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Stiassny, Alfred; Somosi, Agnes; Kolos, Krisztina

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Agnes Somosi
Alfred Stiasny
Krisztina Kolos

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Agnes Somosi *

Corvinus University of Budapest

Alfred Stiassny †

Department of Economics, Vienna University of Economics and Business

Krisztina Kolos ‡

Corvinus University of Budapest

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*agnes.somosi@uni-corvinus.hu

†alfred.stiassny@wu.ac.at

‡krisztina.kolos@uni-corvinus.hu

ABSTRACT

Generally, service industries require a rapid innovation of service portfolios to gain and maintain a competitive advantage. In this context, service elimination is a tool of portfolio renewal, where customer retention is a strategic priority for companies. This is especially so because service elimination usually causes higher churn rates than an average churn in telecommunications. Thus, customer retention is seen as a major aspect in enhancing service elimination success. The purpose of this paper is to investigate the factors that increase customer churn in the case of service elimination. We use one of the three Hungarian telecommunication operator's databases containing usage data three months before and after service elimination in the course of a major service package reform. Contract-related information and demographics of 10 065 customers are used to differentiate between high and low churn factors, taking care of a possible sample selection problem. The results show that in the course of service elimination there is a significant positive relationship between price decrease, tenure, interaction intensity on the one, and customer retention on the other side. Besides these, demographics (age and residence) also play an important role in explaining churn rates during service elimination. Furthermore, we find that a higher monthly fee after elimination increases the customer's usage intensity. This research aims to contribute both to service elimination, as well as to customer retention literature, by hierarchical modeling of retention and usage during service elimination with practical implications for decision-makers in rapidly innovating telecommunication markets.

Keywords: service elimination; customer retention; churn; switching cost; telecommunication services; Heckman sample selection

JEL Codes: C21, C31, L8, M2, M21, M31

1 Introduction

It seems to be obvious that portfolio innovation is a requirement of any service industry, but as, from the eighties onwards, companies were focusing on extending services, many of their resources are locked by increased development and maintenance costs. Thus, an overcrowded service portfolio is a serious drawback hindering innovation, which is seen as a basic requirement of competitive advantage in the twenty-first century.

As a customer you might have encountered a situation that your bank calls you to

inform you about changes in your credit card conditions. For instance, if an enhanced version of the current service was introduced recently, and as a result, you are not eligible to use the service anymore, but you can choose a new one. Similarly, such changes might happen in your mobile subscription, insurance, and so on. The question is, do you stay with your current operator or look for a better competitive service? Why would you accept the new offer of your operator and in what cases would you reject it? Clearly, it is not an easy choice, because the value for money is influenced by many factors, such as trust towards your operator, the competitiveness of alternate offers, etc.

These questions are all related to service innovation and service elimination, as operators constantly strive to improve their service portfolio, which at some point also requires the removal of outdated services. We argue that service elimination is one of those tools that enables simplification of service portfolios, thereby facilitating accelerated service innovation.

Surprisingly, service elimination is a rather neglected area in the literature, even though the significance of the topic is gaining more importance due to technological innovations emerging in service industries. Furthermore, even in the existing literature of service elimination, there are significant gaps focusing on measuring the outcomes of service elimination and expected customer reactions. Often, the outcome is measured by customer retention; however, this is not applied in a service elimination context, but rather in general churn studies.

Our results show that tenure and interaction intensity increase the probability of retaining customers during service elimination. Additionally, increased prices and more intense interaction play an important role in higher usage intensity after service elimination. To our knowledge, these effects have not been investigated in a service elimination context in order to estimate the probability of customer retention as a measurement of outcome success. Thus, our results shed light on how service elimination churn could be minimized. Furthermore, we revealed two factors, i.e. price increase and interaction intensity, which notably affect customer behavior following service elimination.

Based on the literature review of service elimination, e.g. Argouslidis (2007), Argouslidis and McLean (2003), Argouslidis and Baltas (2007), Avlonitis and Argouslidis (2012), we have formulated a definition of service elimination that is used to operationalize our research: service elimination is the process, when a service firm eliminates its existing services by migrating existing customers to new service packages. Whereas so called service-closing still enables to keep the existing subscription for existing customers with

closing the service from new customers, service elimination requires the closing for both new and existing customers. In our paper we define service elimination as full elimination, meaning that all affected customers must be migrated to new service packages. Thus, although there are other types of definitions in the literature regarding the execution of elimination (partial elimination, replacement, merging etc.), we have excluded these from our analysis. Further, regarding the typology of service elimination, this can be either of a voluntary or forced type, influencing customer retention as well.

An important aspect of the work is to identify service elimination as a pre-requisite of portfolio renewal. In this process, it is essential that the company does not lose its customers during service elimination as this would demolish all potential benefits, e.g. process-optimization, maintenance and development-cost reduction, obtainable by portfolio-simplification. So this argument asserts that customer retention is crucial for companies during service elimination.

The main contributions of our research are twofold. First, it is shown that price increase, tenure and interaction intensity increase customer retention during service elimination. Second, price increase and a lower interaction intensity also increase post-elimination customer usage intensity.

The paper is structured as following: Section 2 reviews the literature, section 3 introduces the theoretical background comprising the relationships between service elimination and price increase, usage, tenure, switching barriers and interaction intensity, developing six hypotheses about customer retention and to suggest main variables. In section 4 we present our basic empirical model. Section 5 deals with some methodological issues related to the “Heckman” sample selection problem and section 6 describes our used database. Section 7 presents our main empirical results whereas section 8 discusses robustness aspects. Section 9 draws some conclusions and finally section 10 discusses the results and additionally pointing to some limitations and suggestions for further research.

2 Gaps in the literature

In the literature, product elimination and service elimination are often studied together; however, there are differences between the two concepts, as already defined above. Avlonitis and Argouslidis (2012) provide an overview of the whole field, but in the following we concentrate only on service elimination as there are important differences between these two concepts.

There are three phases of the service elimination process itself:

1. The pre-elimination phase, which defines the objectives
2. Service elimination decision-making phase, which determines the attributes of the elimination process
3. The post-elimination phase, which focuses on the result of the service elimination

From the service elimination literature review, it is clear that service elimination is mostly studied in the financial sector from the firm's perspective, Argouslidis (2001), Argouslidis and McLean (2003), Argouslidis (2007) and Argouslidis and Baltas (2007).

Performance outcomes are only studied in manufacturing sectors, and success factors in the financial service sector and multi-sector studies. Surprisingly, there is no customer perspective analysis in the service area combined with the post-elimination phase, especially the success factors, which is a significant gap in the extant literature, table 1.

