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MULTILATERAL INTERCHANGE FEE EFFICIENCY EVALUATION: THE CASE OF THE RUSSIAN RETAIL PAYMENT CARDS MARKET

PHD DISSERTATION SUMMARY
for the purpose of obtaining academic degree
Doctor of Philosophy in Economics

Academic Supervisor:
Maria V. Semenova, Candidate of Sciences in Economics

JEL: G21, D53, E42, L14

Moscow – 2020

Introduction

Cashless retail payments have become an integral part of the financial services industry during the last 10-15 years. Russian retail payments market is one of the most developed ones in terms of a number of indicators, including the penetration of financial technologies and the share of cashless payments users[1]. At the same time, the market continues to grow rapidly. Key market indicators show stable growth: as at Q1 2019 272.92 mln. payment cards were issued in Russia, 84% of the population has at least one payment card, and 88% of them conduct payments using cashless payment instruments[2]. The value of cashless payments has increased by 23.19% during 2018 compared to the similar period of 2017 according to the Bank of Russia data[3], while the market participants observe benefits related to the acceptance and usage of the cashless payments.

However, payment systems are often criticized for exploiting the benefits of other market participants. Merchants note the high costs of cashless payments acceptance and suggest considering the possibility of regulatory intervention into the process of tariff setting in the Russian financial services market. Particularly, the Russian Association of Retail and Internet Trade Companies (AKORT, AKIT), as well as the Association of Trading Companies and Manufacturers of Household Appliances and Computer Equipment RATEK complained to the Federal Antimonopoly Service (FAS) at the beginning of 2019 to initiate the case against international payment systems to decrease the level of interchange fees[4]. Although the FAS did not find evidence in favor of exceeding levels of commissions and did not consider the position of international payment systems to be dominant at the time of the investigation, the analysis of tariffs efficiency, as well as the discussions of the need for regulation, are still active. At the same time, the analysis of global regulatory initiatives indicates that none of the obligatory interchange fee changes has led to the Pareto improvement yet.

Regulation of tariffs may affect not only the cashless retail payments market growth rates but also the general welfare of the economy's participants, which is why the necessity of regulatory intervention is usually discussed. The first public case on the interchange fees was NaBanco v. Visa in 1979[5]. Ever since, regulatory tariff restrictions and changes were imposed in a number of

[1] Russia is ranked third in terms of financial technologies penetration level according to the Global Fintech Adoption Index (EY, 2019): https://www.ey.com/en_gl/financial-services/eight-ways-fintech-adoption-remains-on-the-rise; Russia is considered one of the top-10 markets in terms of cashless retail payments volumes and values according to the World Payments Report 2019: https://worldpaymentsreport.com/resources/world-payments-report-2019/

[2] Official statistics for the Russian retail payments market is available on the Bank of Russia website: https://www.cbr.ru/statistics/psrf/. National survey results are available in the reports by the National Agency of Financial Research (NAFR) (2019): https://nafi.ru/analytics/rost-chisla-polzovateley-beznalichnykh-platezhey-zamedlilsya/.

[3] Author's calculations based on the Bank of Russia official statistics: https://www.cbr.ru/statistics/psrf/sheet014_1/

[4] Interchange fee or multilateral interchange fee is an interbank fee paid by acquiring bank to the issuing bank upon every transaction made with cashless payment instruments (payment cards).

[5] The litigation between NaBanco and Visa is the first case of a public discussion of the requirements for lowering interchange fee levels set by payment systems. The arguments for interchange fee decrease are based on antitrust

developed retail payments markets (for instance, Eurozone countries, the USA, Australia, etc.) (Weiner & Wright, 2005). Most of the arguments are aimed at the decrease in the levels of these fees. Malaguti & Guerrieri (2014) and the European Commission report (European Commission, 2013) propose 3 key arguments in favor of interchange fee levels decrease:

1. Higher levels of interchange fees may lead to higher prices on final goods and services since acquiring banks transfer the costs related to the interchange fee payment to the merchants increasing the merchant discount fee levels[6]. Merchants respond to higher fee levels by transferring additional costs to the consumers setting higher retail prices.

2. Consumers that use payment instruments that are cheaper for merchants (for instance, cash or debit cards) subsidize consumers that use more expensive payment instruments (for example, credit cards). This fact is mainly explained by the no-surcharge rule[7] imposed in the majority of countries, which prohibits merchants from price discriminating consumers based on the chosen payment instruments.

3. Both acquiring and issuing banks may achieve profit maximization goals more easily by setting higher interchange fee levels. Firstly, many banks act as both acquirers and issuers in the retail payments market, which makes them neutral to the interchange fee levels. Secondly, payment systems may set interchange fees that satisfy issuing banks in order to stimulate demand from cardholders, which usually drives the cashless retail payments values and volumes since the card issuance market is usually less competitive than the acquiring services market.

As a result, the evaluation of efficient interchange fee levels is needed to understand the opportunities for increasing market participants' welfare and evaluate the necessity of regulatory intervention into the existing retail payments market conditions in Russia such as the levels of tariffs. This research question is partially addressed in the studies aimed at the modeling of retail payments market equilibrium, however, as yet, no study has provided an empirical evaluation of the regulatory interventions' consequences before they are introduced, i.e. ex-ante. Research on the roles and the effect of interchange fee levels changes in the retail payments market is usually based on the benefits of key market participants (in particular, individuals, merchants, and banks)[8].

