depends on the actual consumption level but also the individual's perception of the terms 'regular' and 'occasional'. If individuals perceive amounts differently based on their LOC, this would bias our results. We can test the reliability of our measure and the sensitivity of our results with respect to the subjectivity of the reported amounts using measures of concrete frequencies and amounts available in the SOEP 2016 wave. In 2016, individuals do not self-assess their consumption but report objective amounts and frequencies. An overview of the descriptive statistics for these variables can be found in Table A.4.[13]

The new dependent variables are generated based on the reported frequency of consumption and the reported consumption amount per consumption day. LOC is imputed from the 2015 wave.[14] The results of this sensitivity check are reported in panel 2b of Table A.3. First, the binary indicator for drinking is one if the individual reports drinking at two or more days per week ("moderate or high frequency"). This behavior is assumed to correspond most closely to "occasional or regular consumption" as per the baseline. The sensitivity check indicates that the results from the baseline are relatively robust with respect to the type of reporting. Although effects for men lose significance due to the extreme reduction in sample size, the effect sizes for high LOC remain stable for men and women.[15] When we look at high consumption amount – defined as three or more

[13]The correlation between subjective intensities in 2010 and concrete frequencies in 2016 is 0.634. This is fairly high given that the observations lie six years apart and thus already indicates that the subjectively reported intensities are quite reliable.

[14]The measurement of LOC in 2015 as well as the construction of the factor is equivalent to those in 2005 and 2010, which was described in detail in Section 3.

[15]If we concentrate on the full sample of all individuals and thus a higher sample size, effects are stable in

drinks per day – for women we can see that LOC most crucially affects the frequency of consumption, but has no effect on the amount of drinks consumed per episode. However, for men, a medium as well as high LOC has a significant positive effect on consumption amounts.

Omitted Variable Bias We also investigate the potential for omitted variables to bias our results using the bounding analysis suggested by Oster (2019). Despite our extraordinary rich set of controls – which include detailed socio-economic characteristics, health status and health behavior in other domains as well as a list of other personality traits and preference measures – we cannot completely rule out the possibility that some unobserved heterogeneity remains. Oster (2019) provides a method of calculating consistent estimates of bias-adjusted treatment effects given assumptions about i) the relative degree of selection on observed and unobserved variables (δ), and ii) the R-squared from a hypothetical regression of the outcome on the treatment and both observed and unobserved controls (R_{max}). $\delta = 1$ implies that observed and unobserved factors are equally important in explaining the outcome, while $\delta > 1$ ($\delta < 1$) implies a larger (smaller) impact of unobserved than observed factors. Given the assumed bounds for δ and R_{max}, researchers can then calculate an identified set for the treatment effect of interest. If this set excludes zero, the results from the controlled regressions can be considered robust to omitted variable bias. Consequently, we focus on our main result – the estimated effect of LOC on our main indicator D_1 (moderate/regular drinking vs none/rare) – and we re-estimate the results reported in Table 4 using OLS and using an indicator for above-median LOC. Comparing Columns (1) and (2) in Table A.5 reveals that for men (women) the estimated effect of LOC on D_1 decreases from 0.069 (0.088) in a model with only time-fixed effects to 0.032 (0.025) in our full specification. Guided by the rule of thumb provided in Oster (2019), the maximum R^2 is set to 1.3 times the R^2 in the fully-controlled model. Column (3) contains the identified set of coefficients at $\delta = 1$, i.e. a situation in which there are unobserved variables that have similarly explanatory power as our large set of explanatory variables. Subsequently, the identified set is $[0.018; 0.032]$ for men and $[0.001; 0.025]$ for women and both effects would still be positive. In fact, the identified set of coefficients only includes zero if $\tilde{\delta}$ exceeds 2.00 for men and 1.03 for women.

significance level and size for both medium and high LOC. The results are available from the authors upon request.

5 Discussion of Results

The results from our empirical analysis stand in contrast to the existing findings on the effect of LOC on health-related behavior in other domains such as smoking, exercise and healthy diet in the previous literature. This is consistent with doubts about the applicability of the health investment model by Grossman (1972, 2000) to the relationship between LOC and alcohol consumption raised by Cobb-Clark *et al.* (2014). Such doubts are prompted by the missing subjective link between current alcohol consumption and future health consequences. Bennett *et al.* (1998) state that alcohol consumption might be associated with higher levels of uncertainty about future outcomes as individuals do not see alcohol consumption in moderate amounts as affecting their health too strongly. This is also supported by the literature on potential positive medical and economic effects of moderate drinking. Although individual considerations about health investments are likely still at play, they might be on average dominated by other mechanisms in the analyzed population.

Potential explanations for an observed positive correlation between LOC and alcohol consumption include the role of being able to afford alcohol consumption, the relationship between LOC and alcohol consumption with behavior in other health domains (compensational drinking behavior), and the correlation between LOC and self-control problems as well as present-biased decision-making. However, all these possible explanations have been ruled out largely through the inclusion of earnings, household income, behavior in other health domains, and patience and impulsiveness as proxies of individual time preferences in the main estimation model. As remaining explanations, in line with the existing literature discussed in Section 2, we hypothesize that LOC is positively associated with alcohol consumption via two mechanisms: (1) through the increased considerations about the investment in social networks; and (2) through the reduced perception of risks driven by information constraints.

5.1 Social Investment Theory

Based on the existing psychological literature on peer effects of alcohol consumption in adolescence (Duncan *et al.*, 2005; Argys and Rees, 2008; Lundborg, 2006; Buonanno and Vanin, 2013), a first likely mechanism might be the link via differences in the importance

of peer and networking effects. Alcohol consumption is associated with important positive effects on social networks. Drinking is common at social events and abstinence has been shown to be linked to strong negative penalties with respect to social integration (see e.g. Leifman *et al.*, 1995). For example, Peters and Stringham (2006) and Ziebarth and Grabka (2009) discuss the association between alcohol consumption and social networks as likely channels for their identified positive effect of alcohol consumption on earnings. As they notice, alcohol consumption remains a social norm in modern Western societies, which inevitably links drinking and the attendance of social events. Thus, moderate drinking produces social capital and can be labeled as a productive activity. In line with the argument about LOC and investment in future outcomes – which has been raised for example in Coleman and DeLeire (2003) and Caliendo *et al.* (2015) – internals are expected to invest more in social capital than externals, as they expect higher future returns from it such as a network of social support or professional contacts. This can easily be achieved by attending social gatherings and thus drinking. Hence, by default they might be more likely to drink alcohol in moderation. As opposed to excessive and uncontrolled alcohol consumption, drinking behavior that can be explained by this mechanism might be connected with less severe negative or even positive economic and medical consequences, which is why it is important to separate it from other potential explanations.

Therefore, we investigate whether internals are simply more likely to be exposed to alcohol by being socially more active and outgoing. This is achieved by controlling for their self-reported frequency of going out eating and drinking, attending social gatherings and attending cultural events.[16] The results of this ancillary analysis are reported in Table 6. For simplicity, only the effects for the LOC terciles and the main outcome variable are reported.[17] Non-response for the additional variables is accompanied by a small loss in observations (about 1.8%). In order to separate the changes in effect size that are due to changes in the sample and the inclusion of controls, the baseline results were replicated using the reduced sample. The results are not substantially different and are presented in columns (1) and (3). The results of the additional analysis presented in columns (2) and (4) indicate that for both men and women, parts of the estimated effects are indeed

[16]Individuals rate the frequency with which they participate in these activities on a scale from 1 ('never') to 4 ('weekly') or 5 ('daily') as scales slightly vary between years. As the activities are surveyed irregularly, they are imputed into the relevant years from the closest observation year.

