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In Vino Pecunia?
The Association Between Beverage-Specific Drinking Behavior and Wages[‡]

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March 31, 2008

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Abstract

The positive association between moderate alcohol consumption and wages is well documented in the economic literature. Positive health effects as well as networking mechanisms serve as explanations for the "alcohol-income puzzle." Using individual-based microdata from the GSOEP for 2006, we confirm that this relationship exists for Germany as well. More importantly, we shed light on the alcohol-income puzzle by analyzing, for the first time, the association between beverage-specific drinking behavior and wages. In our analysis, we disentangle the general wage effect of drinking into diverse effects for different types of drinkers. Mincerian estimates reveal significant and positive relationships between wine drinkers and wages as well as between beverage-unspecific drinkers and wages. We are unable to detect endogeneity problems with the drinking variables, which speaks in favor of OLS regressions. When splitting the sample into age groups, the "wine gain" disappears for employees under the age of 35 and increases in size and significance for higher age groups. We also find a "beer gain" for residents of rural areas and a "cocktail gain" for residents of urban areas. Several explanations for our empirical results are discussed in view of the likelihood that the alcohol-income puzzle is a multicausal phenomenon.

Keywords: "alcohol-income puzzle," beverage-specific drinking behavior; wages; wine

JEL classification: I10; I12; J30; J31

1 Introduction

According to the World Health Organization (WHO), about 2 billion people consume alcoholic beverages worldwide (World Health Organization, 2004). An extensive body of medical, economic and sociological literature has documented tremendous negative effects of alcohol abuse: not only harmful health consequences, but also high social and economic costs that impose a major burden on society.

On the other hand, economists have identified a distinct positive relationship between moderate alcohol consumption and earnings (Van Ours, 2004; MacDonald and Shields, 2001; Zarkin *et al.*, 1998). The exact mechanisms of this "alcohol-income puzzle" still remain subject to speculation. An often-cited explanation refers to the positive health effects of moderate alcohol intake. Another argument involves the potential networking and social effects induced by drinking.

Despite a substantial body of the literature that deals with alcohol consumption and labor market outcomes, there has been no analysis to date of the association between beverage-specific drinking behavior and labor market outcomes. Our work extends the current literature in various ways. First, the existence of a positive wage differential for moderate drinkers has never before been shown for Germany. Moreover, we use a representative sample and recent data for our analysis. Third and most importantly, this is the first attempt to model a relationship between beverage-specific drinking behavior and wages. We present different model specifications and consider cohort-specific as well as regional effects.

The paper is organized as follows. Section 2 summarizes previous studies and the background. Section 3 deals with the econometric model employed and several statistical testing procedures. Section 4 outlines the dataset and the variables used. In Section 5, we present our empirical results. Section 6 discusses the findings and limitations of the paper and Section 7 concludes.

2 Background and Previous Studies

Since the early work of Becker (1964) and others, human capital is considered to be one of the major income determinants. Following Grossman (1972), a

tremendous amount of empirical work has been conducted on human capital formation. In recent years, substance use and abuse and their impact on health and labor market outcomes has received at great deal of attention. We can formulate:

$$\ln(\omega) = \beta_0 + \beta_1 X + \beta_2 J + \beta_3 H + \varepsilon \tag{1}$$

This Mincerian earnings equation models the wage (ω) as a function of observable demographic characteristics (X), job characteristics (J), and the stock of human capital (H). We add an error term (ε) that captures unobservable characteristics.

Alcohol may affect the stock of human capital through at least two channels. Alcohol consumption may influence an individual's productivity and thus wages through his or her health status. Additionally, social and network effects could be induced through drinking habits. It is also imaginable that factors like passion or life satisfaction that determine work productivity are driven by alcohol consumption.

Numerous empirical studies have been conducted in the last twenty years investigating these relationships. The publications differ with respect to the datasets used (most of them are US, Canadian, or British datasets), the target sample (in most cases the working population aged 25 to 55) and the exact research question. The latter can be categorized as follows.

One group of studies focus on how the volume of alcohol consumed affects wages. Among the first to analyze the relationship between drinkers, nondrinkers, and their hourly wages were Berger and Leigh (1988). Taking data from the US Quality and Employment Survey, they found that drinkers earn significantly more than nondrinkers. In the subsequent years, several papers revealed that the relationship between units of alcohol consumed and wages follows an inverse U-function (French and Zarkin, 1995; Heien, 1996; Hamilton and Hamilton, 1997; Zarkin *et al.*, 1998; MacDonald and Shields, 2001).

A second group of articles concentrates on the effects of problem drinking or alcohol dependency. Mullahy and Sindelar (1991, 1993, 1996) came to the conclusion that what lowers an alcoholic's income is the negative impact on the decision to work rather than pressure on wages. Terza (2002) replicated Mullahy and Sindelar's (1996) study and came to the same conclusion. One of the

few studies that found no significant effect of problem drinking on labor market participation was the one of Feng *et al.* (2001). The three most recent studies congruently found negative labor market effects induced by alcohol dependency. MacDonald and Shields (2004) estimated various specifications of bivariate probit models with different sets of instruments and found significant and negative employment effects. Jones and Richmond (2006) took advantage of the propensity score matching method as an alternative to instrumental variable estimation and detected, in addition to substantial gender and lifecycle effects, productivity losses due to alcoholism. Johansson *et al.* (2007) reasoned that alcohol dependency substantially lowers the probability of being employed in the Finnish labor market.