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regulation, which, according to the plaintiff, was violated because payment systems decide on the level of these tariffs. Trial materials are available online: https://law.justia.com/cases/federal/district-courts/FSupp/596/1231/1676672/

[6] Merchant discount fee is a commission paid by the merchant to the acquiring bank upon every transaction conducted with the means of cashless payments (e.g., using payment card). The fee is set by the acquiring bank for providing the merchant with an opportunity to accept retail cashless payments.

[7] No-surcharge rule is a regulatory restriction or rule, which prohibits merchants from using differential pricing on the goods and services (i.e., setting different prices or imposing additional fees to the consumers) based on the payment method chosen by the consumer.

[8] Net benefits of the end-users of cashless retail payments are equal to the amount of surplus that a particular individual or merchant receives as a result of using cashless payment instruments compared to using exclusively cash less of all the costs associated with such a decision. The value of net benefits is comparable to the maximum

At the same time, the level of total benefits for consumers and merchants are still considered theoretical values, and banks do not consider the payment business as a separate P&L line, which makes data collection more difficult[9]. Similarly, empirical studies do not provide quantitative estimates of the benefits of key market agents. Despite the absence of such measurements, the analysis of tariffs and the costs of accepting/using cashless retail payment instruments presented in empirical studies usually becomes the basis for regulatory changes in the interchange fee levels.

In this work, an empirical mechanism, which allows determining the efficiency, under current conditions, of currently set interchange fee levels as well as assessing the effects of changes in tariffs on the welfare of end-users, is developed in accordance with the theoretical equilibrium models of the cashless retail payments market and based on an estimation of the benefits of key agents. The proposed mechanism makes it possible to determine the necessity and desirability of regulatory changes to the interchange fee levels in the Russian retail payments market.

Literature review

Research on the evaluation of the multilateral interchange fees can be divided into two key areas: theoretical modeling of equilibrium in the cashless retail payments market (Baxter, 1983; Ding & Wright, 2017; Rochet & Tirole, 2002, 2003, 2011; Schmalensee, 2003; Mariotto & Verdier, 2017; Wright, 2004, 2012; Bedre-Defolie & Calvano, 2013) and determination of the efficiency of proposed changes and shocks in the industry after the implementation of regulatory changes (Weiner & Wright, 2005; Jonker, 2011, 2016; Evans, Chang & Joyce, 2015; Carbo-Valverde & Linares-Zegarra, 2013; Manuszak & Wozniak, 2017; Wang, 2016; Veljan, 2018, 2019; Tirole, 2011).

Studies from the first stream of literature are devoted to the theoretical modeling of decision-making by key market participants in order to calculate the socially optimal values of the interchange fees (Baxter, 1983; Ding & Wright, 2017; Rochet & Tirole, 2002, 2003, 2011; Schmalensee, 2003; Mariotto & Verdier, 2017; Wright, 2004, 2012; Bedre-Defolie & Calvano, 2013). These values are then compared with the interchange fee levels set by the responsible agents (usually, payment systems). The socially optimal interchange fee level is usually defined in this literature as the level of the fees at which the total welfare of market participants is maximized. A comparison of the obtained values of socially optimal and currently set values of the interchange fees allows determining regulatory strategy. One of the central results of the studies in this stream of literature is the sub-optimality of the set interchange fee levels compared with the socially

amount that the end-user is willing to pay for using cashless retail payments, taking into account current market conditions and offers.

[9] Retail payments in Russia 2014 study and Retail payments in Russia 2017 study, Centre for Research in Financial Technology and Digital Economy SKOLKOVO-NES, Moscow School of Management SKOLKOVO. Available online: https://finance.skolkovo.ru/ru/sfice/research-reports/1653-2018-08-10/

optimal levels. (Rochet & Tirole, 2002, 2003, 2011; Schmalensee, 2003; Wright, 2004; Bedre-Defolie & Calvano, 2013). Usually, these models predict that the level of fees chosen by payment systems is higher than the socially optimal one. Hence, they recommend regulatory cuts of interchange fee rates.

Articles from the second stream of literature are usually empirical and analyze the effects of changes in the market after the implementation of regulatory changes to the levels of the interchange fees. (Weiner & Wright, 2005; Jonker, 2011, 2016; Evans, Chang & Joyce, 2015; Carbo-Valverde & Linares-Zegarra, 2013; Manuszak & Wozniak, 2017; Wang, 2016; Veljan, 2018, 2019; Tirole, 2011). The interchange fee regulation is a relatively popular measure of stimulating the retail payments market, which was adopted in a number of countries: in the Eurozone (PSD2, European Commission, 2013) as a part of payment systems directive (PSD2), in the USA within Durbin amendment (Jonker, 2011, 2016; Evans et al., 2015), and a number of European countries (for instance, Spain) at the beginning of the 21st century as well as in Australia. The efficiency of regulation is usually assessed by evaluating the achievement of goals set in relation to the interchange fee levels changes. Usually, the goal of such regulation is to increase the volume and the value of payments as well as to stimulate the share of cashless payments acceptance holding consumer activity constant or increased. One of the central conclusions of studies in this area of literature is the inefficiency of unilateral tariff regulation, both from the point of view of achieving the goals set by the regulator and from the point of view of improving the general welfare of the industry participants (Weiner & Wright, 2005; Jonker, 2011; Evans et al., 2015; Carbo-Valverde & Linares-Zegarra, 2012; Veljan, 2018, 2019).