[17]The results for the continuous LOC measure and the alternative outcomes are in line and are available from the authors upon request.

Table 6: Additional Results (Marginal Effects) - Social Activity (Outcome: Moderate or Regular Drinker)

	Men		**Women**	
	(1)	(2)	(3)	(4)
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$	0.028***	0.021**	0.015	0.007
	(0.010)	(0.010)	(0.011)	(0.011)
$(LOC_{P66}, LOC_{max}]$	0.029**	0.020*	0.040***	0.029**
	(0.011)	(0.011)	(0.012)	(0.012)
Going out Eating/Drinking (Ref.: Never)				
Rarely		0.094***		0.082***
		(0.022)		(0.020)
Min 1x per month		0.140***		0.140***
		(0.023)		(0.021)
Weekly or more		0.165***		0.173***
		(0.024)		(0.024)
Attending Social Events (Ref.: Never)				
Rarely		0.002		-0.024
		(0.029)		(0.035)
Min 1x per month		0.053*		0.025
		(0.029)		(0.035)
Weekly or more		0.089***		0.063*
		(0.029)		(0.035)
Attending Cultural Events (Ref.: Never)				
Rarely		0.038***		0.036***
		(0.010)		(0.010)
Min 1x per month		0.073***		0.080***
		(0.015)		(0.015)
Weekly or more		0.074**		0.082**
		(0.034)		(0.039)
Observations	16,382	16,382	17,638	17,638
Time-Fixed Effects	✓	✓	✓	✓
Demographics	✓	✓	✓	✓
Education	✓	✓	✓	✓
Labor Market	✓	✓	✓	✓
Personality	✓	✓	✓	✓
Health	✓	✓	✓	✓

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

driven by differences in participation in events and social activities. The overall effect of a high LOC drops from 2.9 (4.0) to 2.0 (2.9) percentage points for men (women). A cross-model Wald test indicates a significant difference between the effect estimates of LOC. Thus, around 30 percent of the overall effect can be explained by different levels of social activity.[18] The effects remain significantly positive even if different levels of social activity are controlled for. Thus, although the social investment theory can explain parts of the estimated relationship for men and women, it is not the sole mechanism behind it.

[18]It should be noted that the results have to be interpreted with care, as these variables are potentially endogenous controls.

5.2 Misestimation of Risks

As discussed above, the uncertainty about the direct link between behavior and negative future outcomes for health is likely to be stronger for alcohol consumption than for other domains of health-related behavior. In line with the seminal work of von Neumann and Morgenstern (1944) and Kahneman and Tversky (1979) on the effect of uncertainty on decision-making, individual perceptions are highly important in those situations. Individuals must build their own expectations about the probabilities with which their behavior is associated with certain outcomes. In the present case, individuals estimate the likelihood with which their alcohol consumption entails negative future consequences for their health. The accuracy of these estimations is importantly affected by individuals cognitive resources (Binswanger and Salm, 2017) and the information available to them (see e.g. Ziebarth, 2018; Kenkel, 1991; Farrell and Fuchs, 1982; Cutler and Lleras-Muney, 2010), as well as their perception of their own susceptibility to health problems (see e.g. Gerking and Khaddaria, 2012; Weinstein, 1984, 1987; Janz and Becker, 1984).

In line with the definition of LOC, it is obvious to expect and assume that an internal LOC is strongly correlated with lower levels of risk perception. Multiple studies in medicine and psychology have already found that LOC has an important effect on individual perceptions about personal risk e.g. with respect to myocardial infarction, AIDS, cancer and mortality (see e.g. Stürmer *et al.*, 2006; Rosengren *et al.*, 2004; Bosma *et al.*, 1999; Cull *et al.*, 1999; Frijling *et al.*, 2004; Källmén, 2000; Sjoberg, 2000). For example, Hoorens and Buunk (1993) show that students with an internal LOC are more likely to report a lower personal risk of having drinking problems. Additionally, Becker *et al.* (2012) find a significant positive association between LOC and subjective health. In line with this literature, Cobb-Clark *et al.* (2014) argue that an increased perception of control might be correlated with a stronger belief about the ability to cope with and prevent the consequences of drinking. An increased perception of individual control might reduce the perceived importance of risk for life's outcomes. The future risks of alcohol consumption might be underestimated if the individual control is overestimated (Slovic, 1992). This argument is largely in line with the latest literature on the association between LOC and risky investment decisions. Salamanca *et al.* (2016) find that household heads with an internal LOC are more likely to invest in equity. They assume that this is driven by a lower perceived variance in equity and thus a lower perceived risk of these investments for

Table 7: Additional Results (Marginal Effects) – Heterogeneity Analysis by Health-Related Risk Attitude (Outcome: Moderate or Regular Drinker)

	Men		**Women**	
	Averse	Seeking	Averse	Seeking
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$	0.050***	0.018	0.015	0.020
	(0.014)	(0.014)	(0.015)	(0.015)
$(LOC_{P66}, LOC_{max}]$	0.052***	0.006	0.037**	0.036**
	(0.016)	(0.016)	(0.016)	(0.017)
Observations	8,962	7,712	9,324	8,631
Time-Fixed Effects	✓	✓	✓	✓
Demographics	✓	✓	✓	✓
Education	✓	✓	✓	✓
Labor Market	✓	✓	✓	✓
Personality	✓	✓	✓	✓
Health	✓	✓	✓	✓

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

internal individuals. Additionally, Pinger *et al.* (2018) find that internals are also more likely to make inconsistent investment decisions, driven by a higher probability of suffering from hot hand fallacy. As opposed to social investment theory, increased alcohol consumption due to a misestimation of risks can have dangerous negative medical and economic consequences, as such behavior runs the risk of developing regular and excessive drinking habits.

Due to the lack of a direct measure for perceived risk in the data, the importance of risk perceptions for the relationship between LOC and alcohol consumption is explored indirectly using heterogeneity in underlying risk preferences, i.e. the willingness to take risk. The reasoning behind this analysis is the assumption that a behavioral effect of differences in perceived risks (i.e. "How high is the risk of drinking for future outcomes?") is likely to be heterogeneous with respect to an individual's risk preferences (i.e. "Am I willing to take this risk?"). If an individual is risk-seeking, differences in perceived risks from drinking caused by differences in LOC might not change decision-making as strongly. For example, an individual might not limit her alcohol consumption, even though she is likely to expect high risks from it if she is willing to take these risks. Thus, the association between LOC and alcohol consumption is expected to be more pronounced for risk-averse individuals, which is what we can test with the available data.

