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Rational Addiction to News? : Habit Formation and Print Media Usage

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2

Rational Addiction to News?

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Rational Addiction to News?

Habit Formation and Print Media Usage

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Abstract

Quarterly data of magazine circulation are used to analyse the consumption behaviour of the readers of German popular magazines in a panel framework using OLS, 2SLS and generalized method of moments techniques, in order to test the rational addiction hypothesis in respect with goods without any biological dependency.

JEL-Classification: C23, D12, L89

Keywords: Rational Addiction, Habit Formation, Print Media, Panel Data

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"People get addicted not only to alcohol, cocaine, and cigarettes but also to work, eating, music, television, their standard of living, other people, religion, and many other activities."

G.S. BECKER AND K.M. MURPHY
(1988)

"The addict looks strange because he sits down at period $j=0$, surveys future income, production technologies, investment/addiction functions, and consumption preferences over his life time to period T , maximizes the discounted value of his expected utility, and decides to be an alcoholic. That's the way he will get the greatest satisfaction out of life. Alcoholics are alcoholics, because they want to be alcoholics, ex ante, with full knowledge of its consequences."

G.C. WINSTON (1980)

1 Introduction

As Becker and Murphy (1988) have already mentioned in their innovative paper on rational addiction, people can be addicted to most every product or activity independently of a biological or pharmaceutical dependency. Both, the so called harmful products like cigarettes and alcohol, or illegal drugs like cocaine or cannabis, but also physically (seemingly) harmless activities like sports, music listening, watching television or even economic research are potentially addictive. Moreover, Becker and Murphy arguing that the consumers even in the case of harmful products are rational in the sense, that they anticipate future, possibly negative consequences of their current activities. A rational consumer, therefore, compares current and future discounted utility. In the case of cigarettes (s)he compares the utility out of smoking and the probability to falling ill with cancer. The strength of the addiction depends strongly on the current consumption and

on the "addictive stock" or, more exact, on the level of past consumption (see Chaloupka 1991).¹

Habit formation and habit persistence as foundations of addiction have been a popular topic in economic studies on consumer behaviour (see Messinis 1999). In this process, there are at least two distinct interpretations of addictive behaviours, a myopic and a rational one. Whereas the myopic consumer is not farsighted, according to a simply backward looking consumer decision. The rational addictive, in contrast, takes into account the consequences of past and current consumption on future events. Consequently, empirical analysis of these different approaches is able to differentiate between a pure backward looking and a rational behave.

Rational addiction is subject of a number of empirical analyses, nearly exclusive concerning drugs, like alcohol or cigarettes. The first test of the Becker Murphy model (BMM) was carried out by Chaloupka 1991. Using data for individuals in the United States he found out that cigarette consumption is addictive in the sense of the BMM and can not be declared as myopical. More exact, consumption is reduced as a response on increased taxes and therefore on increased prices. Chaloupka also estimated separate demand equations for different consumer groups discriminated by age and education and found that younger and less educated consumers act more myopically than older and more educated consumers. The long run-price elasticities are found to be higher for more myopic individuals than for rational addicts.

Also Becker et al. (1994) tested the Becker-Murphy model using data of cigarette consumption in the United States as well. Although they find some empirical evidence for the BMM, the calculated interest rates, regarding intertemporal utility maximization, are implausible high. In addition, they found evidence for higher long-run price elasticities in comparison to short-run price elasticities. Cameron (2000), in contrast, suggest that it is the nicotine in a cigarette that is

¹Regarding harmful products the level of the past consumption has in addition a negative effect on health (e.g. the accumulated volume of nicotine or alcohol consumed in the past). The addictive stock of harmless products in contrast has no (negative) influence on health, but nevertheless it could have an effect on addiction.

causal for smoking but not vice versa. Furthermore he found that this relation is negative, and that it seems to be less a rational decision to smoke than a myopic one. Many other studies deal with the demand for cigarettes and the empirical test of the rational addiction model (e.g. Labaega 1999, Cameron 1998, Yen and Jones 1996).

A further product that is suitable for empirical tests of the rational addiction model is alcohol. A couple of studies deal with this topic (e.g. Grossman et al. 1995, Waters and Sloan 1995 or Bentzen et al. 1999) and all of these support for the BMM. The rational addiction to caffeine is analyzed by Olekalns and Bardsley (1996). The authors find strong evidence for a addictive behaviour of the consumers, regarding the per capita coffee consumption of the United States between 1967 and 1992. Also the demand for drugs like opium (see van Ours 1995 or Liu et al. 1999) and cocaine is analyzed in a rational addiction framework. Grossman and Chaloupka (1996) find that past and future consumption do influence the demand for cocaine.

Further fields of interest due to rational addictive behaviour is the phenomenon of gambling (Mobilia 1993), the consumption of calories (Cawley 1999), or the rational addiction to arts (Villani 1992). Cameron (1999) analyses a market where the biological or pharmaceutical dependency is not given at all. Referring Becker and Murphy he investigates the addictive effect of cinemas in the United Kingdom. Altogether, he finds only a weak support for the rational addiction model. But this results do not surprise for two reasons. First of all, he refuses to use variables that control for the introduction of strong substitutes like VCR's or Pay-TV, that was possibly the reason for a temporary decline in cinema attendance, consequently the model could probably be miss-specified. Secondly, it is not absolute required that one can measure an addictive effect in general using aggregated data (see Ferguson 2000). Even, if some people get addicted to cinemas it is not obvious, why this should hold for all film-goers. However, a test using disaggregate data could possibly lead to further insights.

Also the reader market for print media like newspapers or magazines is characterized by a habituation effect of the consumers. A piece of circumstantial

evidence for this habit effect is the relatively scarce switching of the readers to comparable substitutional products in spite of the relative low switching costs.² Particularly the newspaper readers, but even though the readers of magazines are trusty consumers of the media. Although apart from subscriptions the switching costs are negligible small, many readers do not often substitute a newspaper or a magazine.