The interchange fee role is first formulated in Baxter (1983). The article is devoted to theoretical modeling of a four-party payment scheme in order to study the factors affecting the level of the interchange fee and the effects of changes in tariffs of individuals and merchants (merchant discount fees). The model in Baxter (1983), which is based on the concept of end-user benefits, implies that payment will be efficient if and only if net total benefits of end-users (individuals and merchants) are higher than the total costs of banks (issuing and acquiring banks) related to cashless payments. At the same time, it is necessary that the net benefits of each group of end-users are higher than the respective bank tariffs, which are set on the basis of the size of the banks' costs. In this case, the interchange fee acts as a balancing mechanism that allows redistributing costs between the acquiring bank and the issuing bank in such a way as to achieve simultaneous satisfaction of all restrictions on the size of net end-users' benefits.

Subsequently, Schmalensee (2003) and Wright (2004) identified one more role of the interchange fees: they allow balancing the demand of end-users on two sides of the market[10] since the interchange fees redistribute bank costs in the payment system and, hence, directly affect the end-user tariffs set by banks. Therefore, the interchange fee can be used not only as a cost balancing instrument but also as a stimulating measure for one of the market sides, which may help agents responsible for interchange fee setting (usually, payment systems and regulators) achieve their own goals (for instance, maximize the volume or value of payments, maximize total welfare, stimulate demand at one of the market sides, etc.). In this respect lower interchange fee level leads to lower levels of merchant discount fees, which may stimulate demand for cashless payment acceptance among merchants, while simultaneously increases tariffs (or worsens the terms of loyalty programs) for consumers, which may lower the demand for cashless payment instruments usage or issuance.

Early models of the cashless retail payment services market laid the foundation for further analysis of the interchange fee levels efficiency and the reasons for the possible discrepancy between chosen rates and socially optimal levels of fees. Rochet & Tirole (2011) summarizes key theoretical models and reaches the conclusion that there are four key groups of factors that affect the size of the discrepancy between the level of socially optimal interchange fees and interchange fees set by responsible agents: the degree of competition between payment systems; the degree of merchants' heterogeneity, i.e. the degree of the heterogeneity of merchants' benefits related to the acceptance of the cashless payments; the degree of issuing banks market power and the degree of pass-through of the changes in bank costs to the end-user tariffs; the power of strategic motives in the decision to accept cashless payments.

The effect of the degree of competition between payment systems on the deviation of set interchange fees from the socially optimal levels is studied in Rochet & Tirole (2003) and Guthrie & Wright (2007). In case all the individuals have payment cards of all payment systems (complete multihoming case) interchange fees are efficient in the short-term since they maximize total end-user welfare. However, in real life merchants are usually obliged to accept all payment instruments of payment systems (for instance, due to the honor-all-cards rule[11]), while individuals are free to

[10] Cashless retail payments market is a two-sided market. One side of the market includes individuals that form the demand for payment services offered by issuing banks. Issuing banks issue payment products (for instance, debit or credit cards) for a set of pre-determined fees upon the individual's initiative. Individuals also choose the method of payment (for instance, cash or debit card) in case different payment methods for goods and services are accepted. The other side of the market consists of merchants that decide on the consumption of acquiring services (i.e., integration of cashless payment methods acceptance), which are offered by the acquiring banks. Acquiring banks set the level of merchant discount fees as well as any other tariffs related to the cashless payment acceptance (for instance, the cost of buying or renting the equipment), while the issuing banks set commissions for the issuance of the cashless payment instruments and their usage (for example, in the form of bonuses or cashback within loyalty programs).

[11] Honor-all-cards rule is a regulatory obligation to accept all types of cashless payment instruments (payment cards) of the payment system and issuing banks issued within one legal and regulatory space (for example, cards of all

choose, which payment card to issue and which payment instrument to use. In this case, payment systems compete for the individuals, which leads to higher than socially optimal levels of interchange fees in order to artificially stimulate the market and attract issuing banks to the payment system.

Schmalensee (2003), Wright (2004), and Rochet & Tirole (2003) extend the analysis of the basic models by relaxing the assumption on merchants' homogeneity. Market modeling under the assumption of merchants' benefits heterogeneity leads to the result that the choice of the interchange fee levels depends on the tariff elasticity of merchants' demand for cashless payments acceptance and individuals' cashless payments usage demand (price elasticities of demand). One of the main findings in Wright (2004) study is related to the fact that under merchants' heterogeneity assumptions there is no systematic deviation of the set interchange fee levels from the socially optimal interchange fee levels in any of the directions. Rochet & Tirole (2003) and Bedre-Defolie & Calvano (2013) achieve similar results that imply that the interchange fee levels will be socially optimal if and only if average net surpluses (aggregate welfare) of different end-user groups (individuals and merchants) are equal. When the average net surpluses are equalized, end-users of cashless payments pay for acquiring and issuing services the value of tariffs, which redistributes bank costs and simultaneously maximizes network effects between two sides of the markets that leads to maximal shares of cashless acceptance and usage of cashless payment instruments.

Interchange fees are set at the levels no smaller than socially optimal ones when issuing banks have market power and when merchants behave strategically, i.e. when merchants use cashless payments as an instrument of attracting clients (Rochet & Tirole, 2002). This result is achieved only in case both the assumption on strategic acceptance and the assumption on issuing banks market power hold simultaneously. In case at least one of the assumptions is violated the results on interchange fee levels efficiency may become different.