Only two studies were found in the product elimination field using customer perspective, Avlonitis (1983), Homburg, Fürst, and Prigge (2010). Harness and Marr (2004) draws attention to the missing empirical evidence of the customer perspective because elimination effects are mainly studied from the firm's point of view. That is why this area is the focus of this study.

Within the post-elimination phase of service elimination, the role of a strategic decision and company type were highlighted as determinants of service elimination success, Harness and Marr (2004) and Gounaris, Avlonitis, and Papastathopoulou (2006). This is in accordance with the choice of telecommunications as a field of study: company-type may account for differences in service elimination, which cannot be captured by studies focusing only on the financial sector, including some multi-sector studies.

The literature review on service elimination gave the foundation for both the main topic and context of this study: customer perspective on assessing the success factors of service elimination in telecommunications. The evidence, as shown in Table 1, suggests that there are indeed only a few empirical studies addressing this issue, which is the main topic of our article.

This gap in the literature also affects practice: portfolio managers are uncertain about how customer retention could be enhanced in these situations. According to anecdotal

evidence, the unacceptably high 20-30% churn ratio is not unusual by service elimination¹, compared to the 2-3% price independent churn without service elimination in the telecommunication industry, (ClintWorld 2013). Accordingly, the combination of service elimination with customer retention phenomena would be able to contribute both to academics and to practice. To fill this gap, our paper analyzes the relationship between customer retention and tenure, switching barriers and interaction intensity in the case of service elimination.

Building on the service elimination literature, our research examines how customer churn could be reduced. During this process, we expect customers to stay with the provider, when the new offer has a lower price, they have a longer relationship with the provider, and also are within the loyalty period. There are many interrelated concepts that we briefly introduce.

Customer retention is defined as “the future propensity of a customer to stay with the service provider” (Ranaweera and Prabhu (2003), p. 381). Two forms of retention include a product-specific retention rate and a broader relationship retention rate, Dawes (2009). We used a concept of a broader retention rate, as service elimination has undoubtedly high churn rates compared to industry averages; therefore the event of churn is defined as occurring whenever the customer leaves the company due to service elimination.

It is shown that the contract status of the customer plays an important role for customer retention as an in-contract status within the loyalty period significantly increases the switching costs and the probability for customer retention, Lam et al. (2004). Out-of-contract status is a churn indicator, as a customer who is out of the time of contract, does not have to pay a serious amount of penalty, especially if he or she received a device subsidy in addition to a service package (tariff) subsidy. On the other hand, during the loyalty period of in-contract status, there are serious switching costs that usually prevent customers from switching. This means that contract status, defined as switching barriers in the service literature is a determinant of a successful elimination. On the one hand there is a timing effect, and on the other, it affects the selection, i.e. which service packages are eliminated by the firm.

A further important concept is tenure, which is defined as the time that passed from

¹Firms do not report service elimination projects officially, and thus, no hard facts are publically available. There are some research results and company evidence that are available though Somosi and Kolos (2014), editor (n.d.)

Table 1: Summary of service elimination literature

Source: Own construction based on Avlonitis and Argouslidis (2012)

BROAD TOPICS	FIRM PERSPECTIVE	
	FINANCIAL SERVICES	OTHER OR MULTI-SECTOR
General description of service elimination practice	(Argouslidis & McLean, 2001a)	
1. Pre-elimination decision-making phase		
Pursued objectives	(Argouslidis & McLean, 2001b) (Argouslidis P., 2006)	
Precipitating circumstances	(Harness <i>et al.</i> , 1998) (Argouslidis, 2007b)	
2. Service elimination decision-making process		
Identification of candidates for elimination	(Argouslidis & McLean, 2003) (Argouslidis & McLean, 2004)	
Analysis and revitalisation/modification	(Argouslidis & McLean, 2004)	
Evaluation and decision-reaching	(Harness D. R., 2004) (Argouslidis, 2007a)	
Implementation	(Harness & Marr, 2001) (Argouslidis, 2004)	
3. Post-elimination phase		
Performance outcomes		
Success factors	(Harness & Marr, 2004)	(Gounaris <i>et al.</i> , 2006)
4. Organizational and structural issues		
Participation		
Decision-making structure (i.e. formalisation)	(Argouslidis & Baltas, 2007)	
Decision speed	(Argouslidis, 2008)	
5. Historical, regulatory and economic aspects of service exits		(Chisholm & Norman, 2006)

the customer's enrollment until churn, Allison (1995). Switching barriers represent any factor that makes it more costly for customers to change providers, and thus loyalty is highly-dependent on these costs, Colgate and Lang (2001), Jones, Mothersbaugh, and Beatty (2002), M. Lee and Cunningham (2001). Lastly, interaction intensity expresses person-to-person interactions, Czepiel and Gilmore (1987).

3 Hypotheses Development

To extend the research on the service elimination- customer retention link we turn our attention to the factors that affect this relationship, including price increase, tenure, switching barriers and interaction intensity. Furthermore, we are also interested in factors that affect post-elimination customer usage intensity.

Customer Retention Due to high churn rates in the case of service elimination, loyalty can be one of the key success indicators of the process. The relationship between service elimination and churn is neither a focus of service elimination literature nor of churn literature. “Service loyalty is the degree to which a customer exhibits repeat purchasing behaviour from a service provider, possesses a positive attitudinal disposition toward the provider, and considers using only this provider when a need for this service, Gremler, Brown, et al. (1996) p. 173.

Within the two main definitions of loyalty – attitudinal Fournier (1996) and behavioral loyalty Keiningham et al. (2007) – we follow the behavioral view of loyalty in our paper, because it expresses the intention of continued purchase of services, which is also directly related to customer retention. Rational customers might assume that any low price might be temporary, which makes it profitable for new customers to take the opportunity and accept a new offer. This also means that locked-in customers usually face higher prices. So, switching behavior is clearly determined by perceived price differences, McSorley et al. (2003), taking into account the quality of service. Based on this, we propose that price increase underlies the premise of the service elimination- customer retention relationship.:

Hypothesis 1: Price increase is associated with a lower propensity to retain customers during service elimination.

Usage intensity According to our hypothesis, price increase has an effect on customer retention, making customers more likely to leave the company. Regarding those who stay, however, we analyze the usage before and after service elimination. (Bolton and Lemon (1999)) suggest that reservation price is crucial in switching behavior. If the new price is lower than the customer’s reservation price, then he may increase his usage, whereas if the new price is higher than the reservation price, it increases the probability of churn. Irrespective of reservation price, usage is higher by those customers who experienced price increase and lower by those experiencing price decrease, because they intend to

compensate for the price increase effect by higher usage intensity levels (Bolton and Lemon (1999)). Similar effects may apply to service elimination.