A possible explanation for this fact could be a kind of rational addiction to the media, in the sense of Becker and Murphy. Although, there is obviously no physical dependency, as it occurs in respect to the use of drugs, one can assume that habituation indeed exists. This habit effect could arise from the permanent use of the product and the scarcely changing format and recurring editorial topics, therefore, the reader gets used to the format and the contents. Furthermore it is conceivable that for some print media a kind of network effect, in the sense of a social network in addition to the habit effect exists. The utility of a reader increases with higher circulations of a certain newspaper or magazine because the number of possible like-minded people increases as well. So, besides the utility out of the information from a magazine, there is a positive utility due to the possibility to discuss certain articles with friends and colleagues.³

But also the same is true for the reversed case. A high number of readers of a certain magazine from the social environment of a consumer could increase the interest into this media. The idea is that people that belong to a social group are influenced by other group members or the group as a whole. Also this process is well known in the psychological, marketing but also in the economic literature as group-thinking and social interaction effects. There is a number of empirical research regarding social interaction effects. For example, Case and Katz (1991) study the influence of family and neighborhood on criminal activity, drug and alcohol use of youth behaviour. Also Glaeser, Scheinkman and Sacerdote (1996) analyse the effects of social interaction on crime (see also Ludwig, Duncan and

²One can calculate the switching costs of monthly women magazines to exemplify the its magnitude. Following Shy (2002), the costs lie between DM 1.16 and DM 2.80, whereas the price for all magazines is DM 4 (see Table 1 in the appendix for more details).

³For a discussion of the economic consequences of network effects see for example Arthur (1994). An empirical consideration of social networks is e.g. Bertrand et al. (2000).

Hirschfeld 2001; Katz, Kling Liebman 2001 or Ichino and Maggi 2000). Hence, from this point of view, the switching costs would rise due to social interactions.

Although it is clear that there seems to be some habit effect for print media products to observe, it is unexplained if such effect can be identified as "rational addictive" or just as myopic. Using panel data of magazine sales and subscription data can lead to further insights to consumers behaviour regarding mass media. Furthermore one may ask, what kind of nature the addictive stock in print media is. Because in contrast to cigarette addiction there is no nicotine or tar, that is consumed. Admittedly, there is some amount of information consumed with the magazines that fills the addictive stock. Unfortunately it is unobservable to what extend readers fill their addictive stock, because only the number of sales but not the amount of information or news that is consumed by the reader can be observed. Hence, any measure of the addictive stock can be biased.⁴

The proceeding of this paper is the following: In the next section the theoretical framework of rational addiction is mirrored to derive testable hypotheses that can be implemented in statistical regression equations. In the third section data of German popular magazines are used to test for the existence of a rational addictive phenomena in respect with print media. This will be done using single genres estimations and cross genres analyses. Finally, the forth section summarizes the most important outcomes and discusses possible improvement of the analysis.

2 Theoretical Background

The phenomena of habit formation and addiction have been analyzed in various directions. Distinct key approaches are the myopic habit, the rational habit formation and the rational addiction. The first models addiction as a process of "backward-looking" habit formation, where the utility of the current consumption depends on past consumption, thus, myopic addicts are not aware of effects

⁴Not only an overestimation of consumption, due to the fact that consumers vary the number of articles they are interested in, is a potential outcome. But also an underestimation because of the synchronous consumption of different magazines by the same reader is possible.

of current consumption on future utility (see Gorman 1967, Pollak 1970, 1976, Spinnewyn 1981). The second approach models addiction as rational and far-sighted behaviour. Therefore, the rational addict realizes the effects of addiction on future utility (see Stigler and Becker 1977 and Becker and Murphy 1988).⁵

In the following the theory of rational addiction introduced by Becker and Murphy will be reviewed in the light of empirical verification. Therefore first the theoretical framework will be represented to introduce possible testable specifications of the model subsequently. Afterwards some implications in respect with the model parameters will be reported that can be used to analyse the consuming behaviour of economic subjects more precisely.

2.1 The Becker Murphy Model

Following Becker and Murphy the rational consumer maximizes utility under the assumption that tastes are constant over time. Accordingly an appropriate utility function is:

$$(1) \quad u(t) = u[Y(t), C(t), S(t)],$$

where Y is the consumption of a non-addictive and C the consumption of the addictive good. S stands for the addictive stock, thus, past consumption leads to an accumulation of S . Becker and Murphy assume that health, in the case of harmful products, is negatively affected by the addictive stock. In the case of harmless products the addictive stock can also have positive influence on utility. Formally, it can be determined by an investment function:

$$(2) \quad \frac{\partial S(t)}{\partial t} = C(t) - \delta S(t),$$

where the difference of the current consumption $C(t)$ and the depreciated stock $\delta S(t)$ determines the rate of change in time over S .

⁵An extensive summary of the different models of consumer behavior and habituation can be found in Messinis (1999).

Assuming a concave and time-separable utility function (in Y , C and S), a constant rate of time preference, σ , and a infinity lifetime the utility function is:

$$(3) \quad U = \int_0^{\infty} e^{-rt} u[Y(t), C(t), S(t)] dt.$$

Maximizing utility has to be carried out under a budget constraint as long as consumers are rational. Under the assumption of a constant price $P_Y(t)$ of the non-addictive good, treated as numeraire, and perfect capital markets one can derive the budget constraint as

$$(4) \quad \int_0^{\infty} e^{-rt} [y(t) + PC(t)] dt \leq A_0 + \int_0^{\infty} e^{-rt} w[S(t)] dt$$

where P is the price of the addictive good, r the constant real interest rate, A_0 the initial value of assets and $w[S(t)]$ the earnings, a concave function of the addictive stock.

Due to optimization of equation (3) subject to (2) and (4) and assuming a quadratic utility function BM calculate the optimal consumption path as:

$$(5) \quad C(t) = \delta S(t) + \lambda_1 [S(t) - S^*],$$

where λ_1 is the smaller characteristic root of a second-order linear differential equation, and S^* is the steady state value of the addictive stock. Thus, optimal consumption is the sum of the depreciated stock and λ_1 times the actual distance to the steady state. Therefore, assuming optimal behaviour, the consumer tends to the optimal consumption path by refilling the sum of the depreciated addictive stock and reducing the distance between the actual stock and the steady-state, if existing. The smaller root of the characteristic difference equation, therefore, determines the speed of adjustment. Stability is, of course, only given if λ_1 is negative.

2.2 Empirical Specifications

Empirical tests of rational addictive behaviour can be performed by specifying a demand function founded in the underlying BM model. Two possible procedures to receive a testable form of the demand equation are reviewed in the following. The first is developed by Chaloupka in 1991 the second by Becker, Grossman and Murphy in 1994. Both analyses use cigarette consumption as the addictive product to test the BMM empirically.