Table 7 shows the results of this heterogeneity analysis. The effects are estimated fully

separated for risk-averse and risk-seeking individuals. Risk-averse and risk-seeking individuals are defined based on the median of the Likert scale of willingness to take health risks in each gender group. For simplicity, only the effects for the LOC terciles are reported.[19] In line with our expectations, the estimation results indicate that for men the effect of LOC on alcohol consumption is heterogeneous with respect to the underlying willingness to take health risks. The positive effect of a medium and high LOC is solely driven by risk-averse men. Having a high LOC on average increases a risk-averse man's probability of being a moderate or regular drinker by 5.2 percentage points. This supports the idea that risk perception is an important channel, especially for men's drinking behavior. Due to the indirect approach of identifying this channel, it is not possible to derive statements about the quantitative importance of the mechanism as opposed to social investment theory. Nevertheless, based on the finding that we do not observe an effect of LOC on alcohol consumption for risk-seeking men, we can assume that risk perceptions are a very important mechanism for men, which are likely to reinforce considerations about social investments of men. Interestingly, we are unable to observe any heterogeneity for women in this respect, suggesting that differences in risk perceptions are less likely to affect drinking behavior for women. This is in line with lower shares of regular drinking for women in general as well as the missing link between women's LOC and their regular drinking probabilities.

6 Conclusion

Most studies in the pre-existing economic and psychological literature show that internal individuals live a healthier life. They are more likely to invest in their future health outcomes by following a healthy diet, exercising regularly and not smoking. Although we would also expect this to also translate into drinking less or abstaining from alcohol, drinking seems to be different. We find a significant positive effect of LOC on alcohol consumption. Men with a medium or high internal LOC are on average about 4% more likely to be at least moderate drinkers compared to men with a low LOC. Women with a high internal LOC are even 7.8% more likely on average to be moderate or regular drinkers than women with a low internal LOC. These findings are robust to controlling for an extensive list of explanatory variables, the variation in the LOC construct, the definition

[19]The results for the continuous measure are in line and are available from the authors upon request.

of the outcome variable and they also pass a test for potentially omitted variables based on Oster (2019).

We argue that this finding is likely driven by the fact that the link between especially moderate drinking and future outcomes is subject to uncertainty more than behavior in other health domains. Alcohol consumption might not be perceived as a behavior that strongly affects health outcomes in general or it might even be associated with positive health outcomes. Thus, LOC does not increase health investments in this domain. Conversely, other mechanisms that cause a positive relationship seem to be at play. Based on the earlier literature on the behavioral consequences of LOC as well as the existing knowledge on the drivers of drinking behavior, we discuss two potential channels.

First, parts of the positive relationship can be explained by differences in social behavior and investments into social networks between internal and external individuals. Internal individuals invest in social networks more strongly by being socially more active. While attending social events, meeting friends and going out, they are more exposed to alcohol and have more opportunities to drink. An ancillary analysis – in which measures for social activities are included into the model as potentially endogenous control variables – indicate that parts of the effect can be explained by different levels of social interaction for both men and women. As a second potential channel, we discuss differences in the perception of risks between internals and externals. Based on the literature on financial investments, we suggest that internal individuals more strongly believe in or overestimate their ability to cope with and prevent the negative consequences of drinking. Thus, they might underestimate the risk associated with drinking. A heterogeneity analysis with respect to underlying willingness to take health risks supports these considerations only for men.

It is important to note that the two mechanisms are expected to have very distinct economic and medical consequences. Whereas drinking as an investment decision might improve occupational and economic success while being related to rather moderate amounts of alcohol consumption, an underestimation of risks is potentially associated with regular drinking and the economic costs involved, e.g. through the strain that it places on individual health care expenditures and labor market perspectives. However, as excessive alcohol consumption and addiction are relatively rare, we are unable to identify a sufficient number of individuals involved in this kind of behavior to make statements about

the effect of LOC on extreme forms of drinking behavior. Further disentangling the effects with respect to the underlying channels is not possible with the data at hand. This might be an important path for future research.

Our paper adds an interesting new aspect to the literature on behavioral implications of LOC, which to date has been largely unified in the assumption that an internal LOC is associated with mainly positive outcomes and desirable behaviors and decisions. The case of drinking seems to be different! More strongly than other forms of unhealthy behavior, alcohol consumption involves multiple opposing behavioral considerations and particular degrees of uncertainty. The underlying mechanisms – social investments and/or misestimation of risks – have many layers and stress the individual complexity behind drinking decisions. Knowing about these specific intrinsic drivers of drinking can e.g. crucially contribute to the efficacy of interventions with the goal of reducing alcohol consumption in the population. Given the gender differences in our results, this would also call for gender-specific solutions.

References

Argys, L. M. and Rees, D. I. (2008). Searching for peer group effects: A test of the contagion hypothesis. *Review of Economics and Statistics*, **90** (3), 442–458.

Becker, A., Deckers, T., Dohmen, T., Falk, A. and Kosse, F. (2012). The Relationship Between Economic Preferences and Psychological Personality Measures. *Annual Review of Economics*, **4** (1), 453–478.

Becker, G. S. and Murphy, K. M. (1988). A Theory of Rational Addiction. *Journal of Political Economy*, **96** (4), 675–700.

Bennett, P., Norman, P., Murphy, S., Moore, L. and Tudor-Smith, C. (1998). Beliefs about alcohol, health locus of control, value for health and reported consumption in a representative population sample. *Health Education Research*, **13** (1), 25–32.

Binswanger, J. and Salm, M. (2017). Does everyone use probabilities? The role of cognitive skills. *European Economic Review*, **98**, 73–85.

Boffetta, P. and Hashibe, M. (2006). Alcohol and cancer. *The Lancet Oncology*, **7** (2), 149–156.

Booth Kewley, S. and Vickers, R. R. (1994). Associations between Major Domains of Personality and Health Behavior. *Journal of Personality*, **62** (3), 281–298.

Bosma, H., Schrijvers, C. and Mackenbach, J. P. (1999). Socioeconomic inequalities in mortality and importance of perceived control: cohort study. *British Medical Journal*, **319** (7223), 1469–1470.

Brant, R. (1990). Assessing Proportionality in the Proportional Odds Model for Ordinal Logistic Regression. *Biometrics*, **46** (4), 1171–1178.

Buonanno, P. and Vanin, P. (2013). Bowling alone, drinking together. *Empirical Economics*, **44** (3), 1635–1672.

Caliendo, M., Cobb-Clark, D. A., Hennecke, J. and Uhlendorff, A. (2019). Locus of control and internal migration. *Regional Science and Urban Economics*, **79**.

—, —, Obst, C., Seitz, H. and Uhlendorff, A. (2020). Locus of control and investment in training. *forthcoming in: Journal of Human Resources*.

—, — and Uhlendorff, A. (2015). Locus of control and job search strategies. *Review of Economics and Statistics*, **97** (1), 88–103.

—, Fossen, F. and Kritikos, A. S. (2014). Personality characteristics and the decisions to become and stay self-employed. *Small Business Economics*, **42** (4), 787–814.

Carman, R. S. (1974). Internal-external locus of control, alcohol use and adjustment among high school students in rural communities. *Journal of Community Psycholog*, **2** (2), 129–133.

Carpenter, C. and Dobkin, C. (2017). The Minimum Legal Drinking Age and Morbidity in the United States. *Review of Economics and Statistics*, **99** (1), 95–104.

Cawley, J. and Ruhm, C. J. (2011). The Economics of Risky Health Behaviours. In M. V. Pauly, T. G. Mcguire and P. P. Barros (eds.), *Handbook of Health Economics, Volume 2, Chapter 3*, Elsevier B.V., pp. 95–199.