Hypothesis 2: Price increase is associated with a higher usage after service elimination

Tenure A longer relationship corresponds to higher customer retention, Dagger, Danaher, and Gibbs (2009). Findings by Dawes (2009) also suggest that longer relationship tenure indicates lower customer churn. As he defined churn as product-specific retention, this effect needs to be investigated whether it holds true for a broader relationship retention rate in the case of service elimination. However, there is a gap in the literature regarding the case of service elimination.

Due to high churn in case of service elimination, Somosi and Kolos (2014), the relationship between service elimination and tenure is important for decision-makers. Service elimination studies focused on the pre-elimination decision-making and the process phase, rather than on assessing the effect of the whole process on customer retention, and its relationship with tenure, Avlonitis and Argouslidis (2012).

Hypothesis 3: Longer relationship tenure with a service provider is associated with a heightened propensity to retain customers during service elimination.

Switching barriers There are basically three types of switching cost typologies in the area of economics and service literature. The first typology assesses transaction costs, learning costs and artificial or contractual costs, Klemperer (1987). The second typology defines six types of switching costs that influence the development of customer loyalty: habit/inertia, setup costs, search costs, learning costs, contractual costs, and continuity costs, Gremler, Brown, et al. (1996). The third one builds three groups of switching costs: procedural switching costs (economic risk costs, evaluation costs, set up costs, learning costs), financial switching costs (benefit loss costs, monetary loss costs), relational switching costs (personal relationship loss costs, brand relationship loss costs) Burnham, Frels, and Mahajan (2003).

Our paper focuses on contractual costs, which have a significant effect on customer retention in case of service elimination, especially in low switching cost markets, such as telecommunications. Operators tend to offer attractive conditions to new customers, which can, however, be burdensome if the customer leaves the operator earlier than the

date to which he is committed. The high amount of liquidated damage the customer has to pay in such cases might affect the customer's intention to leave the company. It does not pay for locked-in customers to switch when being 'in loyalty', though, after the loyalty period, low switching costs can be a driver of churn. Considering that service elimination is often related to forced migration, these switching costs can be even higher. Service elimination is also one of these cases, thus, we expect a similar effect on customer retention. The literature, however, does not reveal how service elimination churn might be reduced by switching-barriers, only referring to a more general case, Lam et al. (2004).

Contractual cost is seen as part of the benefit loss cost, which is defined as the cost related to contractual linkages that create economic benefits for staying with an incumbent firm, Guiltinan et al. (1989). This means that customers are no longer eligible for any benefits they have so far received from the company and that they should, therefore, pay penalties in these cases.

Contractual switching costs can be created when the customer signs an agreement to remain loyal for a certain period of time or pay an exit penalty, Caruana (2003). This also requires customers to have a detailed knowledge of contractual terms, Jonathan Lee, Janghyuk Lee, and Feick (2001).

There is a well-grounded literature on the relationship between switching costs and customer retention, Bansal and Taylor (1999), Gremler, Brown, et al. (1996), Jonathan Lee, Janghyuk Lee, and Feick (2001). Burnham, Frels, and Mahajan (2003) also found that switching costs explain 30% of the customer's intention to stay with the provider. There is also a relationship between contractual switching cost and loyalty, Caruana (2003).

Hypothesis 4: Switching barriers are associated with a heightened propensity to retain customers during service elimination

Interaction Intensity Interaction intensity is emphasized as one of the key characteristics of services. The psychology- marketing literature highlights intangibility and heterogeneity, Czepiel and Gilmore (1987), and services marketing literature draws attention to perceived risks and levels of individualisation besides interaction intensity, Hennig-Thurau (2004).

Many scholars have concluded that the interactions between service provider and customers may have a significant effect on perceptions of quality, satisfaction and repurchase

intentions, thereby influencing customer retention; Bateson (1983), Cermak, File, and Prince (1991), Jeanne Hill (1988), Kelley, Donnelly Jr, and Skinner (1990), Mills and Morris (1986) .

As customer expectations may vary regarding interaction intensity according to different situations, Berthon and John (2014), pre-elimination interaction is considered as a strategy based on customer expectations. As service elimination is considered to be at the end of the consumption phase, it might require more interaction than usual during the consumption phase.

The results of Hennig-Thurau (2004) show that in the case of high-interaction services (i.e. travel agencies), the direct impact of customer satisfaction on retention is clearly stronger than in the case of the less individualized services offered by media retailers. Regarding this aspect, the present study can be considered to be one of a lower-interaction service, with less individualized services, so the direct impact of customer satisfaction on retention is expected to be lower.

A more intense relationship with the service provider can either have a positive or negative effect on the customer. As customer behavior and expectations vary, too frequent interpersonal contact might have the opposite effect to that intended by the provider. That is why we restrict interactional intensity solely to the pre-elimination process, meaning providing information to the customer before service elimination, usually done by a phone call. As practical evidence shows, Somosi and Kolos (2014), customers not receiving a notification by phone before the elimination, in addition to the letter as a form of legal requirement, had higher churn rates. As the offer is usually very complex, the written notification by itself is probably not enough to explain the content of the service elimination for the customer, but requires more interpersonal communication. In this way, interaction intensity might reduce customer churn, noting that this means informing the customer interpersonally before service elimination.

Hypothesis 5: Interaction intensity is associated with a heightened propensity to retain customers during service elimination

As we noted, service elimination requires a direct interaction between the customer and service provider in order to decrease customer churn. Pfisterer and Roth (2015) found that customers differentiate between usage processes with direct or indirect interaction. Service elimination requires direct communication, since, as we already noted, at the end of the life-cycle customers need more information. Interaction intensity might also have a

role in raising awareness of the service-package elements that influence the usage behavior of the customer after elimination. Even if he chooses to stay with the company, his usage might be lower due to a more conscious usage after elimination than before. Since the effect of interaction-intensity on usage-intensity is ambiguous in the literature, further empirical evidence is needed.