Besides a growing body of the literature that examines the impact of cigarette use, drug abuse, and obesity on labor market outcomes (Morris, 2006), there is a third group of papers that models and simultaneously estimates the wage effect of drinking together with a second endogenous variable which affects both alcohol consumption and wages. Van Ours (2004) employed a proportional hazard model to estimate the starting rates of alcohol and tobacco consumption in order to model unobserved heterogeneity. He concluded that the positive wage effect of moderate drinking was of the same size as the negative effect of smoking. Wage losses due to smoking are reported by Auld (2005), who estimated a system of equations and found wage gains for drinkers. The work of Bray (2005) is the first that explicitly models the mechanism through which drinking affects wages, namely through the formation of human capital. The empirical application of his theoretically derived model suggests that moderate alcohol consumption exerts positive effects on the returns to education and experience, whereas heavy drinking has a negative impact.

To our knowledge, this is the first study that tries to link beverage-specific drinking behavior to wages. By decomposing the wage gains of moderate drinkers into diverse effects for different types of drinkers, we contribute to the existing literature and shed light on the alcohol-income puzzle. Estimates reveal a highly significant positive association between being a wine drinker and being a higher earner, as well as between beverage-unspecific drinking and wages. We are unable to uncover a distinct endogenous relationship between drinking and income, which speaks in favor of OLS estimation. Splitting the sample into three age groups

results in age-increasing wage differentials for wine and unspecific drinkers. Surprisingly, the wine gain vanishes for the youngest cohort. A beer gain appears for people living in rural areas whereas in urban areas, cocktail drinkers have higher wages. The evidence suggests that the alcohol income puzzle is a multicausal phenomenon, making it very difficult to identify a single distinct causal relationship.

3 Econometric Methods and Statistical Testing

3.1 OLS regression

Consider the following simple framework:

$$Y = X\beta + \varepsilon$$

where Y stands for the logarithm of hourly gross wages and X is a $n \times K$ matrix of regressors, with n as the number of observations. The set of regressors can be partitioned into $[X_1, X_2]$, where X_1 includes observable individual characteristics and X_2 incorporates variables of alcohol consumption. As usual, ε is an unobservable error term.

OLS estimates for β are unbiased, given that the regressors are exogenous, e.g., uncorrelated with the error term. For at least two reasons, the drinking variables X_2 are potentially endogenous. If unobserved factors exist that jointly determine alcohol consumption and wages, we face an omitted variable bias. Moreover, the problem of reverse causality occurs if drinking behavior depends on income.

3.2 IV regression

The standard econometric method to overcome the problem of an estimation bias due to endogeneity is instrumental variable (IV) estimation. The IV method requires the use of a set of instruments (Z). Consider Z to be $n \times L$. Again, we separate the matrix into $[Z_1, Z_2]$ and call $Z_1 = X_1$ included and Z_2 excluded instruments.

Instruments need to fulfill three conditions. First, there must be at least as

many instruments as regressors, e.g., $L = K$, so that the equation is identified. For $L = K$, the equation is called exactly identified and for $L > K$ overidentified. Second, the instruments need to be correlated with the endogenous regressors (relevance). Third, the instruments should be exogenous to the error process (validity), e.g. $E(Z'\varepsilon) = 0$ (Wooldridge, 2002).

The IV estimator is often referred to as the two-stage least squares (2SLS) estimator since it is possible to compute it by two successive regressions. In the first-stage regression, the full set of instruments Z is regressed on the endogenous variables (X_2) by OLS. The fitted values are then regressed on Y, producing an unbiased estimator.

It is crucial for IV estimation that these conditions hold. The practical problem is to find relevant and valid instruments. In a first step, researchers need to choose instruments by economic insight. Then, statistical tests should be employed.

Testing the relevance of instruments

Bound *et al.* (1995) have shown that weak correlation between the instruments and the endogenous variables can lead to large inconsistencies of the IV estimates, even if there is only a weak correlation between the instrument and the error process (weak instrument problem). To test the explanatory power of the excluded instruments, it is convenient to rely on the R^2 of the first-stage regression with the included instruments partialled out (partial R^2). A further development is Shea's partial R^2 which takes the intercorrelations between the instruments into account (Shea, 1997). Additionally, an F-test on the joint significance of Z_1 in the first-stage regression can be computed (Bound *et al.*, 1995). Unfortunately, the weak instrument problem may be present even if the instruments are significant in the first stage and with large n. A rule of thumb suggests that the F-statistic should well exceed 10 (Staiger and Stock, 1997). Another proposal is to keep the number of excluded instruments as small as possible, as the IV bias increases with the number of instruments (Hahn and Hausman, 2002).

Testing the validity of instruments

Testing the orthogonality condition is somewhat more difficult since it requires the overidentified case, and a direct test is not possible. Tests of overidentifying restrictions should be routinely reported under the joint null of orthogonality and correct exclusion of the instruments (Davidson and MacKinnon, 1993). A rejection calls the validity of the instruments into question. For the 2SLS estimation, the test statistic is Sargan's (1958); for efficient GMM in case of heteroskedasticity, Hansen's (1982) J-statistic needs to be employed.

Testing the endogeneity of regressors

IV estimation yields a consistent output no matter whether the regressors X_2 are endogenous or not. The price to pay in case of exogenous regressors is a loss of efficiency in comparison to OLS. It is therefore worth testing whether a suspicious regressor is indeed correlated with the error term. For this purpose, a C-test can be performed by conducting two regressions. One regression assumes the variables to be tested as exogenous and the other as endogenous. This test resembles the more popular Durbin-Wu-Hausman test but is robust to the presence of heteroskedasticity (Baum *et al.*, 2007).

4 Data

4.1 Dataset

The empirical part of this paper is based on wave W (2006) of the German Socio-Economic Panel Study (GSOEP). In 2006, questions about drinking habits were asked for the first time. The GSOEP is a representative longitudinal household based panel study for Germany (Wagner *et al.*, 1993). It started in 1984 and in 2006 sampled data on 11,000 households with more than 20,000 individuals over 17 years. In the following, we focus on the working population aged 18 to 65; the resulting sample size consists of 5026 males and 4484 females.