Chaloupka, F. (1991). Rational Addictive Behavior and Cigarette Smoking. *Journal of Political Economy*, **99** (4), 722–742.

Chiteji, N. (2010). Time preference, noncognitive skills and well being across the life course : do noncognitive skills encourage healthy behavior? *The American Economic Review*, **100**, 200–204.

Cobb-Clark, D. A., Kassenboehmer, S. C. and Schurer, S. (2014). Healthy habits: The connection between diet, exercise, and locus of control. *Journal of Economic Behavior and Organization*, **98**, 1–28.

—, — and Sinning, M. G. (2016). Locus of control and savings. *Journal of Banking and Finance*, **73**, 113–130.

— and Schurer, S. (2013). Two economists' musings on the stability of locus of control. *The Economic Journal*, **123** (570), 358–400.

— and Tan, M. (2011). Noncognitive skills, occupational attainment, and relative wages. *Labour Economics*, **18** (1), 1–13.

Coleman, M. and DeLeire, T. (2003). An economic model of locus of control and the human capital investment decision. *Journal of Human Resources*, **38** (3), 701–721.

Cook, P. J. and Moore, M. J. (2000). Alcohol. In A. J. Culyer and J. P. Newhouse (eds.), *Handbook of Health Economics, Volume 1, Chapter 30*, Elsevier B.V., pp. 1629–1673.

Corrao, G., Bagnardi, V., Zambon, A. and La Vecchia, C. (2004). A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine*, **38** (5), 613–619.

Cull, A., Anderson, E. D., Campbell, S., Mackay, J., Smyth, E. and Steel, M. (1999). The impact of genetic counselling about breast cancer risk on women's risk perceptions and levels of distress. *British Journal of Cancer*, **79** (3-4), 501–508.

Cutler, D. M., Glaeser, E. L. and Shapiro, J. M. (2003). Why Have Americans Become More Obese? *Journal of Economic Perspectives*, **17** (3), 93–118.

— and Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of Health Economics*, **29** (1), 1–28.

Dielman, T., Campanelli, P. C., Shope, J. T. and Butchart, A. T. (1987). Susceptibility to Peer Pressure, Self-Esteem, and Health Locus of Control as Correlates of Adolescent Substance Abuse. *Health Education Quarterly*, **14** (2), 207–221.

Duncan, G. J., Boisjoly, J., Kremer, M., Levy, D. M. and Eccles, J. (2005). Peer effects in drug use and sex among college students. *Journal of Abnormal Child Psychology*, **33** (3), 375–385.

Farrell, P. and Fuchs, V. R. (1982). Schooling and Health: The Cigarette Connection. *Journal of Health Economics*, **1**, 217–230.

Francesconi, M. and James, J. (2019). Liquid Assets? the Short-Run Liabilities of Binge Drinking. *The Economic Journal*, **129** (621), 2090–2136.

Frijling, B. D., Lobo, C. M., Keus, I. M., Jenks, K. M., Akkermans, R. P., Hulscher, M. E., Prins, A., Van Der Wouden, J. C. and Grol, R. P. (2004). Perceptions of cardiovascular risk among patients with hypertension or diabetes. *Patient Education and Counseling*, **52** (1), 47–53.

Furnham, A. and Greaves, N. (1994). Gender and locus of control correlates of body image dissatisfaction. *European Journal of Personality*, **8** (3), 183–200.

Gerking, S. and Khaddaria, R. (2012). Perceptions of Health Risk and Smoking Decisions of Young People. *Health Economics*, **21**, 865–877.

Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C. and Schupp, J. (2018). The German Socio-Economic Panel (SOEP). *Journal of Economics and Statistics*.

Grønbæk, M. (2009). The positive and negative health effects of alcohol- and the public health implications. *Journal of Internal Medicine*, **265** (4), 407–420.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, **80** (2), 223–255.

— (2000). The Human Capital Model. In A. J. Culyer and J. P. Newhouse (eds.), *Handbook of Health Economics, Volume 1, Chapter 7*, Elsevier B.V., pp. 347–408.

Gruber, J. and Köszegi, B. (2001). Is addiction "rational"? Theory and evidence. *Quarterly Journal of Economics*, **116** (4), 1261–1303.

Hennecke, J. (2020). The Independent Woman - Locus of Control and Female Labor Force Participation. *AUT Economics Working Paper Series*, **2020/03**.

Heywood, J. S., Jirjahn, U. and Struewing, C. (2017). Locus of control and performance appraisal. *Journal of Economic Behavior & Organization*, **142**, 205–225.

Holt, C. L., Roth, D. L., Huang, J. and Clark, E. M. (2014). Gender Differences in the Roles of Religion and Locus of Control on Alcohol Use and Smoking Among African Americans. *Journal of Studies on Alcohol and Drugs*, **76** (3), 482–492.

Hoorens, V. and Buunk, B. P. (1993). Social comparison of health risks: locus of control, the person-positivity bias in favor of anonymous peers. *Journal of Applied Social Pscyhology*, **23** (4), 291–302.

Janz, N. K. and Becker, M. H. (1984). The Health Belief Model: A Decade Later. *Health Education & Behavior*, **11** (1), 1–47.

Jones, A. S. and Richmond, D. W. (2006). Causal effects of alcoholism on earnings: Estimates from the NLSY. *Health Economics*, **15** (8), 849–871.

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, **47** (March), 263–291.

Källmén, H. (2000). Manifest anxiety, general self-efficacy and locus of control as determinants of personal and general risk perception. *Journal of Risk Research*, **3** (2), 111–120.

Kenkel, D. S. (1991). Health Behavior, Health Knowledge, and Schooling. *Journal of Political Economy*, **99** (2), 287–305.

Lassi, G., Taylor, A. E., Mahedy, L., Heron, J., Eisen, T. and Munafo, M. R. (2019). Locus of control is associated with tobacco and alcohol consumption in young adults of the Avon Longitudinal Study of Parents and Children. *Royal Society Open Science*, **6** (3).

Leifman, H., Kühlhorn, E., Allebeck, P., Andréasson, S. and Romelsjö, A. (1995). Abstinence in late adolescence-Antecedents to and covariates of a sober lifestyle and its consequences. *Social Science and Medicine*, **41** (1), 113–121.

Lemos-Giráldez, S. and Fidalgo-Aliste, A. M. (1997). Personality dispositions and health-related habits and attitudes: A cross-sectional study. *European Journal of Personality*, **11** (3), 197–209.

Lundborg, P. (2006). Having the wrong friends? Peer effects in adolescent substance use. *Journal of Health Economics*, **25** (2), 214–233.

Macdonald, Z. and Shields, M. A. (2001). The impact of alcohol consumption on occupational attainment in England. *Economica*, **68** (271), 427–453.

— and — (2004). Does problem drinking affect employment? Evidence from England. *Health Economics*, **13** (2), 139–155.

Marcus, J. and Siedler, T. (2015). Reducing binge drinking? The effect of a ban on late-night off-premise alcohol sales on alcohol-related hospital stays in Germany. *Journal of Public Economics*, **123**, 55–77.