Hypothesis 6: Interaction intensity is associated with a heightened propensity of lower usage after service elimination

4 Model

Based on the literature review we operationalize the theoretical constructs according to our hypotheses. The variables in our empirical model are the following:

Criterion variables

- Churn: takes the value of 0, if the customer has changed his/her current mobile operator after service elimination (SE) and 1 otherwise (first stage);
- Usage intensity difference: difference in minutes customers have talked before and after elimination (second stage);

Independent variables

- Price increase: logarithm of the difference between new and old (fixed) monthly fee;
- Tenure: time elapsed between the start and end date of the contract, in thousand days;
- Switching barriers: takes the value of 1, if the customer is in contract at the time of SE, and 0, if s/he is out of contract;
- Interaction intensity: number of calls initiated/received by the call center from the start of the customer's contract;
- Interaction intensity dummy: Dummy variable for Interaction intensity, which takes the value of 1, if data are available, and 0 otherwise;

Control variables

- Usage intensity before elimination: number of thousand minutes the customer has talked before the elimination (usage intensity before service elimination);
- Satisfaction: Net Promoter Score given by the customer after a call center call (caller satisfaction);
- Satisfaction Dummy: Dummy variable for Satisfaction, which takes the value of 1, if data are available, and 0 otherwise;
- Age: age of the customer;
- Age Dummy: Dummy variable for Age, which takes the value of 1, if data are available, and 0 otherwise;
- Regional location: takes the value of 1, if the customer's city of residence is in Western Hungary, and 0 otherwise;
- City size: takes the value of 1, if the customer's city of residence is a county seat in Hungary, and 0 otherwise;
- Household members: number of members in the customer's household;
- Household members Dummy: Dummy variable for Household members, which takes the value of 1, if data are available, and 0 otherwise.

For our empirical analysis, we assume a two-stage decision process, where we use churn as dependent variable in the first stage, and the logarithmic difference of minutes customers have talked before and after service elimination in the second stage. The relationships between the two independent variables with the six hypotheses are presented in Figure 1.

According to the reviewed literature, we expect that price decrease, tenure, switching barriers and interaction intensity decrease churn. For holding constant of other possible effects, we include additional control variables, but no specific hypotheses are related to them (satisfaction, age, regional location, city size and household members). So, in the first step (the so called selection equation), the model should estimate the drivers

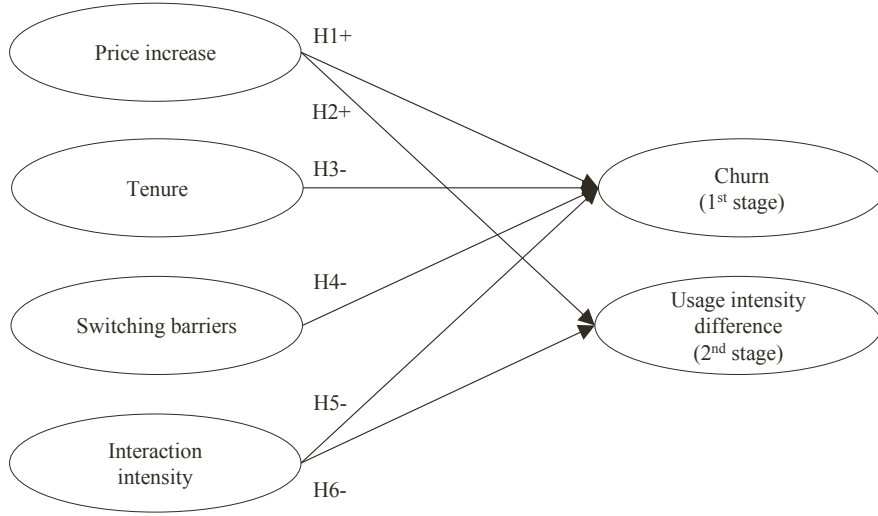


Figure 1: Hypothesized effects between variables

of churn and in particular, our sample selection model is the following (based on the Heckman procedure):

$$\begin{aligned}
Churn = (1 \text{ or } 0) = & \\
& \gamma_0 + \gamma_1 Price \text{ increase} + \gamma_2 Tenure + \gamma_3 Switching \text{ barriers} \\
& + \gamma_4 Interaction \text{ intensity} + \gamma_5 Interaction \text{ intensit Dummy} \\
& + \gamma_6 Usage \text{ intensit before SE} + \gamma_7 Satisfaction \\
& + \gamma_8 Satisfaction \text{ Dummy} + \gamma_9 Price \text{ increase Age} + \gamma_{10} Age \\
& + \gamma_{11} Age \text{ Dummy} + \gamma_{12} Regional \text{ location} + \gamma_{13} City \text{ size} \\
& + \gamma_{14} Household \text{ members} + \gamma_{15} Household \text{ members Dummy} + u_1
\end{aligned} \tag{1}$$

Regarding the second stage, we use the difference of minutes the customer has talked before and after service elimination to analyze the changes in customer behavior. Thereby, we have to consider the possibility that those customers who stayed with the company after service elimination are probably not a random sample. The methodological issues involved with this problem are discussed in the next section.

According to Figure 1, we use the following specification for the second stage equation (the so-called outcome equation), once again considering several control variables:

$$\begin{aligned}
& \text{Usage intensity difference} = \\
& \beta_0 + \beta_1 \text{Price increase} + \beta_2 \text{Interaction intensity} \\
& + \beta_3 \text{Interaction intensit Dummy} + \beta_4 \text{Usage intensit before SE} \\
& + \beta_5 \text{Satisfaction} + \beta_6 \text{Satisfaction Dummy} + \beta_7 \text{Age} \\
& + \beta_8 \text{Age Dummy} + \beta_9 \text{Regional location} + \beta_{10} \text{City size} \\
& + \beta_{11} \text{Household members} + \beta_{12} \text{Household members Dummy} + u_2
\end{aligned} \tag{2}$$

We have to assume that $u_1 \sim N(0, \sigma)$, $u_2 \sim N(0, 1)$ and $\text{corr}(u_1, u_2) = \rho$.

Further note, that this specification does not include tenure and switching barriers. In our view, there is simply no reason to believe that these variables might affect usage intensity difference and the service elimination literature does not point to this direction too. However, this assumption improves the identification of the whole model.

5 Methods

As stated in the previous section, in a *first* step, our intention is to examine the factors, which determine the probabilities of the customers staying with the company following service elimination. This can be interpreted as a churn analysis in a service elimination context. As the dependent variable is a dummy variable – stay or leave the provider – probit or logit regressions are the appropriate methods. However, for this purpose one can also use a simple linear regression model – called linear probability model in this context, LPM –, but this procedure can lead to predicted “probabilities”, which are negative or larger than one, especially for individuals with unusual characteristics (compared to an average individual). Nonetheless, a comparison of the estimated effects of the LPM and the average effects of the probit model is interesting, especially if the estimated effects differ to a large extent. This could be a hint that the distribution assumption of the probit model is inappropriate.

In a *second* step we want to estimate the factors which determines the differences in usage intensity after service elimination. Also for this purpose, one can apply common linear regression analysis, but now the problem is that after service elimination and the leaving of many customers, the remaining sample is possibly not a random sample anymore; maybe there are some unobservable factors (e.g. unobservable characteristics

of customers), which influence *both* the first stage decision (staying or leaving) and the second stage decision regarding usage intensity. If this is the case, a so-called sample selection problem arises: ordinary estimated parameters are only valid for the particular subsample and not for the population if a sample selection effect is present; and usually we are interested in the population effects.