Chaloupka (1991)

Up to now the most frequent application of the BM model is the empirical analysis of cigarette consumption. Chaloupka (1991) used micro-data on smoking behaviour to analyze cigarette addiction and price elasticities. In his study he uses a quite different approach, where health and relaxation are explicit modeled and being influenced negatively and positively by smoking respectively. Chaloupka assumes a quadratic specific utility function in its arguments $(C(t), Y(t), S(t))$. Under the assumption that the rate of time preference equals the real interest rate, neglecting the effects of consumption on earnings, and using the first-order conditions for $C(t)$ and $S(t)$ he derives the demand equations:

$$(6) \quad C_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 P_{t+1} + \beta_4 C_{t-1} + \beta_5 C_{t+1}$$

and

$$(7) \quad C_t = \phi_0 + \phi_1 P_t + \phi_2 P_{t+1} + \phi_3 C_{t+1} + \phi_4 S_t,$$

which are converted into discrete time. If rational addiction exists future and past consumption is assumed to be positive correlated with current consumption. Current prices are, as usual, supposed to have a negative effect on consumption. Future and past prices instead should have a positive influence, (if the price-effect on future and past consumption is ignored) for the following reasons: If past (future) prices are higher than current prices, the contemporary consumption is

higher than past (future) consumption, since the consumer substitutes cigarettes intertemporal. The effects outgoing from past (future) prices on past (future) consumption and, therefore, on current consumption is not included in equations (6) and (7) (see Chaloupka 1991 and Becker et al. 1994 for details).

The solutions of the second-order difference equations (6) and (7) lead to the characteristics roots when utility is maximized:

$$(8) \quad \lambda_{1,2} = \frac{1 \mp (1 - 4\beta_4\beta_5)^{1/2}}{2\beta_4}$$

and

$$(9) \quad \lambda_{3,4} = \frac{1 \mp (1 - 4(\phi_4/\delta)\phi_3)^{1/2}}{2(\phi_4/\delta)},$$

respectively. Because as a condition for a maximum, λ_1 and λ_3 measure the influence of an (anticipated) variation in future consumption on current consumption and $1/\lambda_2$ and $1/\lambda_4$ measure the influence of a variation in past consumption on current consumption of the addictive good. As long as the utility function is concave in C and S , the signs of the roots are positive, if addictive behaviour is present.

Chaloupka also calculates the long-run price elasticities of the equations (6) and (7) as the elasticities of the steady-state level of consumption (C^*) that is a replacement for the depreciated optimal level of the addictive stock (δS^*) each period:

$$(10) \quad \frac{\partial C^*}{\partial P} \frac{P}{C^*} = \frac{(\beta_1 + \beta_2 + \beta_3)}{1 - \beta_4 - \beta_5} \frac{P}{C^*}$$

and

$$(11) \quad \frac{\partial C^*}{\partial P} \frac{P}{C^*} = \frac{(\phi_1 + \phi_2)}{1 - \phi_3 - (\phi_4/\delta)} \frac{P}{C^*}.$$

In this way the long-run relationship between consumption and prices can be measured. This relationship is of special interest regarding political interventions like taxes on addictive goods.

Becker, Grossman and Murphy (1994)

Becker, Grossman and Murphy expand the empirical analysis on cigarette addiction in 1994 by the impact of unmeasured life-cycle variables on the utility. Starting from a concave lifetime utility function in discrete time

$$(12) \quad \sum_{t=0}^T \delta^{t-1} U(Y_t, C_t, C_{t-1}, e_t)$$

where e_t and e_{t+1} determines present and future life-cycle variables and δ determines the time discount factor. Under the assumption of a life-time budget constraint ($\sum_{t=1}^{\infty} \beta^{t-1} (Y_t + P_t C_t) = A^0$), where A^0 is the initial value of wealth and assuming a quadratic utility function one can derive the following difference equation:

$$(13) \quad C_t = \theta_1 C_{t-1} + \theta_2 C_{t+1} + \theta_3 P_t + \theta_4 e_t + \theta_5 e_{t+1}, \quad \text{with } \theta_2 = \delta \theta_1.$$

In contrast to equations (6) and (7) past and future prices are not considered here, as a consequence of the different specification of the utility function. Hence, past consumption determines addictive behavior and only future consumption presents rationality in addiction.

Apart from the testable equation it is possible to calculate important relations using the parameters of (13). First, one can directly derive the rate of depreciation as $\delta = \theta_1/\theta_2$. Thus, taking into account that $\delta = 1/(1+r)$ it follows that the rate of time preference is $r = (\theta_1/\theta_2) - 1$, that is as assumed equal to the market rate of interest.

Again, solving the second order difference equation (13) leads to the characteristics roots $\lambda_{1,2} = [1 \mp (1 - 4\theta_1\theta_2)^{1/2}]/2\theta_1 = [1 \mp (1 - 4\theta_1^2\delta)^{1/2}]/2\theta_1$. Whereas, the interpretation of these parameters is the same as in the Chaloupka specification, $\lambda_{1,2}$ measures the response of current consumption based on a shock in future and past consumption respectively. Using the characteristic roots one can derive the the long- and short-run effects. By multiplication with the ratio of prices and consumption at the sample means short and long-run elasticities can be represented as

$$(14) \quad \eta_s = \frac{\partial C P}{\partial P C} = \frac{\theta_3}{\theta_1(1 - \lambda_1)\lambda_2} \frac{P}{C}$$

and

$$(15) \quad \eta_l = \frac{\partial C P}{\partial P C} = \frac{\theta_3}{\theta_1(1 - \lambda_1)(\lambda_2 - 1)} \frac{P}{C}.$$

Summarizing there are three different specifications which can be used to analyse consumer behaviour regarding rationality and habit effects. Moreover, there is a number of hypotheses that can be tested in respect with the consistency of the models. In comparison with the Chaloupka approach the model of Becker et al. is less restrictive due to the omitted led and lagged prices. Indeed, ignoring future and past price variables could lead to specification bias if prices are important for the consumer decisions. Thus, we don't expect each specification to support for rational addiction, if any, using data of the same market. However, all of the specifications and hypotheses illustrated above will be tested in the next chapter using quarterly data of German magazine consumption.