McGee, A. D. and McGee, P. (2016). Search, effort, and locus of control. *Journal of Economic Behavior and Organization*, **126** (2), 89–101.

Mendolia, S. and Walker, I. (2014). The effect of noncognitive traits on health behaviours in adolescence. *Health economics*, **23** (9), 1146–1158.

Merikangas, K. R., Mehta, R. L., Molnar, B. E., Walters, E. E., Swendsen, J. D., Aguilar-Gaziola, S., Bijl, R., Borges, G., Caraveo-Anduaga, J. J., Dewit, D. J., Kolody, B., Vega, W. A., Wittchen, H. U. and Kessler, R. C. (1998). Comorbidity of substance use disorders with mood and anxiety disorders: Results of the international Consortium in Psychiatric Epidemiology. *Addictive Behaviors*, **23** (6), 893–907.

Mullahy, J. and Sindelar, J. (1996). Employment, unemployment, and problem drinking. *Journal of Health Economics*, **15** (4), 409–434.

— and Sindelar, J. L. (1993). Alcoholism, Work, and Income. *Journal of Labor Economics*, **11** (3), 494–520.

Ohsfeldt, R. L. and Morrisey, M. A. (1997). Beer Taxes, Workers' Compensation, and Industrial Injury. *Review of Economics and Statistics*, **79** (1), 155–160.

Oster, E. (2019). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business and Economic Statistics*, **37** (2), 187–204.

Ours, J. V. (2004). A pint a day raises a man's pay; but smoking blows that gain away. *Journal of Health Economics*, **23** (5), 863–886.

Peters, B. L. and Stringham, E. (2006). No booze? You may lose: Why drinkers earn more money than nondrinkers. *Journal of Labor Research*, **27** (3), 411–421.

Peters, R., Peters, J., Warner, J., Beckett, N. and Bulpitt, C. (2008). Alcohol, dementia and cognitive decline in the elderly: A systematic review. *Age and Ageing*, **37** (5), 505–512.

Piatek, R. and Pinger, P. (2016). Maintaining (locus of) control? Data combination for the identification and inference of factor structure models. *Journal of Applied Econometrics*, **31** (4), 734–755.

Pinger, P., Schäfer, S. and Schumacher, H. (2018). Locus of control and consistent investment choices. *Journal of Behavioral and Experimental Economics*, **75** (11537), 66–75.

Preuss, M. and Hennecke, J. (2018). Biased by success and failure: How unemployment shapes locus of control. *Labour Economics*, **53**, 63–74.

Rachlin, H. (1997). Four teleological theories of addiction. *Psychonomic Bulletin and Review*, **4** (4), 462–473.

Rehm, J., Greenfield, T. and Rogers, J. (2001). Average volume of alcohol consumption, patterns of drinking, and all-cause mortality: Results from the US national alcohol survey. *American Journal of Epidemiology*, **153** (1), 64–71.

Renaud, S., Guéguen, R., Schenker, J. and D'Houtaud, A. (1998). Alcohol and Mortality in Middle-Aged Men from Eastern France. *Epidemiology.*, **9** (2), 184–188.

Ronksley, P. E., Brien, S. E., Turner, B. J., Mukamal, K. J. and Ghali, W. A. (2011). Association of alcohol consumption with selected cardiovascular disease outcomes: A systematic review and meta-analysis. *British Medical Journal*, **342** (7795), 479.

Rosengren, A., Hawken, S., Ounpuu, S., Sliwa, P., Zubaid, M., Almahmeed, W., Ngu Blackett, K., Sitthi-Amorn, C., Sato, H. and Yusuf, P. (2004). Association of psychosocial risk factors with risk of acute myocardial infarction in 11 119 cases and 13 648 controls from 52 countries (the Interheart study): Case-control study. *Lancet*, **364** (9438), 953–962.

Rotter, J. B. (1966). Generalized Expectancies for Internal Versus External Control of Reinforcement. *Psychological Monographs: General and Applied*, **80** (1), 1–28.

Sacks, J. J., Gonzales, K. R., Bouchery, E. E., Tomedi, L. E. and Brewer, R. D. (2015). 2010 National and State Costs of Excessive Alcohol Consumption. *American Journal of Preventive Medicine*, **49** (5), e73–e79.

Salamanca, N., De Grip, A., Fouarge, D. and Montizaan, R. (2016). Locus of Control and Investment in Risky Assets. *IZA Discussion Paper Series*, **No. 10407**.

Schilbach, F. (2019). Alcohol and self-control: A field experiment in India. *American Economic Review*, **109** (4), 1290–1322.

Sjoberg, L. (2000). Factors in Risk Perception. *Risk Analysis*, **20** (1), 1–11.

Slovic, P. (1992). Perception of Risk: Reflections on the Psychometric Paradigm. In D. Golding and S. Krimsky (eds.), *Social Theories of Risk*, pp. 117–152.

SOEP (2017). Socio Economic Panel Data: Data for years 1984-2016, version 33, Doi: 10.5684/soep.v33.

Specht, J., Egloff, B. and Schmukle, S. C. (2013). Everything under control? The effects of age, gender, and education on trajectories of perceived control in a nationally representative German sample. *Developmental Psychology*, **49** (2), 353–364.

Steptoe, A. and Wardler, J. (2001). Locus of control and health behaviour revisited: A multivariate analysis of young adults from 18 countries. *British Journal of Psychology*, **92**, 659–672.

Stürmer, T., Hasselbach, P. and Amelang, M. (2006). Personality, lifestyle, and risk of cardiovascular disease and cancer: Follow-up of population based cohort. *British Medical Journal*, **332** (7554), 1359–1362.

Terza, J. V. (2002). Alcohol abuse and employment: A second look. *Journal of Applied Econometrics*, **17** (4), 393–404.

Vollrath, M., Knoch, D. and Cassano, L. (1999). Personality, risky health behaviour, and perceived susceptibility to health risks. *European Journal of Personality*, **13** (1), 39–50.

von Neumann, J. and Morgenstern, O. (1944). *Theory of Games and Economic Behavior*. Princeton University Press.

Wallston, B. S. and Wallston, K. A. (1978). Locus of Control and Health: A Review of Literature. *Health Education Monographs*, **6**, 107–117.

—, — and DeVellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Education Monographs*, **6** (2), 160–170.

Weinstein, N. D. (1984). Why It Won't Happen to Me: Perceptions of Risk. *Health Psychology*, **3** (5), 431–457.

— (1987). Unrealistic optimism about susceptibility to health problems. *Journal of Behavioral Medicine*, **10** (5), 481–500.

Wijatkowski, S., Forgays, D. G., Wrzesniewski, K. and Gorski, T. (1990). Smoking behavior and personality characteristics in polish adolescents. *International Journal of the Addictions*, **25** (4), 363–373.

Ziebarth, N. R. (2018). Biased Lung Cancer Risk Perceptions: Smokers are Misinformed. *Jahrbücher fur Nationalökonomie und Statistik*, **238** (5), 395–421.

— and Grabka, M. M. (2009). In vino pecunia? The association between beverage-specific drinking behavior and wages. *Journal of Labor Research*, **30** (3), 219–244.