Empirically, you can test for this and look whether the residuals of the first and second stage regressions are correlated (usually measured by the correlation coefficient ρ).

If we have such a problem, how to deal with this? In our particular case, after service elimination, we only observe a subsample and hence we are lacking a control group. As a result, many popular estimation procedures are not applicable, like the difference-in-differences estimator (DID), Card and Krueger (1993). Also, instrumental variables estimators, Arellano and Bover (1995), do not help, because we would need exogenous instruments which are correlated with the unobserved factors. Nevertheless, if we have such variables, we would have used those in the first place.

It was the basic insight of Heckman (1979) that this sample selection difficulty could be seen to an omitted variables bias. He showed that this particular truncation problem can be resolved by inclusion of an additional variable in the second stage regression; this additional variable is the so called inverse Mills ratio, defined as ²

$$IMR_i = \frac{\phi(z'_i\gamma)}{\Phi(z'_i\gamma)}.$$

Thereby z_i are the factors determining the first stage decision of individual i , γ are the associated parameters estimated of the first stage by a probit regression, ϕ is the density function of the standardized normal distribution and Φ is the cumulated standard normal distribution function. Hence, IMR_i is a weighted measure of the conditional probability that individual i is not an element of the sample.

So, the “Heckman two-step procedure” is as follows:

1. Estimate the first step decision with a probit model
2. Using the linear predicted values of this model, $z'_i\gamma$, estimate the inverse Mills ratio for every individual in the sample according to the formula above

²Note, in the literature one can find different definition if the inverse Mills ratio but these turn out to be all equivalent.

3. Use the inverse Mills ratio as an additional variable in the second stage regression, which can now be consistently estimated by usual OLS if the error terms of both equations are jointly normal distributed
4. Take care that all second stage variables are also included in the first stage regression and that there are some regressors in the first stage, which are not included in the second stage. If the sets of regressors are identical in both stages the model's identification only rests on the non-linearity of the inverse Mills ratio
5. Test, whether the coefficient of the inverse Mills ratio, usually denoted by λ , is significant. If it is, then the residuals of both stage regressions are correlated and we have a sample selection problem which is, however, dealt with this two-step procedure in a proper way
6. The extent of the sample selection problem, the so-called truncation effect, can be measured by the product of the average inverse Mills ratio times the corresponding estimated parameter λ

Later it has been shown, that this two step procedure can be replaced by a more efficient maximum likelihood estimator, ML, where the first and second stage problems are estimated simultaneously, Nawata (1994). In our analysis, we use both estimators as the more simple and more common two step procedure is said to be more robust against specification errors, especially regarding the joint normal distribution assumption.

6 Data

Data is available from one of the three Hungarian telecommunications operators covering their biggest tariff simplification project in 2012-2013. The sample is received from the company as part of a research agreement between the company and the Corvinus University of Budapest. The sample includes twenty-five eliminated mobile service packages (not including a fixed line or other services) in the consumer, and sixty-two in the SOHO (small office-home office) segments, affecting altogether around 10 065 customers, who have been involved in this elimination.

Of the ten thousand sixty-five customers, one thousand five hundred eighty-five have churned, so the churn rate is 15.76%, which is significantly higher than the 2% industry average ClintWorld (2013).

Data Quality Due to data quality issues, some part of the database had to be modified in order to obtain any results related to the price changes due to service elimination.

The database has an omission problem in case of non-churned customers. Customers that did not leave the operator after service-elimination, should have a new subscription, thus the monthly fee should be known. In certain cases however, the data were missing. i.e were coded with zero, which could not be the case as these customers stayed with the company. Unfortunately, the company was not able to reproduce the valid data because the database was generated in 2012-13 and these data were not available in the relevant structure anymore.

To overcome this problem, we decided to impute missing new monthly fee data of non-churned customers as follows: We analyzed to which package group these customers belonged to and chose the typical values of the new monthly fees of this particular package group. We used these old and imputed new monthly fees to calculate logarithmic monthly fee differences. In the rest of the database, we found no obvious mistakes.

We must note however, that despite of this data imputation, out-of bundle fee data couldn't be recovered. Therefore, we had to rely on fixed monthly fee changes only throughout this paper.

7 Results

Our empirical results for the basic model, equations (1) and (2), are presented in Table 2 and Table 3.

The first stage equation is estimated by three different methods, a probit model, a maximum likelihood procedure (first and second stage are estimated simultaneously) and with the linear probability model, LPM, which is simply an OLS estimation. In the fourth column of Table 2, the average partial effects, APE, of the probit model are presented. These estimates can be directly compared to the LPM.

For our basic model, the first stage Heckman results show that a smaller new monthly fee after elimination, tenure and interaction intensity increase the probability of staying with the company after elimination, confirming H1, H3 and H5. These results are independent of the used estimation technique. Switching barrier is not significant at the usual 5% level, so H4 is not supported by the data. Among the covariates, it can be concluded that the number of minutes spent talking before elimination, age and its interaction with price increase, Western Hungarian location and smaller city location (not county seat) in-

crease the probability of staying with the company after elimination, whereas satisfaction and the number of household members are not significant at the usual level.

It should be noted that generally all used estimation techniques show qualitative very similar results. Especially the two-step estimator and the maximum likelihood estimator hardly differ. There are some differences with the linear probability model (LPM).³ Especially price differences, tenure and interaction intensity show a more pronounced effect in the probit model than in the LPM. However, such differences are expected as explained in the methodological section.

Let's turn to the second stage equation, where the effect of service elimination on usage behavior is investigated (Table 3). In the first column simple OLS estimates are reported, which do not account for a possible sample selection problem. In the second and third columns the Heckman two-step estimator and Heckman maximum likelihood estimator are reported, both methods account for possible selection bias.

The results show that a price increase leads to a more intense usage after service elimination, favoring H2, whereas interaction intensity is related with a smaller post-elimination usage intensity, confirming H6.⁴ Concerning the covariates, it can be concluded that the number of minutes spent talking before elimination increase, whereas larger cities (county seat) decrease post-elimination usage in as significant way. All other covariates do not play a significant role in the variants considering a possible sample selection bias. Regional location and the number of household members are only significant in the OLS versions.

The highly significant estimate of the coefficient of the inverse Mills ratio shows (second column at the bottom) that there seems to be a substantial selection bias present, meaning that there are some unobserved factors, which influence both the first and second stage decisions.