3 Empirical Evidence

3.1 Data

All data used in this study are gathered from the Focus-Medialine Internet database, which includes information about German magazines of different genres like programme guides, news magazines, women's magazines, or computer magazines for example. The data are quarterly and the maximum sample cover the period 1972:3 to 2001:3. Because of the various ages of the magazines the panel is unbalanced and consist of different variables regarding the reader and the advertising market like circulation, subscriptions, copy prices, ads, and advertising rates. Regardless of the availability of the variables, application of most of them is problematic, because of interrelated reader and advertising markets. Therefore an endogeneity problem could probably occur. For this reason only the necessary variables like circulations and prices are used in the following.

Another problem could occur if some of the variables are integrated of order one or higher. Even if some of the variables are I(1) and also independent of the existence of a cointegrating relation, the pooled panel estimator yields consistent estimates (Phillips and Moon 1999). But unfortunately, only long-run relationships are measurable using integrated variables. So the usage of lagged variables is not appropriate. Thus, the first step is to test the several sub-samples against unit roots using panel unit root tests. There is a set of unit root tests for panel data but since the (sub)-samples are unbalanced, tests by Im, Pesaran and Shin (1997) or Levin and Lin (1993) are not applicable here.⁶ Therefore a non-parametric approach by Maddala and Wu (1999) is used to determine the order of integration. The authors suggest to choose a test-statistic by Fisher (1932) where the p-values of single unit root tests (π_i) from each cross-sectional unit are used to calculate $p_\lambda = -2 \sum_{i=1}^N \ln(\pi_i) \sim \chi_{2N}^2$. By this means one can use unit root tests with respect to different lag length to account for autocorrelation in the series that is a very important feature especially when the panel is unbalanced.

In order to calculate the p-values needed for the panel unit root test statistic, Phillips-Perron tests (see Phillips 1987 and Phillips and Perron 1988) were applied to each time series in the form: $y_t = \alpha + \beta y_{t-1} + \delta t + \varepsilon$, where y_t and y_{t-1} are current and lagged realizations of a time series, t is a time trend and ε is an i.i.d. error. The number of lags used for each series is calculated by $l = \text{int}(4 \cdot (T/100)^{(2/9)})$, where T is number of observation in the series. The advantage of this statistic is that the test can be carried out even if the errors are autocorrelated and heteroskedastic as well (see Hamilton 1994).

At first, each genres has been tested using the Phillips-Perron statistic on the single magazine data. In most cases the null hypothesis of a unit root can be rejected at least at the 5% confidence level. Only prices in four genres and circulation in one genre show some evidence for I(1) processes (see Table 12). Therefore, the single genres estimates have to be interpreted carefully.

Next, all genres magazines have been pooled and the tests were repeated over

⁶Other advantages of the Maddala and Wu approach in comparison to other tests are summarized in Banerjee (1999).

the all magazines and over pooled genres subsequently. Because of the fixed effects and pooled estimation of the Becker-Murphy model using information of all magazines in the following, this is a necessary procedure. In contrast to the single genre unit root tests, pooled magazines and pooled genres tests show no evidence for integrated series at all common levels. Thus, regarding pooled genre and fixed effects genres estimates, there is no danger of spurious regression.

The variables of interest out of this database are the circulation of the magazines (CIRC) which is calculated per capita using the total number of population over 14 years old⁷, the copy prices (P) which are deflated by the consumer price index, and number of pages (PAGE) that is the average number of pages of the magazines regarding the last four quarters.⁸ Additionally variables used are seasonal dummy variables $D1, D2$ and $D3$, yearly dummy variables (counteracting the income effect), and dummy variables identifying the different magazines or genres, to prevent unobserved heterogeneity. Overall, data of 123 different magazines are used out of 12 genres (see Table 9 in the appendix).

3.2 Results

To analyze the habit effects that are inherent in print media products the above mentioned models are tested using different kinds of techniques. First of all, single genre estimations are carried out, to determine peculiarities within the genres. Therefore, OLS regression followed by two stage least squares regressions are applied. Because of the usage of a higher number of instruments than regressors the generalized method of moments will be applied subsequently. The next step will be a pooled estimation of all genres available in the database using 2SLS and GMM estimator.

Single Genre Estimation

Starting with single genre estimation each genre is tested using the different models reported above. The samples consist of pooled data with varying num-

⁷Of course, subscriptions are subtracted from the circulations because of much higher switching costs for subscribers.

⁸Consumer price index and population statistics are taken from the publications of the Federal Office of Statistics of Germany (Statistisches Bundesamt).

ber of magazines and time periods (see data description in the appendix). At first all models are regressed using least squares estimator, but because of the endogeneity of past and current consumption, OLS is likely to lead to biased estimates. Therefore, 2SLS is an adequate method using led and lagged prices as instruments. Following Chaloupka, Becker et al. and others, four lagged and four led prices are used as instruments. This is a suitable procedure, because in the reduced form, the consumption is a function of all prices, contemporary and inter-temporal (see Chaloupka 1991 for example).

The first model estimated is the rational addiction specification following Becker et al. using current prices, past and future consumption of 25 weekly women magazines, followed by Chaloupka specifications I and II. The panel is unbalanced and consists at least 1320 observations.⁹

As one can see from Table 2 the OLS regression results support for the BMM to a weak extent because of the statistically insignificant coefficient of current prices regarding the Chaloupka specifications. One reason for this seemingly insignificance of prices could be the fact that copy prices of popular magazines do not change frequently. Though both, lagged and led consumption seems to have impact on current consumption. The same is particularly true for the 2SLS regression. As current, future, and past prices are not significant at any common level, again, past and future consumption is positive correlated with present consumption. Therefore, a habit effect and probable rational addiction could be present. But also the magnitude of the coefficients of past and future consumption is problematic, because future consumption has seemingly a higher impact than past consumption. The addictive stock variable, measured by the average number of pages out of the last four quarters carry the the right sign considering harmless products but, moreover, it is statistically insignificant.

Neglecting the partly insignificance of the coefficients all characteristic roots λ_1 (λ_2) of the difference equation are less (larger) than one, stability in consumption is therefore ensured since the smaller root is less and the larger root

⁹Due to the varying number of leads and lags the number of observations is of course uneven. But this genre is specially advantageous because of its high number of observations. In Germany exists a high number of women magazines since many years.

is greater than unity. An anticipated variation of future consumption of weekly women magazines by 10% would lead to a variation in current consumption by about 1 to 7%. A variation by 10% in past circulation leads to a 13% to 15% variation in current consumption.