Arguments in favor of the existence of discrepancy between the interchange fees set by the responsible agents and the socially optimal levels of the interchange fees have led to discussions about the need to reduce the gap between these two values. An optimal interchange fee evaluation is required in order to assess the necessity of such regulation and develop a strategy for changing tariffs in the cashless retail payments market. Most of the studies in this stream of literature, including the articles mentioned above, are based on the banks' costs as a key method for estimating the interchange fee levels. At the same time, ever since Baxter (1983), all of the key

domestic issuing banks or all cards of the payment system operating in the territory of one country). The rule prohibits acquirers and other payment service providers, as well as merchants from setting restrictions or other barriers to accepting cards of individual issuers or specific types of payment instruments within payment systems.

theoretical studies take into account the concept of end-user benefits. However, due to the lack of these benefits' estimates, the cost-based approach is often used in practice (Evans, Litan & Schmalensee, 2011; Weiner & Wright, 2005). As a result, despite the presence of arguments in favor of interchange fee cuts, there are doubts about the accuracy of the estimates of the socially optimal interchange fee levels due to the lack of inputs, which is why regulatory initiatives can yield suboptimal results (Evans et al., 2011). Evans et al. (2011) suggest that the evaluation of the end-users' demand curves for cashless payment services under the assumption of heterogeneous agents, in addition to accurate estimates of the costs of market participants, is one of the key directions for improving existing approaches to estimating interchange fee levels.

"Tourist test" proposed in Rochet (2006) is the only alternative method for estimating interchange fee levels that attempts to take into account the end-users' demand. According to this approach, the interchange fee levels should equate merchants' costs of accepting cash and cashless payments. The merchant discount fee level (and, hence, corresponding interchange fee level) is efficient under the "tourist test" in case the merchant is indifferent between payment methods chosen by a random tourist that enters the merchant's location and has both cash and cashless payment instruments. Rochet & Tirole (2011) clarifies this result by adding that the interchange fee levels efficiency obtained in the "tourist test" hold if and only if issuing banks fully pass-through the changes in interchange fee levels to cardholders' tariffs, while the benefits of cashless retail payments market participants are heterogeneous. Interchange fee levels obtained under the "tourist test" cease to become efficient in case any of these assumptions are violated and once other market participants are added into consideration.

Despite the difficulties in determining the efficient interchange fee levels upon which the regulation should be based, some regulatory initiatives were implemented in developed payments markets. This allowed analyzing the effects of changes in tariffs on market indicators and empirically assess the effectiveness of the proposed changes. One of the first comprehensive studies of the effects of interchange fee regulation was Weiner & Wright (2005). After analyzing 10 developed markets (Australia, the USA, Canada, Mexico, the UK, and a number of European countries), the authors came to the conclusion that the interchange fee changes did not lead to the goals set by the regulator. In fact, regulatory initiatives implementation slowed down the development of the cashless payments market or led to the reduction in the volume of cashless payments (for example, due to the cancellation of the no-surcharge rule and changes in tariff structure for end-users in Australia). One of the authors' conclusions is the fact that the basic factors affecting the interchange fee level, indicated in the theoretical literature, cannot fully account for the differences in rates between markets. Therefore, the authors suggest a more detailed analysis, including that at the level of individual countries.

Other studies in this stream of literature analyze either specific countries or later periods in which direct or indirect tariff regulation was present. The general tendency of the results of these studies is such that the unilateral tariff regulation in the market does not lead to an improvement in welfare or attainment of all the goals set. For instance, Chang, Evans & Garcia-Schwartz (2005) show that the interchange fee cut in Australia led to unexpected consequences such as the increase of fixed fees for individuals by 30-40% as well as a decrease in the loyalty program bonuses values by 0,2 percentage points per transaction. Acquiring banks decreased the merchant discount fee levels, however, retail prices did not change, while more than 20% of merchants recognized the increase in profits. The value of payments did not change, while the volume of issuance within the three-party payment systems increased.

Durbin amendment, which was aimed at the change of tariffs in the USA also failed to stimulate the market. Evans (2011) estimated the reduction in income of issuing banks by 75-85%, and further research confirms a decrease in efficiency as a result of the regulation (for instance, Bolt, Jonker & Plooij, 2013; McGinnis, 2012; Wang, 2013).

European regulatory initiatives are based on estimates of the interchange fees from the "tourist test". Evans & Mateus (2011) argue that the consequences of regulation for Eurozone countries depend on local market conditions, however, the general conclusion is that the regulatory interchange fee level cuts are likely to worsen the welfare of consumers. At the same time, Ardizzi & Savini Zangrandi (2018) demonstrates the positive effects of tariff regulation for stimulating the share of cashless payment acceptance by merchants in Italy. However, analyzing a wider sample of 27 countries in Europe Carbo-Valverde & Linares-Zegarra (2012) reach the conclusion about the negative effects of regulation for end-users' welfare. According to their data, the introduction of regulatory restrictions does not have a significant impact on the penetration of cashless payments, reduces the average value of card transactions but increases the number of transactions.