4.2 Definition of variables

The whole set of variables, their definitions, means and standard deviations are presented in Appendix B.

Dependent variable

Our variable of interest is the logarithm of hourly gross wages. We calculated this measure of labor market success by adding all bonuses, such as Christmas bonuses and profit shares, to the monthly gross wage. Then we divided by the actual working time per month. Missing values were imputed and an imputation dummy added to each regression. We dropped nonsense data with an hourly wage of less than three euros.

Exogenous variables

The set of exogenous variables (X_1) can be classified as follows. The first group is labeled as "demographics" and involves the dummy variables "immigrant," "eastgerman," "married," and "kids." The second category lists educational regressors. Potential labor market experience ("experience") serves as an indicator for general skills, whereas the number of years with the current employer ("work for company since") stands for firm-specific capital formation. The third category deals with job-specific characteristics, such as whether the employee holds a blue or a white-collar job and the number of employees in the company. The whole set of explanatory variables can be found in Appendix B.

Variables of drinking behavior

From the four questions presented in Appendix A, we construced two groups of variables on alcohol consumption. The first group solely tries to measure the volume of alcohol consumed. "Abstainers" are persons who never drink any alcohol. The dummy "rare drinkers" takes on the value one if the respondent stated never drinking alcohol "regularly" or "occasionally" but at least one sort of alcohol "rarely." "Moderate drinkers" consume at least one type of alcohol occasionally but deny regular alcohol consumption. The last dummy "regular drinkers" assigns one to a person who drinks at least one alcoholic beverage

regularly. The drawback of these indicators is their rather vague character, as no information about the exact quantity of alcohol consumption is collected.

The second group classifies individuals into drinkers of wine, beer, spirits, and cocktails, and beverage-unspecific drinkers. For the sake of having a consistent reference category and mutually exclusive variables that sum up to 100 percent, we keep the dummies abstainers and rare drinkers in this group. We categorize people as "beer drinkers" if they drink beer regularly or occasionally but no other beverage regular or occasionally. The same goes for drinkers of wine, spirits, and cocktails. Beverage-unspecific drinkers consume at least two kinds of alcohol occasionally or regularly. The sample distribution can be found in Table 1.

Instruments

Relevant and valid instruments need to be sufficiently correlated with the endogenous variable but uncorrelated with unobservable characteristics. Most of the previous studies took religious affiliation, long-term non-acute illnesses such as asthma or diabetes, alcohol prices or taxes, and structural indicators of the region (e.g. unemployment rate) as instruments for drinking behavior. To instrument beverage-specific alcohol consumption, these instruments appear to be weak with the known consequences.

Taking advantage of the household character of the rich SOEP dataset, we generated three main classes of instruments. Analogously to the drinking variables presented above, we modeled the drinking behavior of the partner, the father, and the mother. For example, we constructed dummy variables for the partner being an abstainer, a rare, moderate, or regular drinker. Because of data limitations, we were unable to construct instruments for drinkers of spirits or cocktails.

The behavior of parents is claimed to be a good instrument because children adopt their parent's behavior due to education and genes. On the other hand, this may also be true for unobservable characteristics, in which case the validity condition of the instruments would be violated.

In the social sciences, the phenomenon of positive assortative mating, e.g., the tendency to marry within one's social group, has been discussed in a large body of literature. Most of the empirical studies on this topic focus on marriages and

define social groups by observables like education, occupation, religion, or race. In industrialized countries, we are currently observing a decline in marriages and a tendency towards noncommittal partnerships. Moreover, race, social background, and religion have become less important factors in the partner selection process, and consequently, recent studies have found only small assortative patterns but preference heterogeneity between gender with respect to education, religion and race (Fisman *et al.*, 2006; Hitsch and Hortacsu, 2005; Kurzban and Weeden, 2005). All in all, it does not seem as if the unobservable characteristics of a person are strongly correlated with the mate's drinking behavior.

5 Results

5.1 Descriptive Statistics

The sample distribution of the two groups of drinking variables is in Table 1 separately by gender. Females abstain from drinking more often than males (10 percent vs. 6 percent). Around 10 percent consume alcohol regularly in comparison to 26 percent of the males.

[Insert Table 1 about here]

Looking at the second group of drinking variables, gender-specific drinking behavior becomes evident, which is in accordance with the literature (Mäkelä *et al.*, 2006; Holmila and Raitasalo, 2005). Twenty-six percent of the women can be classified as wine drinkers, but only 5 percent are beer drinkers. Men report the opposite (7 percent vs. 26 percent). The majority of males are beverage-unspecific drinkers (37 percent) but only 21 percent of the females. Note the low percentage of respondents who primarily drink spirits or cocktails.

Table 1 also presents first data on the mean wage. It seems as if wages would rise with the amount of alcohol consumed. The highest income group is that of wine drinkers, followed by beverage-unspecific drinkers. Due to the descriptive nature of the data, we cannot establish a causal relationship on that basis. Econometric methods, which control for socioeconomic status, are required.

5.2 OLS results

Table 2 shows OLS estimation results by gender for the two models.[1] In both models and for both genders, the non-drinking covariates are about the same size and do not differ widely in significance. Moreover, they all take on reasonable values.

[Insert Table 2 about here]

Rare drinkers are the omitted category in both models and serve as a control group. We believe this to be more appropriate than choosing abstainers as the reference group, as abstainers may consist of ex-alcoholics or people with severe illnesses. Given that these people are a negative selection with respect to the labor market for reasons other than being abstainers, it might bias our estimation results.

Model 1 measures the impact of alcohol consumption on wages by volume. For both females and males, we can state a positive and significant association between alcohol consumption and wages. For both genders, moderate drinkers seem to earn about 3.5 percent more than rare drinkers; the effect is even more pronounced for regular drinkers (7 percent). These results are in line with the rest of the literature (MacDonald and Shields, 2001; Zarkin *et al.*, 1998; Hamilton and Hamilton, 1997; Heien, 1996; French and Zarkin, 1995).