***** Insert Table 2 about here *****

The short-run elasticity, measured in terms of sample means is (if measurable) -0.43 to -0.47 that is rather small but in respect with addiction or habit effects not surprising at all. The long-run price elasticity is -1.20 to -1.97 . Thus, the long-run elasticity not only exceeds the short-run elasticity but it is approximately 4 times the short-run elasticity. Apparently, in the long-run, as predicted by Becker et al., price changes do influence the consumption of magazines much more than in the short-run.

Regarding the first specifications of the demand for weekly women magazines using OLS and 2SLS regression techniques there is only weak evidence for the Becker-Murphy model. And the most important deviation from the BMM is probably founded in the price coefficients, using four leads and lags of the price variables as instruments. However, especially in the case of overidentification due to a higher number of instruments than exogenous variables (as applied here) the generalized method of moments (GMM) is an appropriate method to receive a consistent estimator, even under the existence of heteroskedasticity or autocorrelation (see Hamilton 1995). Thus all models applied above were re-estimated using GMM (see Table 3).

***** Insert Table 3 about here *****

Also the GMM estimates of the different specifications are ambiguous. None of the regressions is absolute consistent with the BMM. Starting with the Becker specification, the GMM estimates provide only weak support for the BMM, whereas current prices seem to have no impact on current consumption but both,

past and future consumption are positive and statistically significant. Furthermore the $\chi^2(J)$ -statistic representing a test for valid overidentification restrictions can not be rejected at the 5% level.¹⁰ Thus, the use of four lagged and led prices seems to be valid.

The second specification (Chaloupka I) is the least meaningful regression. Refrained of this specification the price coefficients are insignificant or carry the "wrong" sign. Though future consumption seems to have a larger impact on current circulation than past consumption. Ignoring this contradiction the long-run price elasticity can be calculated as about -1.42 . The third column of Table 3 shows the results of the second specification following Chaloupka. Also here, both, future prices and addictive stock carrying the wrong sign. Thus, this outcome does not support the BMM.

Restricted Estimates

In order to extend the analysis, some of the estimates above are re-estimated under different restrictions on the discount rate. Therefore the Becker and the Chaloupka specification I are modified to receive the following equations:

$$(16) \quad C_t = \theta_0 + \theta_1 C_{t-1} + \delta \theta_1 C_{t+1} + \theta_3 P_t + \theta_4 \varepsilon_t$$

and

$$(17) \quad C_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 P_{t+1} + \beta_4 C_{t-1} + \delta \beta_4 C_{t+1} + \varepsilon_t.$$

In both equations the restrictions are directly implemented regarding the proportion of future and past consumption. Adding seasonal and yearly dummies equation (16) and (17) are calculated using the generalized methods of moments. Moreover, both specifications are repeated using fixed effects.

First regarding the estimates using a common intercept for all magazines (see Table 4). The Becker specification repeatedly rejects the hypothesis of rational

¹⁰Under the null hypothesis that the overidentifying restrictions are justified, the statistic is asymptotically χ^2 distributed with degrees of freedom equal to the number of instruments (restrictions) minus the number of regressors (see Hamilton 1995).

addiction concerning current price. Seemingly current prices have no influence on consumption. That is implausible and probably attributed to the poor specification of Becker, Grossman and Murphy. For this reason it is nonsense to calculate the roots of the difference equation or the elasticities. Interestingly the coefficients of past consumption are nearby 0.5 assuming a discount rate of 100%, so that one can conclude that addiction is relatively strong. Increasing the discount rate the coefficient of future consumption, consequently, also increases. As above the application of GMM is feasible, the null of valid overidentification can not be rejected in each equation at the 5% level.

***** Insert Table 4 about here *****

The Chaloupka specification, in contrast, leads to more distinct results. All relevant variables are statistically significant at the 5% level and carrying the expected sign. Albeit here, the coefficients of past consumption are relatively high, however, this results could be interpreted as some evidence for rational addictive behaviour.

The response on anticipated shocks in future consumption (by 10%) on current consumption lies between about 5 and 7%. The reaction of current consumption as a response on a variation of past consumption lies between 7 and 8%. Of course the magnitude of this parameters strongly depends on the different restrictions implemented, they do not vary much. Also the long-run elasticities are very similar, for $\delta = 100\%$ $\eta_l = -1.36$ and for $\delta = 80\%$ and $\delta = 60\%$ $\eta_l = -1.39$ and $\eta_l = -1.43$ respectively.

Overall almost the same results can be observed using a fixed effects estimation (see Table 5). Current prices in the Becker equation are not significantly different from zero and the coefficients of past consumption are of similar magnitude. Moreover the outcomes of the Chaloupka specification are very similar to the results above. Overall the past consumption seems to have a slight stronger influence as using a common intercept.

***** Insert Table 5 about here *****

Summarizing, weekly women magazines show some empirical evidence for the BMM, but in respect with the insignificance of the price variables (especially in the Becker equations) this evidence is only weak. On the other hand past and future consumption seems to have impact on current consumption and the long-run price elasticities predicted by the distinct specifications are of usual magnitude. Furthermore, the most considerable specification using past and future prices and consumption shows indeed evidence for the BMM. Thus, the hypothesis of rational addiction regarding weekly women magazines can not be rejected, moreover, the results rather support for the BMM than for myopic behaviour.

The reported genre of news magazines is exemplary for all other estimations. Additionally, eleven other genres were used to determine evidence for the BMM. Table 2 summarizes the results from all genres, whereby also an ARMA approach is used to test for myopic behaviour. The ARMA specification includes an autoregressive term (AR(1)) to test for habit effects and a moving average element (MA(1)) because of the probable time aggregation bias, as we use quarterly data. More exact, if magazines are sold more frequently than once a quarter, the errors could have a moving average structure. Thus the orthogonality condition could be violated (see Wickens and Molana 1984). If the MA terms are significant it could be an indicator for biased results in the rational addiction models.

The first column in Table 2 reports the results from the ARMA specifications, where AR means a significant autoregressive term at the 5% level and (AR) means a significant term at the 10% level, the same is true for the MA terms. Also a - represents a negative coefficient. In about the half of the regressions the MA terms are statistically significant. Only few models support directly for the BMM but only news and cars magazine do not show any support for rational addiction. Again it is the prices that are insignificant regarding the most regressions. In almost every estimation, both, past and future consumption seem to have influence on circulation. In each genres a habit effect is obviously.