A Appendix

Table A.1: Summary Statistics

	All	Men	Women
Demographic Controls			
Female	0.52		
Age	47.37	47.67	47.10
German Nationality	0.94	0.94	0.94
Region of Germany			
North and Central	0.20	0.20	0.20
East	0.27	0.27	0.27
West	0.26	0.26	0.26
South	0.26	0.26	0.26
Married or Stable Partner	0.76	0.76	0.75
Number of Children in HH	0.49	0.47	0.50
Young Children			
Has Child under 1	0.02	0.02	0.02
Has Child 1 - 7 Years	0.12	0.12	0.13
Expecting child	0.01	0.01	0.01
Net Household Income in KEUR	2.96	3.03	2.90
Religious Affiliation			
Non	0.33	0.37	0.30
Christian	0.63	0.60	0.67
Muslim	0.02	0.02	0.02
Other	0.01	0.01	0.01
Educational Controls			
Highest School Degree			
No School Degree	0.02	0.02	0.02
Lower Secondary School	0.30	0.32	0.28
Intermediary School	0.33	0.29	0.36
Highschool	0.30	0.31	0.28
Other School	0.06	0.06	0.06
Highest Vocational Degree			
No Vocational Diploma	0.16	0.14	0.18
Apprenticeship	0.45	0.47	0.43
Higher Technical College	0.26	0.25	0.26
College or University Degree	0.24	0.27	0.22
Labor Market Controls			
Gross Labor Income in KEUR	1.77	2.42	1.16
Occupational Autonomy			
Low	0.33	0.28	0.38
Medium	0.25	0.27	0.24
High	0.22	0.18	0.26
Labor Force Status			
Employed or Self-employed	0.67	0.72	0.62
Unemployed	0.06	0.06	0.05
Out of the Labour Force	0.28	0.22	0.33
Personality Controls			
Conscientiousness (avg.)	5.89	5.83	5.95
Extraversion (avg.)	4.81	4.68	4.93
Agreeableness (avg.)	5.37	5.19	5.53
Neuroticism (avg.)	3.86	3.61	4.10
Openness (avg.)	4.48	4.39	4.57
Willingness to take risk (general) (avg.)	4.49	4.93	4.08
Willingness to take health risk (avg.)	2.96	3.32	2.63
Patience (avg.)	6.12	6.11	6.13
Impulsiveness (avg.)	5.11	4.98	5.24

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	All	Men	Women
Health Controls			
Disabled	0.12	0.13	0.10
In Bad Health	0.16	0.15	0.17
Body Mass Index (imputed)	26.20	26.99	25.47
Smoking			
Non	0.71	0.67	0.74
Light	0.16	0.16	0.17
Heavy	0.13	0.17	0.09
Healthy Diet			
Non	0.06	0.08	0.03
Moderate	0.86	0.86	0.86
Strong	0.08	0.06	0.11
Exercise			
Non	0.35	0.35	0.35
Moderate	0.28	0.30	0.26
Strong	0.38	0.35	0.39
Time Controls			
Year 2006	0.33	0.33	0.33
Year 2008	0.34	0.34	0.34
Year 2010	0.33	0.33	0.33
Season			
Autumn and Winter (October - February)	0.35	0.36	0.35
Spring (March-May)	0.54	0.54	0.54
Summer (June-September)	0.11	0.11	0.11
Day of Week			
Monday	0.16	0.16	0.17
Tuesday	0.17	0.17	0.17
Wednesday	0.17	0.17	0.17
Thursday	0.15	0.14	0.15
Friday	0.16	0.16	0.16
Saturday	0.13	0.13	0.13
Sunday	0.06	0.06	0.06
Observations	34,629	16,674	17,955
Individuals	14,937	7,202	7,735

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.

Table A.2: Full Results (Marginal Effects) – Binary Drinking Indicators

	Men				Women			
	Mod./Reg. D_1	Moderate D_2	Regular D_3	Regular D_4	Mod./Reg. D_1	Moderate D_2	Regular D_3	Regular D_4
LOC Factor (cont.)	0.013***	0.016***	0.008	-0.006	0.013**	0.013**	0.006	-0.001
	(0.005)	(0.006)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Demographics								
Age	0.003	0.000	0.009**	0.009**	-0.001	-0.001	0.004	0.002
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Squared Age	0.000	0.000	-0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
German Nationality	0.011	-0.003	0.043	0.048	0.036	0.032	0.026	0.025
	(0.022)	(0.027)	(0.035)	(0.031)	(0.025)	(0.025)	(0.022)	(0.027)
Region (Ref: Central and North)								
East	0.018	-0.000	0.063***	0.060***	-0.014	-0.000	-0.047***	-0.044***
	(0.015)	(0.018)	(0.022)	(0.019)	(0.015)	(0.016)	(0.013)	(0.016)
West	0.007	-0.001	0.033	0.033*	-0.014	-0.023	0.015	0.032**
	(0.014)	(0.017)	(0.021)	(0.018)	(0.014)	(0.014)	(0.013)	(0.015)
South	0.005	-0.025	0.064***	0.081***	0.003	-0.007	0.021	0.034**
	(0.014)	(0.017)	(0.020)	(0.018)	(0.014)	(0.014)	(0.013)	(0.016)
Number of Children	-0.009	-0.009	-0.011	0.002	-0.011	-0.011	-0.005	0.005
	(0.007)	(0.008)	(0.010)	(0.009)	(0.007)	(0.008)	(0.007)	(0.008)
Has Child 1 year or younger	-0.038	-0.071**	0.003	0.055	-0.176***	-0.168***	-0.085***	-0.025
	(0.026)	(0.033)	(0.034)	(0.036)	(0.026)	(0.026)	(0.019)	(0.040)
Has Child 1-7 years old	-0.033**	-0.031	-0.058***	-0.038*	-0.054***	-0.050***	-0.038***	-0.025
	(0.016)	(0.019)	(0.023)	(0.020)	(0.016)	(0.016)	(0.014)	(0.018)
Expecting Child	-0.092***	-0.110***	-0.092**	0.013	-0.257***	-0.229***	-0.144***	-0.156***
	(0.034)	(0.040)	(0.046)	(0.049)	(0.029)	(0.028)	(0.011)	(0.029)
In a stable partnership	0.013	0.016	0.020	0.007	-0.005	-0.011	0.020*	0.037***
	(0.013)	(0.015)	(0.018)	(0.016)	(0.012)	(0.012)	(0.011)	(0.013)
Net HH Income in KEUR	0.012***	0.011**	0.018***	0.005	0.022***	0.017***	0.016***	0.009**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)
Religious Affiliation (Ref: Non)								
Christian	0.017	0.028**	0.006	-0.020	0.000	0.009	-0.023**	-0.022*
	(0.011)	(0.014)	(0.016)	(0.014)	(0.012)	(0.012)	(0.011)	(0.013)
Muslim	-0.295***	-0.256***	-0.352***	-0.189***	-0.341***	-0.303***	-0.159***	-0.153***
	(0.037)	(0.038)	(0.035)	(0.049)	(0.033)	(0.031)	(0.015)	(0.048)
Other	-0.301***	-0.279***	-0.319***	-0.102*	-0.321***	-0.299***	-0.126***	-0.009
	(0.038)	(0.038)	(0.039)	(0.057)	(0.038)	(0.036)	(0.026)	(0.101)
Education								
Highest School Degree (Ref: No Degree)								
Lower Secondary School	0.044	0.028	0.088*	0.053	-0.008	-0.020	0.070	0.127
	(0.032)	(0.041)	(0.050)	(0.051)	(0.045)	(0.045)	(0.062)	(0.090)
Intermediary School	0.071**	0.050	0.148***	0.097*	0.049	0.025	0.133**	0.168**
	(0.032)	(0.042)	(0.050)	(0.052)	(0.045)	(0.046)	(0.063)	(0.082)
Highschool	0.075**	0.043	0.176***	0.132**	0.051	0.018	0.169**	0.215**
	(0.033)	(0.043)	(0.052)	(0.053)	(0.046)	(0.047)	(0.075)	(0.091)
Other School	0.045	0.046	0.077	0.017	-0.008	-0.026	0.108	0.182
	(0.033)	(0.043)	(0.057)	(0.057)	(0.047)	(0.047)	(0.078)	(0.113)
Highest Vocational Degree (Ref: No Diploma)								
Apprenticeship	0.013	0.029*	-0.008	-0.041**	0.028**	0.030**	0.007	-0.009
	(0.013)	(0.016)	(0.019)	(0.016)	(0.013)	(0.013)	(0.012)	(0.014)
Higher Technical College	-0.016	-0.007	-0.032	-0.036**	0.006	0.008	-0.001	-0.007
	(0.015)	(0.018)	(0.021)	(0.018)	(0.014)	(0.014)	(0.013)	(0.015)
College or University Degree	0.038**	0.043**	0.038	0.002	0.044***	0.033**	0.039***	0.032**
	(0.015)	(0.019)	(0.023)	(0.018)	(0.016)	(0.016)	(0.015)	(0.016)
Labor Market								
Gross Labor Income in KEUR	-0.002	-0.002	-0.002	-0.001	-0.000	-0.000	-0.003	-0.001
	(0.002)	(0.004)	(0.003)	(0.003)	(0.006)	(0.005)	(0.004)	(0.005)
Labor Force Status (Ref: (Self)Employed)								
Unmployed	-0.025	-0.021	-0.038	-0.029	-0.046	-0.035	-0.060***	-0.053**
	(0.021)	(0.028)	(0.030)	(0.027)	(0.029)	(0.029)	(0.021)	(0.027)
Not in the labour force	-0.055***	-0.061**	-0.055**	-0.002	-0.033	-0.021	-0.048***	-0.047**
	(0.020)	(0.026)	(0.027)	(0.024)	(0.024)	(0.024)	(0.018)	(0.021)
Occupational Autonomy (Ref: Low)								
Medium	0.022	0.031	0.009	-0.015	-0.026	-0.008	-0.067***	-0.074***
	(0.015)	(0.019)	(0.022)	(0.019)	(0.021)	(0.021)	(0.014)	(0.017)
High	0.005	0.008	0.005	-0.006	-0.007	0.008	-0.038***	-0.047***