We can calculate the average truncation effect to see how much the usage intensity difference is shifted due to the sample selection bias. The average inverse Mills ratio is 0.335, which means that the truncation effect is: $\lambda \times \text{inverse Mills value} = 0.974 \times 0.335 = 0.326$. The interpretation of the truncation effect is that a customer with sample

³Remember that you have to compare these values with the average partial effects of the probit model, APE.

⁴The Interaction intensity dummy – which is coded with one if interaction intensity is missing – is significant in the OLS version but not in the Heckman versions. It seems that this “unobserved” effect is captured quite well by the inverse Mills ratio.

average characteristics who is predicted as churned but due to some unobserved factors nonetheless in the sample, has a $[\exp(0.326) - 1] * 100 = 38.5$ % higher usage than average customers with comparable characteristics who are predicted to be in the sample.

This also means that churned customers would typically have a higher usage intensity if they were observed in the second stage. This points toward a so-called heavy user bias: those with higher phone usage typically have a higher propensity to churn during service elimination, whereas those who have lower usage stay with the service provider with a higher probability. Our Heckman two-step and maximum likelihood estimators deliver estimates for the whole population, all customers, and not only for those who happens to be in the sample and therefor correct for this bias. This is the primary reason for choosing this method in our paper.

There are several reasons that might explain the heavy user bias. First of all, due to an increased and more intense usage, customers become more conscious regarding terms of the contract. Eliminating a service package with favorable conditions means that they actually have little reason to stay with the service provider. By contrast, the terms of contract is likely not that well-known for light users and as such, a change in current conditions due to service elimination might not cause them to leave the service provider.

The evidence for the presence of a sample selection bias is further shown by the estimate for the correlation between first and second stage residuals is $\rho = 0.572$. This means that unobservable variables are related to both stage decisions with the same sign. Such exogenous variables could be e.g. brand image or some psychological factors influencing usage and churn rates. But this is clearly an area for further research.

We have to caution that the previous statements regarding the presence of a sample selection bias rely on our identifying restrictions that tenure and switching barriers play no role in the second stage decision. Without these restrictions the sign of the estimated parameter for the inverse Mills ratio is still positive but not statistically significant any more. However, in this case, identification of the sample selection effect solely rely on the non-linearity of the inverse Mills ratio. But this non-linearity is generally only weak for the bulk of observations and so, in the absence of additional identifying restrictions, the inverse Mills ratio is nearly a linear combination of the all the variables in the second stage leading to a severe multicollinearity problem. Hence, for a sensible usage of the Heckman procedure one has to rely on some additional identifying restrictions.

Fortunately, as Table 3 shows, none of our statements regarding the hypotheses H1 – H6 depend on our identifying restrictions. Especially the price effect is nearly identical

for the OLS and Heckman versions. Interaction intensity is highly significant in all three versions, but numerically less pronounced in the Heckman versions. The same is true for regional and household member effects.

In the following section we investigate some other variants to further examine the robustness of our results.

8 Robustness Analysis

To check the reliability of results, to some extent we refer to the double robustness procedure Carpenter and Lehmann (1985). This procedure is based on the idea that model should be estimated for three different datasets, which means using all available data (in our case with the imputed data of price increase), partially observed data (in our case without the imputed price variable), and finally, the third estimates the probability of observing data. Our study is solely based on a firm's dataset, so the third model is not applicable. As explained in Section 5 for the basic model, one variable (price increase) had to be imputed due to data quality issues.

Based on this, in order to check for robustness regarding this imputation, Variant 2 was specified, where this imputed variable (price increase) is not present, so it only contains full data (Table 4-5.). It turns out that this second variant, which does not include the logarithm of old and new monthly fee differences (price increase) and its interactions with age, the coefficients of the other variables are not remarkably different compared to the original model. So there is no hint that the other variables are contaminated by our imputation procedure.

As demographic data is only available for a limited number of customers, particularly in case of age, we included the interaction of the calculated price increase variable (price increase) and age in the basic model to refine effects of age (Table 2-3).

Further, Variant 3 was created to test the model containing only the significant variables. The results show that the other coefficients do not change remarkably, only the significance of regional location changes slightly. The basic model includes non-significant variables as well in order to test hypotheses on extant literature, including switching barriers.

9 Discussion

Various business decisions are based on customer retention, e.g. in banking, telecommunications, ICT, etc. Yet, despite its importance, there is little research on the service elimination context of churn, however decision criteria are similar.

Our objective was to identify churn indicators during service elimination and provide a theoretical understanding of the factors leading to customer churn. Besides this, we analyzed post-elimination behavior to reveal the effects of service elimination on those customers, who stayed with the company.

Service elimination churn depends on price increase, tenure and interaction intensity

Three churn indicators were identified in the first stage results: price increase, tenure and interaction intensity, which is also in accordance with the literature regarding a normal retention case (without service elimination). Price increase is the monthly fee change of service packages before and after service elimination. In accordance with the literature analyzing general churn cases, the price increase was found to increase the probability of churn, which is also confirmed by our results in a service elimination setting.

Second, tenure expresses the length of the relationship between the service company and the customer, where longer relationships tend to be more stable and customers more rarely decide to churn. In a service elimination setting, however, which we consider similar to a service failure, the customer encounters an unexpected situation, which is often not explained correctly by the service firm, resulting in confused customers. We found that this relationship holds true in the service elimination context, which indicates that 1) service elimination literature might share common areas with customer retention; (2) companies should focus even more on new (in-contract) customers in a service elimination process, as they are endangered groups in terms of customer retention, after the expiry of the contract.

Third, interaction intensity in the literature is described as depending on service life cycle, because certain life cycle events require more interaction from the service provider, e.g. in the beginning and end of the life-cycle. These more intense periods also involve service elimination, as it is an unexpected action by the firm and requires a thorough explanation towards the customer in order to find a new service package. In this sense, the churn-reducing effect of interaction intensity is not unexpected in the case of service elimination, noting that there could be several points during the life cycle that are dis-

similar to this situation, thus interaction intensity might have a reverse effect to that which was originally intended.

Interaction intensity is much debated in the literature regarding its various effects on customer reactions, depending on different situations. But the argument is not so clear, because customers would not be calling for a more intense interaction with the service company if there were no changes in service conditions. Furthermore, it might be the case that the customer would not be interested in new/additional services, etc.

The statistically significant variable between price increase and age is a strong evidence that age softens the churn increasing effect of price increase, as older customers are more likely to remain.