*** Insert Table 6 about here ***

Cross Genre Estimation

In order to analyse consumer behaviour in a broader context all genres presented above are used to calculate a cross genres model in respect with rational addiction. Therefore a new sample was built using information of the genres mentioned above with a resulting number of 9641 observations. Because of the variable PAGE to calculate the Chaloupka model II the number of observation reduced to 8342. As one can see from Table 7, cross genres estimates using GMM in a fixed effects framework support for the BMM following Chaloupka with respect to the coefficients and its signs. Current prices have negative and future and past prices have positive impact on consumption as predicted by Becker and Murphy. Moreover, past and future consumption is significant and positive related to circulation, solely the addictive stock has seemingly no influence. Regarding the Becker specification prices have no impact but intertemporal consumption is positive related to current consumption pattern at all common level.

The characteristic roots of the difference equations are respectively less or larger than unity, thus, stability is guaranteed for two out of three specifications.¹¹ The magnitude of the roots indicate that a change in future consumption by 10% leads to a change in current consumption by about 9-10%. And a change of 10% in past consumption leads to a variation in current consumption by also about 10%.

Furthermore, two specifications allow to calculate the rate of time preference and the discount rate respectively. Overall, both values of the discount rates are reasonably (0.97 and 0.9). The third specification can only be regressed when r or δ is predetermined, therefore we assumed $\delta = 0.9$ to be as high as in the Chaloupka I model. Because of a positive and insignificant price coefficient in the Becker specification the calculation of the elasticities is nonsense, however, both other models allow for the calculation of η_l . According to this the long

¹¹The larger root of the Chaloupka specification II is negative and implausible high, that depends on the small and negative value of PAGES.

run elasticity lies between -0.71 and -0.48 , that is relatively low in comparison with the single genre estimation of weekly women magazines but not surprising in respect with comparable studies of (rational) addictive products.

To analyse a valid overidentification by using more restrictions (instruments) than regressors, again, χ^2 -Tests were realized. None of the statistics rejects the null at the 5% level. Therefore the use of 4 lagged and led prices is a feasible proceeding. Using the 2SLS technique leads to the same outcomes regarding the signs of the estimated coefficients but not in respect with its magnitudes.

Finally, not all of the above results are consistent with the Becker-Murphy model of rational addictive behaviour. Particular prices are often problematic as in the Becker specification but also in many regressions of the single genres estimates. One reason, as reported, could be the low variation of prices at large. Also the measure of the addictive stock is seldom successful, here, a better approximation would be indicated. At least all of the results have shown that past consumption influences the current circulation and therefore a habituation effect can not be neglected. But there is also some evidence for rational behaviour. Future consumption is connected positively with circulation and mostly it is of lower magnitude than past consumption. The roots of the difference equations show evidence for stability on the most cases and long-run elasticities are of usual magnitude. The discount factor of about 0.9 is quite reasonable. For this reasons, the conjecture of some rationality in spite of habit can not be rejected.

4 Conclusions

In this paper an analysis on consumer behaviour of the readers of German magazines has been presented in order to shed some light on the kind of habit effect that is usually inherent with print media usage. Using quarterly data for a period from 1972:3 to 2001:3 and 123 magazines out of 12 genres, we applied simple OLS regressions, two-stage least squares, and the generalized method of moments serving to test different specifications of the Becker-Murphy model of rational addiction.

Starting with single genres estimates, we found ambiguous symptoms for the validity of the BMM in the context of print media consumption. Only few genres support the Becker-Murphy model in more than one specification. However, the rejection of the rational addiction hypothesis is seldom founded in consumption variables but in prices. Nominal copy prices of German magazines are used to vary approximately only once a year. Because of this rigidity, demand reactions induced by price changes are hardly measurable. Moreover, if appropriate we calculated long-run price elasticities varying from -1.20 to -1.97. Also the relatively low magnitude of the short-run elasticities support the habit hypothesis.

While the most single genres estimates produces only weak, at least partly different evidence regarding *all* specifications of the BMM, the regression results using a complete panel consisting each magazine supports for the hypothesis of rational addiction in a more considerable way. Refrained of the Becker specification that missed to confirm an impact of current prices on consumption, both other specification drew results agreeing with rational addiction. Furthermore, past and future consumption estimates confirmed an intertemporal dependency in respect with circulation. So that it is probable that print media consumption is not only addictive but rational.

Long-run elasticities estimates using the Chaloupka specifications lie between -0.48 and -0.71 at the sample means, that is not very high, but in comparison with other studies of addictive products those elasticities are usual outcomes. Becker et al. (1994) for example measure long-run elasticities of -0.73 to -0.79 for the case of cigarette consumption. Much lower values (-0.27 to -0.46) are calculated by Chaloupka (1991) also regarding smoking behaviour. Labeaga (1999) measures price elasticities for Spanish cigarette demand of about -0.113 to -0.665 for different types of consumers. For the case of opium van Ours (1995) found the long-run price elasticity of about -1.0 . Finally, Bentzen et al. estimate long-run price elasticities according to different kind of alcoholic drinks for the nordic countries that lie between -1.2 and -1.9 .

Uncontentiously it has been shown that, however, the readers of German magazines are subject to a considerable habit effect. Independently of the single

genres, past consumption has always a significant impact on current consumption. Hence, at least habituation does play an important role for consumer behaviour in respect with print media, even if switching costs are negligible small. Moreover, there is also some evidence for *rational* addictive behaviour according to Becker and Murphy (1988). Almost every estimation using past and future consumption simultaneously, yields to significant measures of impact. Hence, again, the hypothesis of rational addiction in print media can not (completely) be rejected. Even more one can understand the outcomes as evidence for non-myopic and probably *bounded* rational behaviour.

Regardless of the evidence discussed above, there are many points that can be improved to receive more precise results. An useful extension of this analysis would be to consider individual data of magazine consumption in order to determine a more exact measure of habituation effects. Due to the aggregation of circulation data it is not clear whether and of what magnitude new readers enter the market and over which period the magazines are used by consumers. Hence, the results could be biased because of aggregation individual behaviour. Furthermore it would be appropriate to control for heterogeneous effects concerning the single magazines, but unfortunately, it is hard to find additional information to control for heterogeneity because of the dependency of reader and advertising markets in the media sector, therefore problems of endogeneity would arise.