Model 2 gives us the relationship between beverage-specific drinking behavior and wages. Consider females first. The regression output reveals a significant 3.4 percent wage gain for wine drinkers and an even larger gain for non-specific drinkers (5.4 percent). The other drinking variables are not significant. In the case of men, the results are similar but we find a significant association between beverage-unspecific drinking and wages of around 6 percent and a large and significant wage differential for wine drinkers of about 14 percent.

[1] We conducted a battery of standard tests on the presence of heteroskedasticity and found evidence for the presence of arbitrary heteroskedasticity. Consequently, in the following, all estimation results are robustified against heteroskedasticity.

5.3 Testing relevance, validity, and endogeneity

In the following, we conduct statistical tests to see whether our instruments fulfill the two conditions of relevance and validity (Table 3). Afterwards we use the most appropriate set of instruments to test whether the drinking variables are endogenous or not (Table 4).

The first column of Table 3 gives us the variables for which instruments are available for. Columns 2 to 7 display the tests on the relevance of the instruments, whereas the test statistics for testing the validity are shown in column 8.

Tests on the relevance of instruments

To evaluate whether an instrument is weak or not, we rely on Shea's partial R^2 and the F-statistic of the excluded instruments in the first stage regression. We can easily see that for our partner intruments, the F-statistics range from 34 to 133 and clearly exceed the minimum value of 10. The father's drinking behavior is correlated with the drinking behavior of his children, but the F-statistic is higher than 10 only in two cases. Turning to the mother IVs, only one of the variables has enough power to serve as an instrument.

[Insert Table 3 about here]

In addition to the tests presented in Table 3, we performed some tests of under- and weak identification. Among them were Anderson's (1950) canonical correlations test and the Cragg-Donald (1993) F-statistic. All these statistics confirmed that the drinking behavior of the mate is a highly relevant instrument.

Tests on the validity of instruments

Testing the validity of instruments, e.g. their potential correlation with the error process, is only feasible in the overidentified case. Thus, we use the parent's and partner's drinking habits at the same time as instruments to test the validity of the partner instruments. Column 8 of Table 3 presents the Hansen J-test which jointly evaluates the entire set of overidentifying restrictions. For all tested instruments, we are unable to reject the null hypothesis of validity.

Remember that we probably face a weak instrument problem for most of the parent IVs and that the validity tests are only of indirect manner. To be precise, to be absolutely sure that an instrument to be tested is valid, we would need one instrument that is definitely relevant and valid apart from the instrument to be tested. But if we had a proper instrument, we would not need to find an additional instrument. This resembles the problem with the hen and the egg and illustrates the practical difficulties with IV estimation. All in all, it seems as if the validity of the mate instruments is given, but nevertheless, we should be cautious when interpreting the IV estimates. In the remainder of this paper, we discard the weak parent IVs and rely exclusively on the partner instruments.

Tests on the endogeneity of drinking behavior

The C-test as described in Section 3.2 serves us as a test on endogeneity. As can be seen in Table 4, the null of exogeneity is never rejected. In other words, we do not find evidence for an endogenous relationship between drinking and earnings, which suggests that, given that our instruments are valid, OLS estimates should be used.

[Insert Table 4 about here]

5.4 IV results

Table 5 shows IV regression results for both models. Every model represents a just-identified case, since we only use the drinking behavior of the partner as excluded instruments. For example, in Model 1, the three variables of the amount of alcohol consumed are instrumented with the included instruments and three excluded instruments, namely "partner abstainer", "partner moderate drinker", and "partner regular drinker."

[Insert Table 5 about here]

In Model 1, regular drinking is highly significant and associated with a wage gain of 17 percent in comparison to drinking rarely. For our second model,

all the drinking variables become insignificant. Note that we employed a less efficient estimation method in comparison to OLS. Increasing coefficients suggests an underestimation of the effects in the OLS case.[2] Since we cannot rule out the possibility that our instruments violate the validity assumption despite having passed all standard test procedures, we should interpret the results with caution. However, as the IV estimates are still of reasonable size and sign and do not differ widely from our OLS results, we are confident that our instruments are not too bad.

5.5 Cohort effects

In the following, we split our sample into three age groups as well as into rural and urban areas. Lifecycle effects are likely to play a role for the alcohol-income puzzle and it is known that drinking behavior varies by cohort (Kerr *et al.*, 2004). The same may be true for rural areas in comparison to urban areas, especially if network effects matter.

Table 6 shows OLS estimation results for respondents under the age of 35. We find significant wage gains for regular but not for moderate drinkers. Interestingly enough, the "wine gain" vanishes and the coefficient for wine drinkers turns out to be negative, though insignificant. In this age group, the wage effect for regular drinkers goes exclusively back to a wage effect for beverage-unspecific drinkers.

[Insert Table 6 about here]

Consider now respondents between 35 and 50 years (Table 7). What we see are significant and positive wage differentials for moderate (3.8 percent) and regular drinkers (6.3 percent) as well as for wine (6.2 percent) and non-specific drinkers (5.4 percent).

[Insert Table 7 about here]

[2] As the IV estimates rely on people in a partnership who might represent a positive selection with respect to labor market outcomes, we repeated our OLS estimates with that subsample. The drinking coefficients increased but remained smaller than in the IV case.

The results for people over the age of 50 can be looked up in Table 8. We see the usual significant coefficients, and the coefficients increase again in size in comparison to Table 7. To sum up, the significant drinking variables increase from the youngest to the oldest cohort and the wine gain vanishes for the youngest.