There is no clear dependence on switching barriers and service elimination churn

Quite surprisingly, switching barriers do not have a significant impact on churn in case of service elimination, which contradicts general churn literature. A common company practice is to use switching barriers as a preventative tool against customer churn because of the high contractual costs for customers leaving the company earlier than committed, so that they would rather remain under unfavorable conditions. Service elimination literature does not examine this factor as a churn reducing technique, but the general churn literature dominantly approves the positive effect of switching barriers on customer retention. In this regard, we see no significant difference between a normal churn situation and service elimination and therefore expected the same effect. The non-significance of switching-barriers in our empirical results could be due to measurement issues: switching barriers were only measured by a Dummy variable whether the loyalty period of two years had already passed. This information is probably not enough to capture all related costs of a potential churn since there are some additional costs for customers we have not observed. Our database did not include all information related to switching costs, which possibly has a significant influence on the results.

Price increase raises the post-elimination intensity of usage The second stage results revealed interesting aspects of post-elimination usage behavior: those customers who decided to remain with the company following service-elimination, and experienced price increase (the new monthly fee is higher than their previous service-package monthly fee before elimination), tended to increase their usage intensity.

To explain this, we have to consider the following facts. First, due to increased in-

teraction intensity during service elimination, customers become better informed about service conditions in general. Those who remained with the company after service elimination, and were contacted several times by the company before the service elimination, also tended to increase their intensity of usage compared to the situation before the service elimination happened. These two groups are not inclusive, nonetheless, the reasons are interrelated: usually, when a customer first hears about service elimination, s/he does not understand what the whole project is about, and what s/he ought to do. We have already seen that interaction intensity in general increases the probability of the customer staying with the company, thus we can argue that those having more contact with the service company before service elimination are more likely to remain. In the second stage, we only observed those customers who actually stayed, which means that they probably had more contact with the service firm than those who left. More contact means more detailed information about possible new service packages, service package conditions, deadlines, and so on.

Second, this often results in a more conscious choice regarding the service package after service elimination that was previously unknown for them. Normally, when we ask a customer about his/her service subscription, they barely know their monthly fee, and the name and accurate conditions of the service package are even harder to remember. Considering these average customer perceptions of service subscriptions, the role of a more intense contact with the provider might change this attitude: they frequently encounter reasons why they should choose a new subscription, what that should be, what the exact conditions of that newly available package are, etc. This generates customer consciousness, which can be surprising compared to the average knowledge of these service package elements; but still, interaction intensity can result in more conscious customers.

As a result, even when choosing a higher monthly fee package after service elimination, due to this growth in consciousness of the customers, they might realize that they are paying more for a higher value that is actually valuable for them. Especially in telecommunications, in most cases, it is about the value for money, not the absolute price of the service package. If they are heavy users, both regarding voice and data usage, a flat rate would be the best choice, independent of its monthly fee, because if they were to pay a price per minute fee, it would be incomparably higher.

In sum, with increased customer consciousness a higher new monthly fee after service elimination might result in a more intensive usage because the customers are better informed about what they are actually paying for. Thus, their understanding of the

exact conditions of the service package changes their behavior, pointing to the fact that a pre-elimination interaction has an important role.

Managerial implications It is an important finding for decision-makers that customer churn during service elimination can be decreased by the appropriate pricing of the new offer, as low switching costs encourage customers to accept better alternatives. Further, new customers and customers who contact the operator less frequently or who are rarely contacted by the operator are considered to be particularly endangered groups regarding service elimination. Additionally, an interesting result is that older customers have a higher probability of remaining with the company after service elimination, and they are also less affected by the churn increasing impact of a price increase. Finally, the effect of a price increase on a more intense usage after service elimination highlights the price-value aspect of customer expectations, instead of lower prices.

Limitations and further research Clearly, the study has some limitations: first, price increase calculated by using the total spending of the customer, instead of monthly fee changes, can have different effects. A more thorough collaboration between service companies and researchers would be required to analyze total spending of customers. Even data collection is challenging because different sources of information are stored many times in different formats that are hardly linkable.

Second, switching barriers might be significant if all costs related to switching could be included. Also, the analysis of databases of other service companies would be required to see whether our results are really representative of the whole industry. Third, in our analysis we haven't considered alternative offers from competitors, therefore in some sense, we might have omitted a variable bias, especially if the offers are correlated with explanatory variables (e.g. price increase).

Further research areas might include more empirical evidence concerning the relationship between service elimination and customer retention, considering oligopoly effects and other limitations.

10 Conclusions

When companies face the need of eliminating their services due to accelerated business portfolio innovation, they need to consider the impacts on customers. New and out-

of contract customers, and light users are identified as endangered groups during service elimination in terms of churn. They may also take steps to optimize the level of interaction with the customer before and during the process.

In the study it was found that how high customer churn in the case of service elimination could be decreased, and what effects the process on customer behavior has. As practical evidence shows, service elimination involves a high risk for decision-makers due to the high churn involved in the process.

Heckman sample selection was used to define high and low churn indicators in case of service elimination, and above all, the model shows that price increase, tenure and interaction intensity significantly increase customer retention. Switching barriers do not have a significant impact, which is probably due to the measuring capability of the total switching costs of the Dummy variable. With regard to non-churned customers, it can be concluded that according to a priori expectations, a higher monthly fee after elimination increases the usage of customers.

Based on the hypotheses testing we can conclude that:

- Hypothesis 1: Price increase is associated with a lower propensity to retain customers during service elimination (1st stage)- Supported
- Hypothesis 2: Price increase is associated with a higher usage after service elimination (2nd stage)- Supported
- Hypothesis 3: Longer relationship tenure with a service provider is associated with a heightened propensity to retain customers during service elimination (1st stage)- Supported
- Hypothesis 4: Switching barriers are associated with a heightened propensity to retain customers during service elimination (1st stage)- Not supported (although the coefficient has the expected sign, but not in a statistically significant way)
- Hypothesis 5: Interaction intensity is associated with a heightened propensity to retain customers during service elimination (1st stage)- Supported
- Hypothesis 6: Interaction intensity is associated with a heightened propensity of lower usage after service elimination (2nd stage)- Supported in the main variant, but not statistically significant in our alternative model variants

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Table 2: Basis model, 1st stage regression results: Estimation of probabilities for churn during service elimination, different estimation techniques