Regarding further research it would be of particular interest to analyse the consumption behaviour of other mass media than magazines. Especially daily newspapers are suitable objects because of the high number of subscription rates and their typically daily use. It is, though, much more difficult to receive the corresponding data. But also media like television or cinemas could be of further interest in respect with rational addiction.

Moreover, from a theoretical point of view, it would be useful to model the behaviour of a media firm being confronted with addicted consumers. In contrast to usual firms dealing with addictive goods as considered by Showalter (1999), the optimization process of media firms is obviously different because of the mutual dependence of the (interrelated) reader and advertising markets (see Blair and

Romano 1993 or Dewenter and Kraft 2001). Therefore the pricing decisions should also depend on addiction and habits.

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A Tables

A.1 Switching costs of monthly women magazines

Table 1: Switching Costs of monthly women magazines

	Circulation	Copy price	Switching costs
Title	N	p	$S_{i,j} = p_i - \frac{p_j N_j}{N_i + N_j}$
Brigitte	858726	4	2.84
Freundin	534364	4	2.42
Für Sie	522324	4	2.40
Journal für die Frau	349130	4	1.16

Notes: To receive the highest switching costs possible, all $S_{i,j}$ are calculated using data of *Journal für die Frau*, the magazine with the lowest circulation, as substitute. Data of *Brigitte* is used to calculate the switching costs for *Journal für die Frau*, respectively.

A.2 Single Genres Estimates

Table 2: Single Genres Estimates - Weekly Women Magazines

	Rational Addiction Models					
	Becker		Chaloupka I		Chaloupka II	
	OLS	IV	OLS	IV	OLS	IV
Constant	0.0001 (0.03)	0.0017 (0.88)	-0.0005 (-0.71)	-0.0007 (-0.49)	0.0065 (3.05)	-1.7071 (-2.71)
P(t)	-0.0009 (-2.61)	-0.0028 (-2.54)	-0.0046 (-1.78)	-0.0043 (-1.64)	0.0005 (0.39)	-0.3208 (-1.67)
P(t-1)	-	-	0.0012 (0.95)	0.0005 (0.35)	-	-
P(t+1)	-	-	0.0029 (1.86)	0.0029 (1.74)	-0.0020 (-1.49)	-0.2437 (-2.66)
CIRC(t-1)	0.5153 (12.69)	0.6766 (7.07)	0.4683 (17.19)	0.4612 (6.78)	-	-
CIRC(t+1)	0.4224 (10.34)	0.1081 (1.48)	0.4802 (17.97)	0.4613 (5.12)	0.8248 (17.87)	0.6951 (5.99)
PAGE	-	-	-	-	8.22E-07 (1.82)	0.00051 (2.61)
\bar{R}^2	0.98	0.97	0.98	0.97	0.95	0.91
Obs	1510	1425	1491	1425	1388	1320
λ_1	0.62	0.11	0.73	0.66	-	-
λ_2	1.31	1.36	1.40	1.50	-	-
η_s	-0.47	-0.43	-	-	-	-
η_l	-1.97	-1.62	-1.20	-1.24	-	-

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required.

Table 3: GMM Estimates - Weekly Women Magazines

	Rational Addiction Models		
	Becker	Chaloupka I	Chaloupka II
Constant	-0.0011 (-1.79)	-0.0008 (-1.35)	-0.8306 (-4.31)
P(t)	0.0002 (0.83)	-0.007 (-2.66)	-0.2472 (-2.71)
P(t-1)	-	0.0032 (2.21)	-
P(t+1)	-	0.0039 (2.53)	-0.0408 (-1.19)
CIRC(t-1)	0.5960 (12.43)	0.4774 (11.70)	-
CIRC(t+1)	0.4356 (8.03)	0.5419 (2.53)	0.8547 (12.08)
PAGE	-	-	0.0002 (3.57)
\bar{R}^2	0.98	0.98	0.95
$\chi^2(J)$	7.41	6.23	7.80
p-value	(0.06)	(0.10)	(0.05)
Obs	1425	1425	1365

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required. $\chi^2(J)$ -statistics reports for valid overidentification.

Table 4: Restricted Estimates - Weekly Women Magazines

	Becker			Chaloupka I		
	$\delta = 100\%$	$\delta = 80\%$	$\delta = 60\%$	$\delta = 100\%$	$\delta = 80\%$	$\delta = 60\%$
Constant	-0.0002 (-0.23)	-1.82E-05 (-0.01)	0.0004 (0.03)	0.0006 (0.41)	0.0009 (0.55)	0.0013 (0.71)
P(t)	-1.26E-05 (-0.02)	-0.0001 (-0.24)	-0.0003 (-0.52)	-0.0054 (-2.43)	-0.0054 (-2.45)	-0.0054 (-2.46)
P(t-1)	-	-	-	0.0022 (2.65)	0.0024 (2.14)	0.0027 (2.07)
P(t+1)	-	-	-	0.0027 (2.49)	0.0023 (2.21)	0.0019 (2.21)
CIRC(t-1)	0.4987 (19.89)	0.5466 (18.40)	0.6019 (16.05)	0.4765 (14.65)	0.5219 (12.77)	0.5750 (11.08)
\bar{R}^2	0.98	0.98	0.98	0.98	0.98	0.98
$\chi^2(J)$	6.46	6.24	6.07	4.54	4.41	7.33
p-value	0.19	0.10	0.10	0.20	0.22	0.062
Obs	1417	1417	1417	1417	1417	1417

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required.

Table 5: Restricted Estimates - Weekly Women Magazines - Fixed Effects

	Becker			Chaloupka I		
	$\delta = 100\%$	$\delta = 80\%$	$\delta = 60\%$	$\delta = 100\%$	$\delta = 80\%$	$\delta = 60\%$
P(t)	-8.34E-06 (-0.02)	4.96E-05 (0.11)	4.39E-05 (0.08)	-0.0054 (-2.37)	-0.0053 (-2.18)	-0.0053 (-2.15)
P(t-1)	-	-	-	0.0029 (2.45)	0.0031 (2.27)	0.0034 (2.37)
P(t+1)	-	-	-	0.0026 (1.80)	0.0022 (1.99)	0.0019 (2.18)
CIRC(t-1)	0.5044 (43.04)	0.5678 (36.71)	0.6452 (30.62)	0.5124 (29.36)	0.5685 (32.04)	0.6374 (30.68)
\bar{R}^2	0.98	0.98	0.98	0.98	0.98	0.98
$\chi^2(J)$	7.34	7.56	7.79	3.53	5.11	5.17
p-value	0.061	0.055	0.05	0.31	0.16	0.16
Obs	1417	1417	1417	1417	1417	1417

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required. $\chi^2(J)$ -statistics reports for valid overidentification.