[Insert Table 8 about here]

In Table 9 and 10 we find the estimation output by type of region. We call areas with less than 5,000 inhabitants[3] rural and those with more than 100,000 residents urban. As for rural regions and with respect to Model 1 (Table 9), we observe no major differences from the general results. Surprisingly, the decomposition of the general drinking gain results in a relatively moderate gain for wine drinkers (5.8 percent) and an equally significant and strong association between beer drinkers and wages (5.0 pecent). The usual positive and significant wage differential for unspecific-drinkers is also observable.

[Insert Table 9 about here]

In urban areas, in contrast to all other results, no significant association between regular drinking and wages can be found (Table 10). Moreover, in addition to the wine and non-specific drinking gain, we find that cocktail drinking is strongly linked to wages.

[Insert Table 10 about here]

5.6 Robustness checks

To exclude the possibility of outliers or selection effects, we restricted the sample to respondents aged 25 to 55 but could not find any distorting effects. Additionally, we experimented with the inclusion of other controls but our results remained stable. By restricting our sample to the working population, we condition the results and conclusions to that subsample of the population. In order to test whether self-selection into the labor market matters in our setting, we

[3] In East Germany: up to 20,000 inhabitants

conducted a battery of standard Heckman selection regressions (Heckman, 1979) and found that it is of minor importance.[4]

6 Pathways from alcohol consumption to wages

There are several potential explanations for our findings. The first refers to the argument that moderate alcohol consumption is beneficial to health and thus increases a person's productivity and wages. Medical studies have consistently found a J-shaped inverse relationship between alcohol consumption and cardiovascular (heart and blood vessel) diseases, cerebrovascular (brain artery) diseases, peripheral arterial diseases, as well as morbidity, implying positive health effects of moderate drinking (Rehm *et al.*, 2001). It has been found that especially men over 40 benefit from moderate alcohol consumption as they have the highest risk of contracting these diseases. These health benefits stem from the positive effects of ethanol, and there is also evidence that red wine provides further benefits for health (Szmitoko and Subodh, 2005). Moreover, some researchers argue that health benefits are specific to red wine (Grønbæk *et al.*, 2000; Renault *et al.*, 1998). The health-productivity explanation is in line with our findings, especially as the drinking effects increase by cohort (section 5.5). However, it is not plausible that health effects play a dominant role.

A second explanation would be that moderate drinkers are more productive than abstainers because of a higher degree of life satisfaction, passion, or vitality; one could argue that alcohol belongs to the amenities of life like chocolate or music. Wine in particular is widely believed to have these effects, and it fits into the picture that wine drinkers report not only better physical but also better mental health than abstainers, heavy drinkers, and particularly drinkers of spirits (Stranges *et al.*, 2006). The question of causality remains. Is it the wine that endows wine drinkers with a higher life satisfaction or do more passionate people tend to drink wine rather than beer?

Third, we may just be capturing selection effects here, and the whole story behind the alcohol-income puzzle might actually go back to endogeneity issues. It is imaginable that people with certain characteristics self-select themselves

[4]For the sake of saving space, we do not report the results here. These can be provided by the authors upon request.

into different drinking habits. According to this explanation, highly intelligent, diligent, or ambitious people would prefer wine. Although we are unable to identify endogeneity problems, we need to admit that our instruments might not be valid. However, because of the lack of a wine gain for the youngest cohort, the appearance of a beer gain in rural areas, and a cocktail gain in urban areas, a sophisticated argument for essential cohort-specific and region-specific endogenous relationships would be needed. We do not think that this is plausible. Moreover, tracing the whole story back to spurious regression results would call the entire previous literature on this subject into question.

A final, and maybe the most convincing argument, is the one of social and networking effects. Several studies have demonstrated that moderate drinkers are more social than abstainers and possess the strongest social networks (Buonanno and Vanin, 2007; Peters and Stringham, 2006; Leifman *et al.*, 1995). As moderate drinking is a social norm in Western culture, it may enhance social skills and lead to a greater efficiency in the production of human capital. Social skills and the ability for networking are important factors in the labor market and determine wages to a high degree (Ioannides and Loury, 2004; Montgomery, 1991). This is in line with our results as it can be assumed that "networking returns" cumulate over the lifecycle and pay off more the older a person is (section 5.5). It is also plausible that beer is a more popular networking beverage in rural areas whereas the same holds true for cocktails in urban areas.

A quick and crude test of the relevance of our hypotheses is to rerun our basic regression specification with additional covariates that proxy our explanations. We see from column 2 of Table 11 that the relevant coefficients decrease slightly when a health status dummy is included. The same holds for column 3 where a dummy on life satisfaction is added. A variable that crudely captures the social networks of a person also leads to a decrease (column 4). If we add the three variables at the same time, the coefficients are reduced about 15 percent in comparison to the basic specification. We take this as a hint for our explanations being at least partly true.

[Insert Table 11 about here]

The limitations of this study should be kept in mind. Due to the cross-sectional character of the data, it is not possible to capture individual hetero-

geneity or to take a potential endogeneity issue into account through appropriate modeling. Moreover, we are unable to identify alcoholics and binge drinkers, a problem that is rooted in the design of the questions.

7 Conclusion

Despite a large body of economic literature on the association between alcohol consumption and labor market outcomes, no study has been conducted to date analyzing the role of beverage-specific drinking behavior. This paper sheds light on the alcohol-income puzzle by decomposing the positive wage differential of moderate drinkers into wage effects for beverage-specific drinkers.