In general, studies more often support the negative effects of regulatory interchange fee changes than positive ones. Partially, this may be explained by the fact that the regulation of the interchange fees is based on the average tariffs values and defines caps for different payment products, but not for different final goods and services categories. More targeted studies (for instance, Evans, Chang & Joyce, 2015; Jonker, 2016; Manuszak & Wozniak, 2017; Wang, 2016; Veljan, 2018, 2019; Tirole, 2011) aimed at particular countries, end-users' groups, and market segments agree that the regulation is not characterized by an improvement in the total welfare of the retail payments market participants and not all of the goals set by the regulator are achieved.

To date, the interchange fee regulation has already been introduced in almost all developed payment markets that is why modern research is aimed at analyzing the consequences of regulatory interventions. Nevertheless, in the absence of regulation some markets develop at a faster pace

than those where regulation has already been introduced (for example, the Russian retail payments market is characterized by one of the most developed landscapes of financial innovations, while the Chinese cashless payments market is almost completely serviced by instant messengers' offerings[12]). However, the discussion of the need for tariff regulation has been active in these markets as well during recent years. The lack of research that takes into account the current specifics of emerging markets makes it harder to determine the potential effects of regulatory interventions, as well as determine socially optimal values of the interchange fees.

Aurazo & Vasquez (2019) revisits "tourist test" to account for the institutional specifics of the developing markets with high levels of corruption (for instance, Latin American and Central Asian markets) by adding the government choice to the model to account for the effects of shadow economy and tax evasion practices, which in case of frequently used cash payments may emerge with higher probability. Russian retail payments market is characterized by the high growth rates but the significant role of cash at the same time (Krivosheya, Plaksenkov & Korolev, 2016; Usoskin & Belousova, 2010). Relaxation of the assumption on merchants' homogeneity is especially important for the Russian market due to geographical, social, and economic heterogeneity of regions and market segments (for instance, Demidova, 2015; Yushkov, 2015). Finally, interchange fee regulation in the Russian retail payments market is currently discussed but not yet implemented, which is why the mechanism of interchange fee evaluation should show the effect of hypothetical changes ex-ante, i.e. before the implementation of the changes.

Objectives of the research

The objective of this research is to develop a mechanism for the determination of the efficiency of existing multilateral interchange fees based on the evaluated benefits of the Russian cashless retail payments market participants.

Given this aim, the following goals were achieved:

- To analyze existing empirical and theoretical literature on mechanisms for determining the level of multilateral interchange fees and the role of benefits of the main participants (cardholders, merchants, issuing and acquiring banks and payment systems) of the cashless retail payments market in these mechanisms.;
- To form two samples on the behavior characteristics and demand of consumers and merchants for cashless retail payment services in Russia based on nation-wide surveys, proprietary surveys, and data from open sources;
- To evaluate the benefits of the key agents in the Russian cashless retail payments market;

[12] Details of the development of financial innovations in various countries are available in the study of EY (2019): Global Fintech Adoption Index 2019. Available online: https://www.ey.com/en_gl/financial-services/eight-ways-fintech-adoption-remains-on-the-rise

- To develop an empirical algorithm for setting an interchange fee that is based on theoretical models for determining equilibrium in the cashless retail payments market and incorporates the values of the estimated benefits of the main agents;
- To determine whether the currently set interchange fee levels are efficient using the developed empirical algorithm and based on the evaluation of the current levels of benefits of the main agents of the Russian cashless retail payments market;
- To highlight key characteristics of the Russian cashless retail payments market that affect the levels of benefits of the main agents and the multilateral interchange fee levels.

Methodology

The goals posed in this thesis are solved within the frameworks of game theory as well as concepts and models of banking, modern monetary, and financial economics. The research was designed in the framework of regulatory impact assessment.

The method for interchange fee evaluation and the effects of its changes is based on a theoretical model of equilibrium in the market of cashless retail payments. The equilibrium in this model provides the value of end-users' welfare (total surplus) and the volume of cashless payments given various values of the interchange fee. The empirical mechanism for evaluating the interchange fee and the effects of its changes uses the values of end-users (merchants and individuals) benefits to estimate the quasi-demand functions for payment services (usage and acceptance of cashless payments). The quasi-demand functions are estimated by constructing empirical cumulative density functions (ECDF).

The theoretical model of the cashless retail payments market is based on the analysis of Bedre-Defolie & Calvano (2013). Bedre-Defolie & Calvano (2013) model formed the basis for regulating interchange fees in the Eurozone and simultaneously accounts for the most of the results and aspects of the cashless retail payments market described in the contemporary literature, which justifies the choice of this model for further analysis. The game-theoretic model accounts for the assumptions on imperfect competition of banks, strategic motives of cashless payments acceptance by merchants and heterogeneity of end-users of cashless payment services and is used to obtain socially optimal levels of interchange fees as well as the levels chosen by responsible agents (payment systems). The model also allows accounting for several institutional specifics of the Russian retail payments market (for instance, information asymmetry between market agents, platform competition, etc.). The model is solved using backward induction with the use of methods from industrial economics to obtain subgame perfect Nash equilibria. The relaxations of the model's assumptions and more detailed analyses of different groups of end-users are provided in the supplementary analysis.