	<i>Dependent variable:</i>			
	Churn			
	Probit	Heckman ML	LPM	Probit APE
Price increase	−0.252*** (0.061)	−0.194*** (0.060)	−0.036*** (0.012)	−0.050*** (0.013)
Tenure	0.258*** (0.052)	0.262*** (0.052)	0.059*** (0.011)	0.068*** (0.012)
Switching barrier	0.060 (0.059)	0.033 (0.057)	0.016 (0.013)	0.024* (0.014)
Interaction intensity	0.137*** (0.028)	0.146*** (0.028)	0.005*** (0.002)	0.032*** (0.006)
Interaction intensity Dummy	−0.319*** (0.080)	−0.306*** (0.079)	−0.103*** (0.012)	−0.051*** (0.016)
Usage intensity before SE	0.009*** (0.001)	0.008*** (0.001)	0.001*** (0.0003)	0.001*** (0.0003)
Satisfaction	−0.061 (0.045)	−0.066 (0.045)	−0.005 (0.006)	−0.014 (0.011)
Satisfaction Dummy	−0.773** (0.357)	−0.814** (0.363)	−0.066* (0.036)	−0.125*** (0.036)
Interaction of price increase and age	0.007*** (0.002)	0.006*** (0.002)	0.001*** (0.0003)	0.001*** (0.0004)
Age	0.006*** (0.002)	0.006*** (0.002)	0.001*** (0.0004)	0.001*** (0.0004)
Age Dummy	0.700*** (0.089)	0.684*** (0.088)	0.168*** (0.020)	0.151*** (0.019)
Regional location (E or W Hungary)	0.107*** (0.039)	0.106*** (0.039)	0.029*** (0.009)	0.028*** (0.009)
Size of city location	−0.087** (0.036)	−0.081** (0.036)	−0.017** (0.008)	−0.018** (0.008)
Household members	0.101 (0.074)	0.124* (0.075)	0.008 (0.012)	0.022 (0.016)
Household members Dummy	−0.372 (0.232)	−0.303 (0.234)	−0.090** (0.039)	−0.070* (0.038)
Constant	1.374*** (0.452)	1.361*** (0.457)	0.866*** (0.059)	
Observations	7,668	7,668	8,720	8,720

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 3: Basis model, 2nd stage regression results: Estimation of usage differences during service elimination by non-churned customers, different estimation techniques

	<i>Dependent variable:</i>		
	Usage intensity difference		
	OLS	Heckman 2Step	Heckman ML
Price increase	0.255*** (0.040)	0.279*** (0.043)	0.283*** (0.041)
Interaction intensity	-0.031*** (0.008)	-0.018** (0.008)	-0.020*** (0.008)
Interaction intensity Dummy	0.331*** (0.055)	0.006 (0.088)	0.067 (0.062)
Usage intensity before SE	0.016*** (0.001)	0.020*** (0.002)	0.019*** (0.001)
Satisfaction	0.030 (0.025)	0.011 (0.027)	0.013 (0.026)
Satisfaction Dummy	0.467*** (0.164)	0.264 (0.176)	0.300* (0.167)
Age	-0.003 (0.002)	0.004 (0.002)	0.003 (0.002)
Age Dummy	-0.198** (0.098)	0.428*** (0.141)	0.346*** (0.112)
Regional location (E or W Hungary)	-0.104** (0.045)	-0.055 (0.051)	-0.066 (0.049)
Size of city location	-0.124*** (0.040)	-0.191*** (0.045)	-0.183*** (0.044)
Household members	0.001 (0.055)	0.038 (0.058)	0.030 (0.056)
Household members Dummy	0.542*** (0.185)	0.254 (0.201)	0.300 (0.190)
Constant	-1.432*** (0.267)	-1.721*** (0.286)	-1.680*** (0.275)
Observations	7,214	7,668	7,668
ρ		0.572	
Inverse Mills Ratio		0.974*** (0.311)	

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4: 1st stage regression results: Estimation of probabilities for churn during service elimination, three model variants, 2Step estimator

	<i>Dependent variable:</i>		
	Basis	Churn Variant 2	Variant 3
Price increase	-0.252*** (0.061)		-0.273*** (0.061)
Tenure	0.258*** (0.052)	0.275*** (0.044)	0.284*** (0.032)
Switching barrier	0.060 (0.059)	0.071 (0.053)	
Interaction intensity	0.137*** (0.028)	0.132*** (0.026)	0.147*** (0.027)
Interaction intensity Dummy	-0.319*** (0.080)	-0.297*** (0.076)	-0.332*** (0.078)
Usage intensity before SE	0.009*** (0.001)	0.008*** (0.001)	0.009*** (0.001)
Satisfaction	-0.061 (0.045)	-0.063 (0.043)	
Satisfaction Dummy	-0.773** (0.357)	-0.822** (0.349)	-0.326** (0.134)
Interaction of price increase and age	0.007*** (0.002)		0.007*** (0.002)
Age	0.006*** (0.002)	0.008*** (0.002)	0.006*** (0.002)
Age Dummy	0.700*** (0.089)	0.734*** (0.087)	0.633*** (0.089)
Regional location (E or W Hungary)	0.107*** (0.039)	0.058 (0.038)	0.111*** (0.039)
Size of city location	-0.087** (0.036)	-0.094*** (0.035)	-0.090** (0.036)
Household members	0.101 (0.074)	0.076 (0.069)	
Household members Dummy	-0.372 (0.232)	-0.350 (0.222)	
Constant	1.374*** (0.452)	1.385*** (0.437)	0.647*** (0.168)
Observations	7,668	8,541	7,673

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5: 2nd stage regression results: Estimation of usage differences during service elimination by non-churned customer, three model variants, 2Step estimator

	<i>Dependent variable:</i>		
	Usage intensity difference		
	Basis	Variant 2	Variant 3
Price increase	0.279*** (0.043)		0.275*** (0.044)
Interaction intensity	-0.018** (0.008)	-0.011 (0.009)	-0.016* (0.008)
Interaction intensity Dummy	0.006 (0.088)	-0.137 (0.088)	-0.061 (0.089)
Usage intensity before SE	0.020*** (0.002)	0.021*** (0.002)	0.020*** (0.001)
Satisfaction	0.011 (0.027)	-0.0005 (0.027)	
Satisfaction Dummy	0.264 (0.176)	0.118 (0.183)	0.184* (0.100)
Age	0.004 (0.002)	0.007*** (0.003)	0.004* (0.002)
Age Dummy	0.428*** (0.141)	0.629*** (0.148)	0.527*** (0.135)
Regional location (E or W Hungary)	-0.055 (0.051)	-0.074 (0.051)	-0.038 (0.053)
Size of city location	-0.191*** (0.045)	-0.201*** (0.046)	-0.201*** (0.047)
Household members	0.038 (0.058)	0.052 (0.062)	
Household members Dummy	0.254 (0.201)	0.149 (0.212)	
Constant	-1.721*** (0.286)	-1.784*** (0.301)	-1.535*** (0.173)
Observations	7,668	8,541	7,673
ρ	0.572	0.913	0.723
Inverse Mills Ratio	0.974*** (0.311)	1.737*** (0.324)	1.287*** (0.293)

Note:

*p<0.1; **p<0.05; ***p<0.01