The main findings can be summarized as follows: First, the existence of positive wage differentials for moderate drinkers can be confirmed for Germany. Second, we find a strong and positive association between wine drinking and wages. Moreover, people who drink more than one sort of alcohol, e.g., beverage-unspecific drinkers, seem to earn significantly more than rare drinkers. Third, we are unable to identify endogeneity problems with our drinking variables. We advise caution, however, since it is not possible to prove the exogeneity of our instruments. Fourth, the wine-gain disappears for respondents under the age 35, and the relationship between (wine) drinking and earnings increases in size and significance by cohort. Additionally, we find a significant relationship between beer drinkers and higher wages in rural areas as well as between cocktail drinkers and higher wages in urban areas. Finally, we offer several explanations for our findings and present indications for their relevance. Multicausal explanations seem to be the key to the alcohol-income puzzle, making the identification of a single and distinct causal relationship between alcohol consumption and the strong and stable association to higher wages very difficult.

All in all, this paper sheds light on the alcohol-income puzzle by decomposing the positive wage effects of moderate drinkers into diverse effects for different types of drinkers. We have shown that beverage-specific drinking behavior plays a crucial role in explaining the alcohol-income puzzle. Further research will need to be conducted as exact measures of drinking patterns and panel data become available since the exact mechanisms of how drinking is related to wages remain obscure.

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Table 1: Descriptive statistic of alcohol consumption variables by gender

	male			*female*		
Covariate	**Freq. d=1**	**Percent**	**Mean wage**	**Freq. d=1**	**Percent**	**Mean wage**
Abstainer	292	5.81	2.633	444	9.90	2.389
Rare drinker	1,059	21.07	2.739	1,632	36.40	2.463
Moderate Drinker	2,345	46.66	2.779	1,968	43.89	2.528
Regular Drinker	1,330	26.46	2.864	440	9.81	2.699
Abstainer	292	5.81	2.633	444	9.90	2.389
Rare drinker	1,059	21.07	2.739	1,632	36.40	2.463
Beer drinker	1,329	26,44	2.704	239	5.33	2.504
Wine drinker	372	7.40	3.049	1,158	25.83	2.578
Spirit drinker	58	1,15	2.629	24	0,54	2.506
Cocktail drinker	40	0.80	2.569	63	1.40	2.341
Non-specific drinker	1,876	37.33	2.849	924	20,61	2.566

Source: German Socio Economic Panel (GSOEP)

Table 2: OLS estimation results

	Coefficient *(Robust Standard Errors)*			
	males		***females***	
Covariate	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Intercept	1.773***(0.043)	1.776***(0.044)	1.819***(0.045)	1.820***(0.045)
Demographics				
Immigrant	−0.027(0.018)	−0.036 ∗ (0.018)	−0.037 ∗ (0.023)	−0.038 ∗ (0.023)
Eastgerman	−0.235***(0.028)	−0.233***(0.028)	−0.193***(0.040)	−0.193***(0.040)
Married	0.064***(0.015)	0.064***(0.015)	−0.006(0.015)	−0.006(0.015)
Kids	0.043***(0.014)	0.045***(0.014)	0.003(0.016)	0.003(0.016)
Education				
Apprenticeship	0.001(0.016)	0.002(0.015)	−0.029 ∗ (0.017)	−0.029 ∗ (0.017)
College degree	0.249***(0.019)	0.242***(0.019)	0.200***(0.021)	0.200***(0.021)
Experience	0.024***(0.003)	0.025***(0.003)	0.025***(0.003)	0.025***(0.003)
$(Experience^2) * 100$	−0.000***(0.000)	−0.000***(0.000)	−0.000***(0.000)	−0.000***(0.000)
Work for company since	0.008***(0.001)	0.008***(0.001)	0.009***(0.001)	0.009***(0.001)
Unemployed last year	−0.168***(0.029)	−0.165***(0.029)	−0.165***(0.029)	−0.165***(0.029)
Job Characteristics				
Part time work	−0.214***(0.035)	−0.217***(0.035)	−0.103***(0.014)	−0.103***(0.014)
Blue collar worker	0.129***(0.021)	0.130***(0.020)	−0.149***(0.030)	−0.149***(0.030)
Self-employed	0.203***(0.033)	0.198***(0.033)	0.024(0.046)	0.024(0.046)
White collar	0.259***(0.017)	0.255***(0.017)	0.071***(0.024)	0.071***(0.024)
Job in East Germany	−0.109***(0.029)	−0.109***(0.029)	−0.063(0.040)	−0.063(0.040)
Work in Job studied for	0.046***(0.012)	0.045***(0.012)	0.122***(0.016)	0.122***(0.016)
High autonomy	0.265***(0.017)	0.262***(0.017)	0.224***(0.021)	0.224***(0.021)
Size of company	0.032***(0.003)	0.031***(0.003)	0.032***(0.002)	0.032***(0.002)
Feel work pressure	−0.030***(0.011)	−0.030***(0.011)	−0.001(0.013)	−0.001(0.013)
Drinking Behavior				
Abstainer	−0.017(0.026)		−0.003(0.023)	
Moderate Drinker	0.034 ∗ ∗(0.014)		0.037***(0.014)	
Regular Drinker	0.073***(0.016)		0.071***(0.023)	
Abstainer		−0.016(0.026)		−0.003(0.023)
Beer drinker		0.009(0.015)		0.036(0.029)
Wine drinker		0.138***(0.027)		0.034 ∗ ∗(0.016)
Spirit drinker		−0.014(0.056)		0.081(0.067)
Cocktail drinker		0.023(0.064)		0.064(0.061)
Non-specific drinker		0.062***(0.015)		0.054***(0.017)
Observations	5026	5026	4484	4484
Adjusted R^2	0.48	0.48	0.38	0.38
$F - test$	213.67	190.01	135.68	120.19

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Omitted categories are "drop-outs" and "rare drinkers."

[c] Also included but not reported is a dummy that is 1 if the wage was imputed.