The interchange fee evaluation mechanism uses other data from open sources or surveys in addition to the estimated values of end-user benefits. The key data source for the analysis in this thesis is proprietary surveys aimed at studying the participants of the cashless retail payments market collected in 2014 by the Centre for Research in Financial Technology and Digital Economy SKOLKOVO-NES of Moscow School of Management SKOLKOVO («Retail payments in Russia 2014» report, "Finance, payments and e-commerce" chair (currently, Centre for Research in Financial Technology and Digital Economy SKOLKOVO-NES)). The research includes nationwide surveys of Russian individuals, merchants, and banks, while the questionnaire is designed in such a way to study the payment behavior, benefits and costs of participating in the cashless retail payment services market, as well as perform a hypothetical experiment of changing tariffs. The author of the dissertation participated in the surveys by supervising the project and forming the design of the project (including the methodology and questionnaires). The sample consists of 1500 individuals and 800 traditional (brick and mortar) merchants from all federal regions of Russia, as well as 7 key banks from the top-20 that collectively covered more than 80% of the issuing and acquiring services markets at the time of surveys. The sample of individuals is collected using three-stage probability sampling method and includes age, settlement type, and gender quotas, while the sample of merchants includes quotas for the region and merchant type to ensure sample representativeness for the Russian retail payments market.

Bank survey is focused on the costs of cashless payment instrument issuance and acquiring services. The specially designed survey questionnaire included key cost and revenue sources related to the cashless payments business in banks. The questionnaire was self-filled by the heads of respective departments (for example, issuance and acquiring services or retail banking departments). The empirical mechanism for the evaluation of the consequences of interchange fee changes also uses the comparative statics mechanics assuming perfect pass-through of the changes in tariffs to end-users of cashless payments.

The survey data on individuals and merchants is used to evaluate the benefits of end-users associated with participation in the retail payments market. Total welfare evaluations and interchange fee evaluations use these benefits estimates as key inputs. Individuals benefits are divided into fixed benefits that are associated with the participation decision, i.e. a decision to issue payment cards, and variable benefits that are related to the usage decisions, i.e. the decisions to use payment cards for payments for goods and services. Fixed benefits are estimated using simulations of Russian population sample based on the descriptive statistics and stylized facts obtained from the survey of individuals. A sample of 1 million observations with 1000 iterations is generated within simulations. Variable benefits are estimated using the survey data as well as data from open sources (for instance, Rosstat, Bank of Russia and others). Resulting estimates of

benefits are calculated in percentage terms as a share of transaction value based on the evaluated average value of cashless transactions and monthly transactions for each individual in the sample.

Merchant benefits associated with cashless payments acceptance are estimated on the data available directly from surveys or open sources. The benefits estimation procedure is based on the behavior of merchants as well as the hypothetical cut-off fee levels that will make merchants stop accepting cashless payments. Benefits are estimated in percentage terms as a share of average transaction value, however monetary equivalent of benefits value in terms of Russian Rubles is available from the multiplication of benefits value in percentage terms and the average merchant's transaction value. The benefits value is estimated for every merchant in the sample. Total benefits are divided into alternative and direct benefits. Alternative benefits, which are related to strategic motives of cashless payments acceptance, are estimated as the value of transactions that would be forgone in case the merchant did not accept cashless payments. Direct benefits value is the difference between total and alternative benefits.

Contribution

This thesis contributes to the literature on the evaluation of interchange fee efficiency and the consequences of tariff changes in the cashless retail payments market. As was shown above, existing works either present theoretical modeling of the interchange fee levels and the hypothetical consequences of their changes or offer ex-post estimates of the consequences of changes in the interchange fee levels. This research proposes an approach to evaluating the interchange fee levels and the effect of their changes (the efficiency of currently set interchange fees) regardless of the implementation of the regulatory requirements. In particular, this thesis:

- Develops an empirical mechanism for evaluating the interchange fee levels based on the benefits of cashless retail payments market participants. The theoretical part of the analysis extends the model of Bedre-Defolie & Calvano (2013) by adding the definition of nonparametric density functions of the end-user benefits.
- Proposes definitions of three types of interchange fees efficiency based on existing research and theoretical and empirical results. Interchange fees are efficient according to a weak form efficiency if they satisfy individual utility maximization conditions for each market participant. Semi-strong form efficiency requires interchange fee levels to maximize the total welfare in the cashless retail payments market. Strong form efficiency implies that a change in interchange fee levels leads to a decrease in welfare for at least one of the end-user groups. The theoretical part of the analysis also demonstrates the role of the end-user quasi-demand price elasticities in the existence of an increase in the total surplus of market participants and Pareto improvement as a result of interchange fee changes.

- Presents the evaluation of the efficient interchange fee levels and the effects of interchange fee level changes based on the data on the Russian cashless retail payments market. In particular, interchange fee efficiency is assessed according to the criteria derived in the theoretical part of the analysis. Also, this research shows the effect of hypothetical changes in the interchange fee on the welfare of end-users of payment services. The proposed method for interchange fee evaluation takes into account all the reasons for the discrepancy between the socially optimal and chosen interchange fee levels described in Rochet & Tirole (2011). An empirical mechanism for assessing the impact of tariff changes on the general market equilibrium and the welfare of its participants before the introduction of changes, i.e. ex-ante, is proposed for the first time.
- Develops an approach for evaluation of individual benefits associated with participation in the cashless retail payments market. In particular, this thesis evaluates individual benefits as a result of the decision to issue cashless retail payment instruments (payment cards) and the benefits of cardholders as a result of the decision to use cashless retail payments (to pay for goods and services) compared with the use of alternative payment methods (for example, cash) based on the survey data obtained during the nation-wide surveys. The developed approach is the first attempt to quantitatively evaluate the benefits of individuals in the cashless retail payments market.
- Develops an approach for evaluation of merchant benefits associated with participation in the cashless retail payments market. The evaluation is based on a sample of traditional (offline) merchants obtained from the nation-wide surveys. Total benefits are estimated to account for the fact that merchants make only one decision in the retail payments market: whether to accept cashless payments. The developed approach is the first attempt to quantitatively evaluate the benefits of merchants in the cashless retail payments market.
- Determines the strength of strategic motives for accepting cashless retail payments due to the separation of total benefits into direct and alternative benefits.
- Estimates the demand functions for cashless payment services based on the end-user benefits estimates. The possibility of adding end-user reactions to shocks based on the estimated demand functions and the theoretical foundations of the proposed mechanism for interchange fee evaluation proposed in this thesis allow obtaining more accurate estimates of the socially optimal interchange fee levels to determine the need for regulation as noted in Evans et al. (2011).