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	(0.014)	(0.018)	(0.020)	(0.017)	(0.018)	(0.018)	(0.013)	(0.015)
Personality (averaged)								
Conscientiousness	-0.004	-0.001	-0.010	-0.012*	-0.030***	-0.027***	-0.022***	-0.015**
	(0.005)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Extraversion	0.020***	0.016**	0.037***	0.022***	0.027***	0.026***	0.014**	0.002
	(0.006)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Agreeableness	-0.007	0.004	-0.029***	-0.035***	0.009	0.009	-0.001	-0.006
	(0.005)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Neuroticism	0.003	0.005	-0.006	-0.010	0.001	-0.001	0.001	0.002
	(0.006)	(0.007)	(0.009)	(0.008)	(0.006)	(0.006)	(0.005)	(0.006)
Openness	-0.012**	-0.009	-0.021**	-0.014*	0.006	0.004	0.007	0.007
	(0.006)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Willingness to take general risk	0.014*	0.017*	0.011	-0.002	0.022***	0.026***	-0.000	-0.017**
	(0.007)	(0.009)	(0.010)	(0.009)	(0.007)	(0.008)	(0.006)	(0.008)
Willingness to take health risk	0.015**	0.017**	0.022**	0.008	0.013*	0.009	0.016***	0.015**
	(0.006)	(0.007)	(0.009)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Patience	-0.013**	-0.011	-0.025***	-0.015**	-0.013**	-0.010*	-0.012**	-0.009
	(0.006)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Impulsiveness	-0.006	-0.007	-0.007	0.001	0.002	-0.002	0.010**	0.019***
	(0.006)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Health								
Disabled	-0.062***	-0.058***	-0.085***	-0.032*	-0.081***	-0.075***	-0.054***	-0.017
	(0.015)	(0.017)	(0.020)	(0.018)	(0.016)	(0.017)	(0.012)	(0.018)
In Bad Health	-0.079***	-0.089***	-0.093***	-0.006	-0.081***	-0.079***	-0.040***	-0.005
	(0.013)	(0.015)	(0.017)	(0.016)	(0.012)	(0.012)	(0.010)	(0.014)
Body Mass Index	-0.006***	-0.005***	-0.011***	-0.006***	-0.009***	-0.008***	-0.008***	-0.005***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Smoking (Ref: Non)								
Light	0.038***	0.030**	0.065***	0.046***	0.042***	0.030**	0.051***	0.046***
	(0.012)	(0.015)	(0.018)	(0.015)	(0.012)	(0.013)	(0.013)	(0.015)
Heavy	0.014	-0.009	0.045**	0.073***	0.047***	0.015	0.088***	0.120***
	(0.013)	(0.016)	(0.018)	(0.016)	(0.017)	(0.018)	(0.018)	(0.021)
Healthy Diet (Ref: Non)								
Moderate	-0.023*	0.015	-0.081***	-0.106***	-0.059**	-0.050*	-0.049*	-0.030
	(0.014)	(0.019)	(0.020)	(0.019)	(0.024)	(0.026)	(0.027)	(0.029)
Strong	-0.122***	-0.088***	-0.201***	-0.118***	-0.117***	-0.114***	-0.065**	-0.015
	(0.023)	(0.027)	(0.030)	(0.029)	(0.027)	(0.029)	(0.029)	(0.033)
Exercise (Ref: Non)								
Moderate	0.026***	0.044***	0.010	-0.034***	0.032***	0.032***	0.015	0.008
	(0.010)	(0.013)	(0.014)	(0.013)	(0.011)	(0.011)	(0.010)	(0.013)
Strong	0.035***	0.054***	0.019	-0.042***	0.076***	0.076***	0.039***	0.004
	(0.011)	(0.014)	(0.016)	(0.014)	(0.011)	(0.011)	(0.010)	(0.012)
Time Fixed-Effects								
Year Dummies								
2008	0.004	-0.001	0.017**	0.019**	0.007	0.005	0.010*	0.005
	(0.006)	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.006)	(0.008)
2010	-0.020***	-0.021**	-0.025***	-0.006	-0.000	0.001	-0.001	-0.007
	(0.007)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)	(0.006)	(0.009)
Season (Ref.: Autumn and Winter (October - February))								
Spring (March - May)	0.008	0.012	0.010	-0.001	-0.004	-0.002	-0.003	-0.007
	(0.008)	(0.010)	(0.012)	(0.010)	(0.008)	(0.009)	(0.008)	(0.010)
Summer (June - September)	-0.006	-0.022	0.023	0.047***	-0.003	0.000	-0.004	-0.013
	(0.014)	(0.018)	(0.020)	(0.018)	(0.014)	(0.015)	(0.012)	(0.015)
Day of the Week (Ref.: Monday)								
Tuesday	0.003	0.001	0.009	0.004	-0.020	-0.017	-0.017	-0.014
	(0.012)	(0.015)	(0.017)	(0.015)	(0.012)	(0.013)	(0.011)	(0.014)
Wednesday	0.010	0.003	0.032*	0.024	-0.004	0.001	-0.009	-0.015
	(0.012)	(0.015)	(0.017)	(0.015)	(0.012)	(0.013)	(0.011)	(0.013)
Thursday	0.001	0.002	0.002	-0.002	0.002	0.006	-0.008	-0.007
	(0.012)	(0.016)	(0.018)	(0.016)	(0.013)	(0.014)	(0.011)	(0.014)
Friday	-0.006	-0.005	0.000	-0.003	-0.016	-0.011	-0.014	-0.015
	(0.012)	(0.015)	(0.017)	(0.016)	(0.013)	(0.013)	(0.011)	(0.014)
Saturday	0.012	0.015	0.021	-0.001	-0.021	-0.018	-0.012	-0.009
	(0.013)	(0.017)	(0.019)	(0.017)	(0.014)	(0.014)	(0.013)	(0.016)
Sunday	-0.033**	-0.034	-0.036	-0.003	-0.040**	-0.036**	-0.029*	-0.017
	(0.017)	(0.021)	(0.023)	(0.021)	(0.018)	(0.018)	(0.017)	(0.022)
Observations	16,674	12,138	9,380	11,830	17,955	16,317	10,736	8,857