Table 3: Overview of tests on relevance, validity, and endogeneity

	Testing relevance						**Testing validity**
	Partner IVs		***Father IVs***		***Mother IVs***		
(1)	**Shea's partial R^2 (2)**	**F-test (3)**	**Shea's partial R^2 (4)**	**F-test (5)**	**Shea's partial R^2 (6)**	**F-test (7)**	**Hansen J-statistic (8)**
Abstainers	0.021	55.30	0.009	10.20	0.003	13.76	0.632
Moderate Drinker	0.017	65.03	0.003	2.75	0.001	4.88	2.562
Regular Drinker	0.061	158.29	0.013	10.84	0.006	9.65	0.478
Beer drinker	0.004	33.84	0.004	2.80	0.001	0.55	3.000
Wine drinker	0.005	44.96	0.005	1.95	0.003	4.85	2.273
Non-specific drinker	0.029	133.48	0.012	8.15	0.002	5.62	1.268

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

Table 4: Testing the endogeneity of the drinking variables

	C-statistic
Abstainers	0.525
Moderate Drinker	0.781
Regular Drinker	0.604
Beer drinker	0.079
Wine drinker	0.830
Non-specific drinker	0.054

Table 5: IV estimation results

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	−0.019(0.135)	
Moderate Drinker	0.129(0.092)	
Regular Drinker	0.173***(0.063)	
Abstainer		−0.014(0.143)
Beer drinker		0.005(0.261)
Wine drinker		0.276(0.239)
Spirit drinker		0.061(0.109)
Cocktail drinker		0.103(0.121)
Non-specific drinker		0.131(0.079)
Observations	6867	6867
Adjusted R^2	0.46	0.44
$F - test$	267.31	232.05

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Spirit drinker and Cocktail drinker are not instrumented due to data limitations.

[d] Omitted category is "rare drinkers."

Table 6: OLS estimation results for respondents under the age of 35

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	0.012(0.029)	
Moderate Drinker	0.015(0.019)	
Regular Drinker	0.056**(0.025)	
Abstainer		0.012(0.029)
Beer drinker		0.017(0.024)
Wine drinker		−0.004(0.027)
Spirit drinker		−0.039(0.070)
Cocktail drinker		−0.000(0.061)
Non-specific drinker		0.043**(0.021)
Observations	2167	2167
Adjusted R^2	0.43	0.43
$F - test$	73.17	65.00

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

Table 7: OLS estimation results for respondents aged between 35 and 50

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	−0.009(0.026)	
Moderate Drinker	0.038∗∗∗(0.014)	
Regular Drinker	0.063∗∗∗(0.018)	
Abstainer		−0.009(0.026)
Beer drinker		0.004(0.018)
Wine drinker		0.062∗∗∗(0.019)
Spirit drinker		0.056(0.065)
Cocktail drinker		0.106(0.079)
Non-specific drinker		0.054∗∗∗(0.016)
Observations	4704	4704
Adjusted R^2	0.43	0.43
$F - test$	159.64	142.89

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

Table 8: OLS estimation results for respondents over the age of 50

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	−0.055(0.037)	
Moderate Drinker	0.053∗∗∗(0.020)	
Regular Drinker	0.095∗∗∗(0.026)	
Abstainer		−0.056(0.037)
Beer drinker		0.014(0.026)
Wine drinker		0.099∗∗∗(0.027)
Spirit drinker		−0.060(0.105)
Cocktail drinker		−0.049(0.133)
Non-specific drinker		0.068∗∗∗(0.023)
Observations	2639	2639
Adjusted R^2	0.46	0.46
$F - test$	104.32	92.94

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

Table 9: OLS estimation results for rural areas

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	−0.015(0.049)	
Moderate Drinker	0.051∗∗(0.021)	
Regular Drinker	0.086∗∗∗(0.026)	
Abstainer		−0.015(0.049)
Beer drinker		0.050∗(0.026)
Wine drinker		0.058∗∗(0.027)
Spirit drinker		0.047(0.062)
Cocktail drinker		0.024(0.095)
Non-specific drinker		0.068∗∗∗(0.024)
Observations	2032	2032
Adjusted R^2	0.45	0.45
$F - test$	80.35	71.60

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

Table 10: OLS estimation results for urban areas

Covariate	Model 1	Model 2
Other Covariates	***controlled for but not reported***	
Drinking Behavior		
Abstainer	−0.036(0.031)	
Moderate Drinker	0.041∗∗(0.019)	
Regular Drinker	0.022(0.024)	
Abstainer		−0.037(0.031)
Beer drinker		−0.036(0.023)
Wine drinker		0.044∗(0.025)
Spirit drinker		0.013(0.083)
Cocktail drinker		0.194∗∗(0.080)
Non-specific drinker		0.059∗∗∗(0.021)
Observations	2755	2755
Adjusted R^2	0.45	0.46
$F - test$	100.12	90.61

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

Table 11: Basic model and alternative specifications with additional covariates

	Basic Specification (1)	**(1) + health status (2)**	**(1) + life satisfaction (3)**	**(1) + social contacts (4)**	**(2)+(3)+(4) (5)**	**Decrease of coefficients in (5) relative to (1) (in percent)**
Other Covariates	***controlled for but not reported***					
Model 1						
Abstainer	−0.011(0.019)	−0.012(0.019)	−0.014(0.019)	−0.012(0.019)	−0.015(0.019)	
Moderate Drinker	0.034***(0.011)	0.033***(0.011)	0.031***(0.011)	0.032***(0.011)	0.028***(0.011))	17.6
Regular Drinker	0.062***(0.014)	0.061***(0.014)	0.057***(0.014)	0.058***(0.014)	0.054***(0.014)	12.9
Model 2						
Abstainer	−0.011(0.019)	−0.012(0.019)	−0.014(0.019)	−0.012(0.019)	−0.015(0.019)	
Beer drinker	0.004(0.014)	0.004(0.014)	0.004(0.014)	0.003(0.014)	0.002(0.014)	
Wine drinker	0.056***(0.015)	0.054***(0.015)	0.049***(0.015)	0.052***(0.015)	0.047***(0.015)	16.1
Spirit drinker	−0.004(0.047)	−0.005(0.047)	−0.016(0.047)	−0.004(0.047)	−0.002(0.047)	
Cocktail drinker	0.047(0.049)	0.048(0.049)	0.051(0.049)	0.044(0.049)	0.049(0.049)	
Non-specific drinker	0.052***(0.012)	0.051***(0.012)	0.048***(0.012)	0.048***(0.012)	0.045***(0.012)	13.5

Notes:

[a] *Significant at the 0.10 level; **Significant at the 0.05 level; ***Significant at the 0.01 level

[b] Also included but not reported are the same covariates as in Table 2 and an imputation dummy.