From the point of view of **practical implications**, the results of this study can be used by the regulator to determine the feasibility of regulatory interference in the formation tariffs in the cashless retail payments market, as well as by the acquiring and issuing banks for the determination of their marketing strategies (including the choice of end-user tariffs levels). Theoretical models for determining tariffs in the cashless retail payments market and approaches to their empirical evaluation can be used in industrial economics, banking, and financial services market regulation courses for undergraduate and graduate students

Main findings

1. *Interchange fee rates set in Russia are efficient.* The rates set in 2014 are efficient according to all three formulated definitions: the rates are efficient according to the criteria of strong (Pareto), semi-strong (impossibility to increase the total welfare of end-users of cashless retail payments), as well as weak forms of efficiency.
2. *None of the unilateral changes in the level of interchange fees leads to Pareto improvement when current Russian market characteristics are taken into account.* None of the changes leads to Pareto improvement under the assumption of symmetric pass-through of the effects of interchange fee changes to the end-users' tariffs or an equivalent change in the quality of services. The interchange fee level which equates total surpluses of end-users, proposed in the literature as the optimal interchange fee level, in the analysis of agents with average benefits (analysis of a representative agents) maximizes the volume of transactions and total wealth but does not lead to Pareto improvement due to the decrease in merchant benefits as a result of higher tariffs. Interchange fee levels decrease to a level comparable to the estimates of the cost of cash, that is, to the level of 0.2-0.3%, which is equivalent to the implementation of the regulatory changes proposed in Eurozone, does not lead to an increase in welfare and transaction volumes in the Russian cashless retail payments market.
3. *The higher the difference in demand elasticities for the two groups of end-users is, the higher is the likelihood of Pareto improvement as a result of interchange fee rates cut.* The theoretical model based on Bedre-Defolie & Calvano (2013) indicates that the efficiency of changes in the cashless retail payments market depends on the relative demand elasticity of individuals and merchants. For a Pareto improvement to be possible the difference in the price elasticities of demands of merchants and cardholders should be greater than in case when it is possible to increase the total welfare in the market.
4. *The participation of the individuals in the cashless retail payments market is characterized by positive and economically and statistically significant benefits compared to the use of cash only.* Based on the approbation of the developed method for evaluation of the individual benefits associated with the participation in the retail payments market, it was

found that both the storage of funds in the current account and the use of payment cards, on average, are characterized by positive benefits for individuals. Net fixed benefits, which are related to the individual's decision to keep funds in the current account, that is, to the decision to issue a cashless payment instrument (for example, a payment card), in the 2014 sample amounted to an average of 247.7 rubles per year. Based on the same data, net variable benefits that are related to the individual's decision to use cashless payment instruments (for instance, to pay for goods and services) account for, on average, 7.7% of the transaction value. However, this value changes depending on the value of the transaction. Fixed benefits size differs depending on the type of payment instrument issued, while variable benefits size depends on regional characteristics, as well as on the characteristics of the payment method and contract with the issuer. However, variable benefits do not vary significantly across different individual characteristics.

5. *Participation in the cashless retail payments market for merchants is characterized by positive and economically and statistically significant benefits compared to the acceptance of cash only.* The developed method for estimating merchant benefits associated with the acceptance of the cashless payments revealed that participation in the cashless retail payment services market is characterized by positive net benefits for merchants. Net total benefits estimated based on 2014 survey data accounted on average for 16.34% of the transaction value.
6. *Evaluation of the merchant benefits allowed identifying two key types of motives for cashless payments acceptance.* The first type of motives, measured using direct benefits, refers to the payment cards acceptance without taking into account the strategic motives of the merchant. The second type of motives are related to strategic motivation and are measured by alternative benefits. Net alternative benefits estimated based on 2014 survey data are, on average, 14.5% of transaction value, while the net direct benefits account for 1.56% of transaction value. Alternative benefits are significant at any reasonable significance level, while the direct ones are significant only when using a one-sided hypothesis at a 10% significance level. This may be the reason for the merchants' dissatisfaction with the terms of cashless payments acceptance, in particular, the size of the merchant discount fees: direct benefits are associated directly with the acceptance decisions, while alternative benefits may be unobservable. Merchants can take advantage of these information asymmetries, i.e. the fact that alternative benefits are unobservable.
7. *Analyses under relaxed assumptions and the detailed analysis of different groups of end-users of cashless retail payment services confirm the efficiency of the established interchange fees.* Total welfare and the volume of payments decreases when more

vulnerable end-user groups with median benefits values[13] are analyzed. If the assumptions of the analysis are relaxed (for example, in cases of information asymmetry, incomplete pass-through of tariff changes, asymmetric interaction between merchants and individuals, etc.), Pareto improvement is also never achieved, and in almost all cases, changes leading to an increase in total welfare of end-users in previous parts of the analysis are characterized by a decrease in total welfare.