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Robustness Checks (Marginal Effects) – Outcome Variable

	Men		Women	
(1) Alternative LOC Variables				
(a) LOC Index (equal weights)				
LOC Factor (cont.)	0.011**		0.012**	
	(0.005)		(0.005)	
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$		0.013		0.015
		(0.010)		(0.011)
$(LOC_{P66}, LOC_{max}]$		0.025**		0.033***
		(0.011)		(0.011)
Observations	16,674	16,674	17,955	17,955
(b) Averaged LOC				
LOC Factor (cont.)	0.021***		0.016***	
	(0.006)		(0.006)	
Locus of Control Terciles (Ref.: $[LOC\_min, LOC\_P33]$)				
$(LOC_{P33}, LOC_{P66}]$		0.026**		0.026**
		(0.012)		(0.012)
$(LOC_{P66}, LOC_{max}]$		0.045***		0.039***
		(0.013)		(0.014)
Observations	16,674	16,674	17,955	17,955
(2) Alternative Outcome Variables				
(a) Abstainer (vs. All Other Outcomes)				
LOC Factor (cont.)	-0.007***		-0.008**	
	(0.003)		(0.003)	
Locus of Control Terciles (: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$		-0.017***		-0.009
		(0.006)		(0.007)
$(LOC_{P66}, LOC_{max}]$		-0.019***		-0.017**
		(0.007)		(0.008)
Observations	16,674	16,674	17,955	17,955
(b) Objective Measure 2016				
Moderate or High Consumption Frequency (2-3 days a week or more often)				
LOC Factor (cont.)	0.013		0.010	
	(0.008)		(0.007)	
Locus of Control Terciles (Ref.: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$		0.027		0.028*
		(0.018)		(0.015)
$(LOC_{P66}, LOC_{max}]$		0.034*		0.026*
		(0.020)		(0.016)
Observations	4,253	4,253	4,941	4,941
High Consumption Amount (3 or more drinks per day)				
LOC Factor (cont.)	0.014*		-0.001	
	(0.008)		(0.006)	
Locus of Control Terciles (Ref.:: $[LOC_{min}, LOC_{P33}]$)				
$(LOC_{P33}, LOC_{P66}]$		0.060***		-0.005
		(0.018)		(0.013)
$(LOC_{P66}, LOC_{max}]$		0.040**		-0.001
		(0.019)		(0.014)
Observations	4,253	4,253	4,941	4,941
All Controls	✓	✓	✓	✓

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Descriptive Analysis - Alcohol Consumption 2016

	Men			**Women**		
	All	Ext.	Int.	All	Ext.	Int.
	(1)	(2)	(3)	(4)	(5)	(6)
How often do you drink alcohol?						
Every Day	0.11	0.11	0.11	0.03	0.03	0.04*
4-6 days a week	0.12	0.10	0.13***	0.05	0.05	0.06
2-3 days a week	0.25	0.23	0.27***	0.17	0.15	0.19***
2-4 days a month	0.24	0.22	0.25**	0.24	0.24	0.25
Once a month or less	0.17	0.18	0.16**	0.30	0.30	0.30
Never	0.12	0.15	0.09***	0.20	0.23	0.17***
Observations	4,267			4,961		
When you drink, how many drinks do you consume per day?						
1-2 drinks	0.59	0.60	0.59	0.79	0.79	0.79
3-4 drinks	0.29	0.29	0.30	0.17	0.16	0.17
5-6 drinks	0.08	0.08	0.08	0.03	0.03	0.03
7-9 drinks	0.02	0.02	0.03	0.01	0.01	0.01
10+ drinks	0.01	0.01	0.01	0.00	0.00	0.00
Observations	4,253			4,941		

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Individuals are grouped into internals (Int.) and externals (Ext.) based on whether their LOC is lower/equal or higher than the median. Significance stars refer to the significance level of a t-test for mean equivalence between externals and internals: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Relative Degree of Selection Test (Oster (2019)) (Outcome – Moderate or Regular Drinking)

	Baseline effect (SE), $[R^2]$	Controlled effect ($\tilde{\beta}$) (SE), $[R^2]$	Identified Set $[\tilde{\beta}, \beta^*]$	$\tilde{\delta}$ for $\beta = 0$ given R_{max}
	(1)	(2)	(3)	(4)
Men ($R_{max} = 0.092$)				
LOC Factor > Median	0.069***	0.032***	[0.018,0.032]	2.00
	(0.008)	(0.009)		
	[.007]	[.071]		
Observations	16,674	16,674		
Women ($R_{max} = 0.136$)				
LOC Factor > Median	0.088***	0.025***	[0.001,0.025]	1.03
	(0.008)	(0.009)		
	[.009]	[.105]		
Observations	17,955	17,955		
Time-Fixed Effects	✓	✓		
Demographics		✓		
Education		✓		
Labor Market		✓		
Personality		✓		
Health		✓		

Source: SOEP, 2006, 2008, 2010 waves, version 33, doi:10.5684/soep.v33, own calculations.
Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Columns (1) and (2) report coefficients of linear regressions using binary LOC indicator (LOC > Median) as explanatory and binary indicator for moderate or regular drinking as outcome variable. R_{max} is set to $1.3 * \tilde{R}$ and reported in the top row of each panel. Column (3) reports the identified set, which is bounded below by $\tilde{\beta}$ and above by β^* at R_{max} and $\delta = 1$. Column (6) shows the value of $\tilde{\delta}$ that would produce $\beta = 0$ given the values of R_{max}.