[c] Omitted category is "rare drinkers."

[d] Specification (2) includes the dummy "health status very good" which takes on the value 1 for respondents who reported a very good health status on a scale from 0 to 5. Specification (3) includes the dummy "high life satisfaction" which takes on the value 1 if the respondent indicated a life satisfaction above 8 on a scale from 0 to 10 (with 10 being the highest score). Specification (4) includes a the dummy "socializing" which takes on the value 1 for respondents who attend cultural events at least once a month and meet friends every week.

[e] All specifications include 8479 observations. As there are no appropiate questions about social networks in the 2006 questionaire, we took the information of 2005, balanced the sample and assumed that the answers wouldn't change within a single year.

Appendix A

The GSOEP group asked the following questions in 2006 for the first time.

How often do you drink the following alcoholic beverages?

1. Beer

    (a) Regularly
    (b) Occasionally
    (c) Seldom
    (d) Never

2. Wine, Champagne

    (a) Regularly
    (b) Occasionally
    (c) Seldom
    (d) Never

3. Spirits (hard liquor, brandy etc.)

    (a) Regularly
    (b) Occasionally
    (c) Seldom
    (d) Never

4. Mixed drinks (cocktails, alcopops etc.)

    (a) Regularly
    (b) Occasionally
    (c) Seldom
    (d) Never

Appendix B

Table 12: Definition of variables and summary statistic

Variable	Definition	Mean	SD	Obs.	Min.	Max.
log gross wage per hour	logarithm of gross wage per hour	2.654	0.554	9510	1.099	6.14
Demographics						
Immigrant	1 if immigrant, 0 else	0.099	0.299	9510	0	1
Eastgerman	1 if East german, 0 else	0.216	0.412	9510	0	1
Married	1 if married, 0 else	0.683	0.465	9510	0	1
Kids	1 if kids, 0 else	0.388	0.487	9510	0	1
Education						
Apprenticeship	1 if apprenticeship degree, 0 else	0.713	0.453	9510	0	1
College degree	1 if college degree, 0 else	0.273	0.446	9510	0	1
Experience	age minus years in education minus 6	24.8	10.4	9510	0	51
$(Experience^2) * 100$	$experience^2 * 100$	722.4	522.1	9510	0	2601
Work for company since	years with current employer	11.779	10.012	9510	0	49.08
Unemployed last year	1 if unemployed last year, 0 else	0.054	0.226	9510	0	1
Job characteristics						
Part time worker	1 if part time worker, 0 else	0.256	0.437	9510	0	1
Blue collar worker	1 if blue collar worker, 0 else	0.268	0.443	9510	0	1
Self-employed	1 if self-employed, 0 else	0.098	0.297	9510	0	1
White collar worker	1 if white collar worker, 0 else	0.548	0.498	9510	0	1
Job in East Germany	1 if job in East Germany, 0 else	0.208	0.406	9510	0	1
Work in Job studied for	1 if working in occupation trained for, 0 else	0.621	0.485	9510	0	1
High autonomy	1 if job with high autonomy, 0 else	0.298	0.457	9510	0	1
Size of company	size of company (increasing scale: 0 to 10)	6.911	2.969	9510	1	11
Feel work pressure	1 if work pressure, 0 else	0.469	0.499	9510	0	1
Drinking behavior						
Abstainer	1 if abstainer, 0 else	0.077	0.267	9510	0	1
Rare drinker	1 if rare drinker, 0 else	0.283	0.450	9510	0	1
Moderate Drinker	1 if moderate drinker, 0 else	0.454	0.498	9510	0	1
Regular Drinker	1 if regular drinker, 0 else	0.265	0.186	9510	0	1
Beer drinker	1 if beer drinker, 0 else	0.165	0.371	9510	0	1
Wine drinker	1 if wine drinker, 0 else	0.161	0.367	9510	0	1
Spirit drinker	1 if spirit drinker, 0 else	0.009	0.092	9510	0	1
Cocktail drinker	1 if cocktail drinker, 0 else	0.011	0.104	9510	0	1
Non-specific drinker	1 if non-specific drinker, 0 else	0.294	0.456	9510	0	1
Instruments						
Partner abstainer	1 if partner abstainer, 0 else	0.098	0.198	6867	0	1
Partner rare drinker	1 if partner rare drinker, 0 else	0.293	0.455	6867	0	1
Partner moderate Drinker	1 if partner moderate drinker, 0 else	0.427	0.495	6867	0	1
Partner regular Drinker	1 if partner regular drinker, 0 else	0.181	0.385	6867	0	1
Partner beer drinker	1 if partner beer drinker, 0 else	0.146	0.353	6867	0	1
Partner wine drinker	1 if partner wine drinker, 0 else	0.174	0.379	6867	0	1
Partner spirit drinker	1 if partner spirit drinker, 0 else	0.008	0.089	6867	0	1
Partner cocktail drinker	1 if partner cocktail drinker, 0 else	0.007	0.082	6867	0	1
Partner non-specific drinker	1 if partner non-specific drinker, 0 else	0.273	0.445	6867	0	1