Table 6: Single Genres Estimates - Summary

Genres/	Myopic	Rational Addiction		
	ARMA	Becker GMM	Chaloupka I GMM	Chalupa II GMM
Cars	AR,-MA	-	-	-
Computer	AR	+,P	-	+,P
Eroticism	AR	+,P	-	-
Lifestyle	AR	+,P	-	+,P
News	AR,-MA	-	-	-
Parents	AR,MA	+,P	+,P	-
Sports	AR	-	(+),P	+,P
TV Guides	AR	-	-	+
Women (fortnightly)	AR,MA	+,P	+,P	+,P
Women (monthly)	AR,(-MA)	+,P	-	+,P
Youth	AR,-MA	+,P	-	+,P

Notes: If myopic models are indicated with AR or (AR) resp. MA or (MA) the autoregressive or moving average term is statistically significant at the 5% (10%) level. Furthermore + means a significance level of 5% and (+) a significance level of 10%, where +,P means significant consumption variables and insignificant prices.

A.3 Cross Genres Estimates

Table 7: Cross Genres GMM Estimates - Fixed Effects

	Rational Addiction Models		
	Becker	Chaloupka I	Chaloupka II
P(t)	0.0000 (0.34)	-0.000644 (-3.14)	-0.000560 (-1.93)
P(t-1)	-	0.000332 (3.19)	-
P(t+1)	-	0.000311 (2.16)	0.0000652 (2.04)
CIRC(t-1)	0.5070 (12.70)	0.5242 (6.05)	-
CIRC(t+1)	0.4923 (12.49)	0.4752 (5.64)	1.0743 (15.07)
PAGES	-	-	-3.73E-08 (-0.42)
λ_1	0.94	0.89	1.07
λ_2	1.02	1.00	-7182801
r	0.03	0.10	0.10
δ	0.97	0.90	0.90
η_t	-	-0.711	-0.48
\bar{R}^2	0.99	0.99	0.97
$\chi^2(J)$	7.81	5.63	8.00
p-value	(0.05)	(0.13)	(0.047)
Obs	9641	9641	8342

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required. $\chi^2(J)$ -statistics reports for valid overidentification. The rate of time preference and therefore the discount rate are exogenously assumed in the Chaloupka model II.

Table 8: Cross Genres 2SLS Estimates - Fixed Effects

	Rational Addiction Models		
	Becker	Chaloupka I	Chaloupka II
P(t)	0.5093 (0.50)	-0.000675 (-2.57)	-0.000732 (-2.34)
P(t-1)	-	0.000310 (2.13)	-
P(t+1)	-	0.000336 (2.15)	0.000818 (2.38)
CIRC(t-1)	0.5093 (11.76)	0.4751 (4.76)	-
CIRC(t+1)	0.4874 (11.37)	0.5214 (5.34)	1.0475 (9.62)
PAGES	-	-	-5.49E-08 (-0.22)
λ_1	0.89	0.95	1.04
λ_2	1.06	1.15	-11591915
r	0.04	-0.08	0.10
δ	0.95	1.09	0.90
η_t	-	-0.20	-0.62
\bar{R}^2	0.99	0.99	0.97
Obs	9641	9641	8333

Notes: t-Statistics in brackets. Dummy variables are not reported. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 led prices as required. $\chi^2(J)$ -statistics reports for valid overidentification. The rate of time preference and therefore the discount rate are exogenously assumed in the Chaloupka model 2.

A.4 Descriptive Statistics and Data Description

A.4.1 Data Descriptions

Table 9: Data Description

<i>GENRES</i>	Magazines	CIRC	P	PAGE
<i>Cars</i>	11	1143	1143	1001
<i>Computers</i>	11	465	465	343
<i>Eroticism</i>	4	300	300	281
<i>Lifestyle</i>	9	485	485	404
<i>News</i>	9	830	830	793
<i>Parents</i>	4	364	364	340
<i>Sports</i>	10	585	585	463
<i>TV Guides</i>	15	1106	1106	1024
<i>Women Weekly</i>	20	1560	1560	1456
<i>Women Fortnightly</i>	5	446	446	415
<i>Women Monthly</i>	28	1792	1792	1412
<i>Youth</i>	7	649	649	446

A.4.2 Cross Genres Sample

Table 10: Descriptive Statistics of the Cross Genres Sample

	Circulation per Capita (C)	Real Prices (P)	Pages (PAGE)
Mean	0.009118	3.152678	880.1764
Std. Dev.	0.010825	1.967447	601.3535
Observations	9681	9681	8374

Table 11: Correlation Matrix of the Cross Genres Sample

	C	C_{t-1}	C_{t+1}	P	P_{t-1}	P_{t+1}	$PAGES$
C	0.9953	0.9897	-0.3529	-0.3529	-0.3508	0.4437	
C_{t-1}		0.9859	-0.3528	-0.3532	-0.3507	0.4459	
C_{t+1}			-0.3527	-0.3526	-0.3532	0.4402	
P				0.9973	0.9906	-0.1694	
P_{t-1}					0.9883	-0.1694	
P_{t+1}						-0.1694	

Table 12: Maddala-Wu panel unit root tests

Magazine Genres	$p_\lambda(CIRC_t)$	$p_\lambda(\Delta CIRC_t)$	$p_\lambda(P_t)$	$p_\lambda(\Delta P_t)$	$\chi^2_{2N}(0.05)$
Cars	43.32	-	23.07	146.59	33.92
Computer	47.85	-	24.13	148.98	33.92
Eroticism	13.26	-	13.25	-	12.59
Lifestyle	29.05	-	14.44	157.68	28.86
News	70.14	-	53.20	-	28.87
Parents	5.45	56.64	13.51	-	12.59
Sport	73.60	-	45.82	-	31.41
TV	41.59	-	88.35	-	31.41
Women (Fortn.)	45.20	-	24.94	-	18.37
Women (Monthly)	220.03	-	80.06	-	79.08
Women (Weekly)	178.36	-	79.13	-	67.50
Youth	34.64	-	21.06	130.41	23.68
All Genres	85.68	-	102.64	-	36.41
All Magazines	805.96	-	481.01	-	298.6

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