8. *It is proposed to stimulate cashless economy development with non-tariff or non-unilateral instruments.* The lack of regulatory intervention as well as the use of non-tariff and local tools to stimulate the market may be one of the key reasons for the development of a cashless economy and financial innovations in Russia from 2014 to 2019.

Approbation of results

The results of the studies were presented at international conferences:

- The 6th Global Innovation and Knowledge Academy (GIKA), (Valencia, 2016). *Benefits of the retail payments card market: Russian cardholders' evidence* (Best paper of the conference award);
- The 9th Annual Conference of the EuroMed Academy of Business, (Warsaw, 2016). Chair of the session: International finance; presenter: *Benefits of the retail payments card market: Russian cardholders' evidence*;
- The 8th European Business Research Conference, (Paris, 2017). *Benefits of the retail payments card market: Evidence from Russian merchants*;
- Second American Academic Research Conference on Global Business, Economics, Finance and Social Sciences, (New York, 2017). *Benefits of the retail payments card market: Evidence from Russian merchants*;
- The 31st International Academic Conference IISES, (London, 2017). *Benefits of the retail payments card market: Evidence from Russian merchants*;
- The 7th Global Innovation and Knowledge Academy (GIKA), (Lisbon, 2017). *Benefits of the retail payments card market: Evidence from Russian merchants*;
- The 10th Economics and Finance Conference, (Rome, 2018). *Network Effects at retail payments market: Evidence from Russian Merchants; Network Effects at retail payments market: Evidence from Russian Individuals*;

[13] A lower level of merchant benefits usually correlates with a smaller size and volume of sales, and a lower level of individual benefits correlates with a lower level of income and lower activity in the market of cashless retail payments. In addition, a lower level of end-user benefits means a closer value to the threshold level (for example, zero), at which agents stop participating in the market. Due to the nature of end-user benefits' distributions, median values are below average benefit values.

- The 8th RSEP International Multidisciplinary Conference, (Barcelona, 2018). *Network Effects at retail payments market: Evidence from Russian Merchants; Network Effects at retail payments market: Evidence from Russian Individuals*;
- The 2nd International Conference on Applied Research in Management, Economics and Accounting, (Brussels, 2019). *Determinants of benefits at payments card market: Evidence from Russian end-users*;
- The 9th Academy of Innovation, Entrepreneurship and Knowledge (AIEK), (Verona, 2019). *Determinants of benefits at payments card market: Evidence from Russian end-users*;
- The 12th Economics and Finance Conference, (Dubrovnik, 2019). *Financial Innovations role in consumer behavior at Russian retail payments market; Perception of acceptance barriers and cashless payments value: Evidence from Russian merchants*.

The results of the studies were also presented at national conferences:

- XX April international academic conference on economic and social development, (Moscow, 2019), *Network effects at retail payments market: Evidence from Russian individuals*;
- 8th Annual CInSt Banking Workshop "Banking in Emerging Markets: Challenges and Opportunities", (Moscow, 2018), *Evaluating Efficient Multilateral Interchange Fees: Evidence from End-User Benefits*;
- XIX April international academic conference on economic and social development, (Moscow, 2018), *Evaluating Efficient Multilateral Interchange Fees: Evidence from End-User Benefits*;
- XVIII April international academic conference on economic and social development, (Moscow, 2017), *Benefits of the retail payments card market: Evidence from Russian merchants*.

Publications:

1. Krivosheya E., Korolev A. Benefits of the retail payments card market: Russian cardholders' evidence //Journal of Business Research. – 2016. – Т. 69. – №. 11. – С. 5034-5039
2. Krivosheya E. Determinants of Benefits in the Retail Payments Market: Evidence from Russian Consumers //Journal of Promotion Management. – 2020. – С. 1-20.
3. Krivosheya E., Korolev A. Benefits of the retail payments card market: Evidence from Russian merchants. //Journal of Business Research. – 2018. – Т. 88 – С. 466 – 473.

4. Krivosheya, E. Evaluating Efficient Multilateral Interchange Fees: Evidence from End-User Benefits (July 9, 2018). Higher School of Economics Research Paper No. WP BRP 66/FE/2018. Available at SSRN: https://ssrn.com/abstract=3210455 or http://dx.doi.org/10.2139/ssrn.3210455

Other publications that contain thesis contents:

5. Krivosheya E., Semerikova E. Network effects at retail payments market: evidence from Russian individuals //Proceedings of Economics and Finance Conferences. International Institute of Social and Economic Sciences. 2018. №. 6910185.
6. Krivosheya E. Network effects at retail payments market: evidence from Russian merchants //Proceedings of Economics and Finance Conferences. International Institute of Social and Economic Sciences. 2018. №. 6910312.
7. Krivosheya E., Belyakova P. Financial innovations role in consumer behavior at Russian retail payments market //Proceedings of Economics and Finance Conferences. International Institute of Social and Economic Sciences. 2019. №. 9511955.
8. Semerikova E., Krivosheya E., Dobrynin A., Perception of Acceptance Barriers and Cashless Payments Value: Evidence from Russian Merchants //Proceedings of Economics and Finance Conferences. International Institute of Social and Economic Sciences. 2019. №. 9511956.