ORIGINAL PAPER

DOI: 10.26794/2587-5671-2023-27-4-194-205
UDC 330.101.2,339.1,338.51,338.57(045)
JEL C23, E31, O33, O57

The Impact of the Development of E-Commerce on Inflation in Russia

A.M. Grebenkina[a], M.N. Kuznetsova[b], E.V. Sinelnikova-Muryleva[c]
[a, b, c] Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia;
[a] Lomonosov Moscow State University, Moscow, Russia

ABSTRACT

Over the past few years in Russia and the world there has been a rapid development of goods and services e-commerce. Therefore, an issue of inflationary consequences of the process of e-commerce growth is **topical**. The **subject** of this research is the impact of the development of e-commerce on inflation. The **purpose** of the paper to identify key theoretical mechanisms of e-commerce development influence on inflation, in addition to empirically verify the presence of the de-inflation effect on Russian data. The paper bases on **methods** of systematization, descriptive analysis, panel data econometric analysis. Also systematize basic mechanisms of e-commerce influence and provide empirical evidence for the disinflationary effect of e-commerce in Russian regions as a **result** of the study. The study **concludes** that e-commerce causes predominantly downward pressure on prices and inflation. Econometric analysis confirms this effect on Russian regions data in 2014–2020. The **scientific novelty** of the research lies in systematization of channels of e-commerce influence on various spheres of economy and confirmation of disinflationary effect of e-commerce using Russian data. The study's **recommendation** is to consider the aspect of price reduction pressure in Russia's monetary policy during the further spread of e-commerce.

Keywords: e-commerce; inflation; monetary policy; disinflationary effect; downward pressure on prices

For citation: **Grebenkina A.M., Kuznetsova M.N., Sinelnikova-Muryleva E.V. The impact of the development of e-commerce on inflation in Russia.** ***Finance: Theory and Practice.*** **2023;27(4):194-205. (In Russ.) DOI: 10.26794/2587-5671-2023-27-4-194-205**

INTRODUCTION

The sector of e-commerce in consumer products and services is rapidly developing in Russia and around the world. According to the *Fig.* in 2021, the volume of Internet trade in Russia reached 3.6 trn rubles[1] and 4.3% of the total trade turnover in Russia.[2] Potential of e-commerce expansion not exhausted. As of 2021, about 88% of the population of the Russian Federation have access to the Internet,[3] but only 46.6% on average in Russia use the Internet to order goods and services.[4] The impact of the growth of e-commerce on inflation and pricing is a significant problem for the future growth of e-commerce in Russia.

MECHANISMS OF E-COMMERCE IMPACT ON PRICES

There are several mechanisms to influence the development of e-commerce on prices (*Table 1*). Most mechanisms suggest a downward pressure on prices from e-commerce: as a result of increased factor productivity and reduced factor costs; reduced cross-border barriers to trade and transport costs such as "iceberg costs" [1]; increased price elasticity of demand and firm economies at scale; increasing consumer power and reducing consumer search costs. Some mechanisms imply an upward pressure of e-commerce's distribution on prices: as a result of price arbitrage; the actions of firms to "confuse" the consumer through differentiated supply; into force more than high effect of the exchange rate transfer in the prices of online goods. The overview of the mechanisms in *Table 1* will probably result in downward pressure on prices from e-commerce.

IMPACT OF E-COMMERCE ON INFLATION IN COUNTRIES

A study on the impact of e-commerce on inflation is being conducted for selected countries and for groups of countries. The overview of studies for countries presented in *Table 2*. The majority of research analyzed show that the rise of e-commerce has a negative impact on inflation, which supports the theoretical arguments presented in *Table 1*. An exception is the paper (Goyal, 2010) for India identifying increases in agricultural producer prices due to the emergence of internet price terminals. The result, however, is consistent with past theoretical explanations, since the rise in producer prices is driven by the reduction in market power of intermediate businesses and the redistribution of products margins to producers.

Research for groups of countries may also be of interest, for example, in testing the hypothesis of greater impact of e-commerce on prices in developing countries than in developed countries. However, such studies are difficult because of limited comparability and incomplete data sets. In particular, country-comparable e-commerce indicators are available only for OECD countries.[5] Other, more universal variables are therefore possible. For example, this variable can be the percentage of Internet users. A good argument for using this variable as a proxy for e-commerce is given in the paper on inflation factors.[6] This paper analyses 11 factors for

[1] Association of the Companies of Internet Trade (ACIT) website. URL: https://akit.ru/analytics/analyt-data (accessed on 14.05.2022).

[2] Unified interdepartmental information and statistical system (EMISS) website. Share of sales through the Internet in the total turnover of retail trade. URL: https://www.fedstat.ru/indicator/50236 (accessed on 14.05.2022).

[3] EMISS website. Share of population using Internet information and telecommunications. URL: https://www.fedstat.ru/indicator/58465 (accessed on 14.05.2022).

[4] EMISS website. Share of the population using the Internet to order goods and (or) services, in the total population. URL: https://www.fedstat.ru/indicator/43565 (accessed on 14.05.2022).

[5] Eurostat. E-commerce sales. URL: https://ec.europa.eu/eurostat/databrowser/view/ ISOC_EC_ESELN 2__ custom_1127925/settings_1/table?lang=en (accessed on 30.10.2021); OECD. ICT Access and usage by business. URL: https://stats.oecd.org/viewhtml.aspx?datasetcode=ICT_BUS&lang=en (accessed on 30.10.2021).

[6] Barme A., Tamayo S., Gaudron A. What economic indicators influence e-commerce? 20th International Conference on Urban Transportation and City Logistic (conference paper). 2018, 8 p. URL: https://www.researchgate.net/publication/325217803_What_economic_indicators_influence_e-commerce_Approach_through_statistic_regression_and_open_data

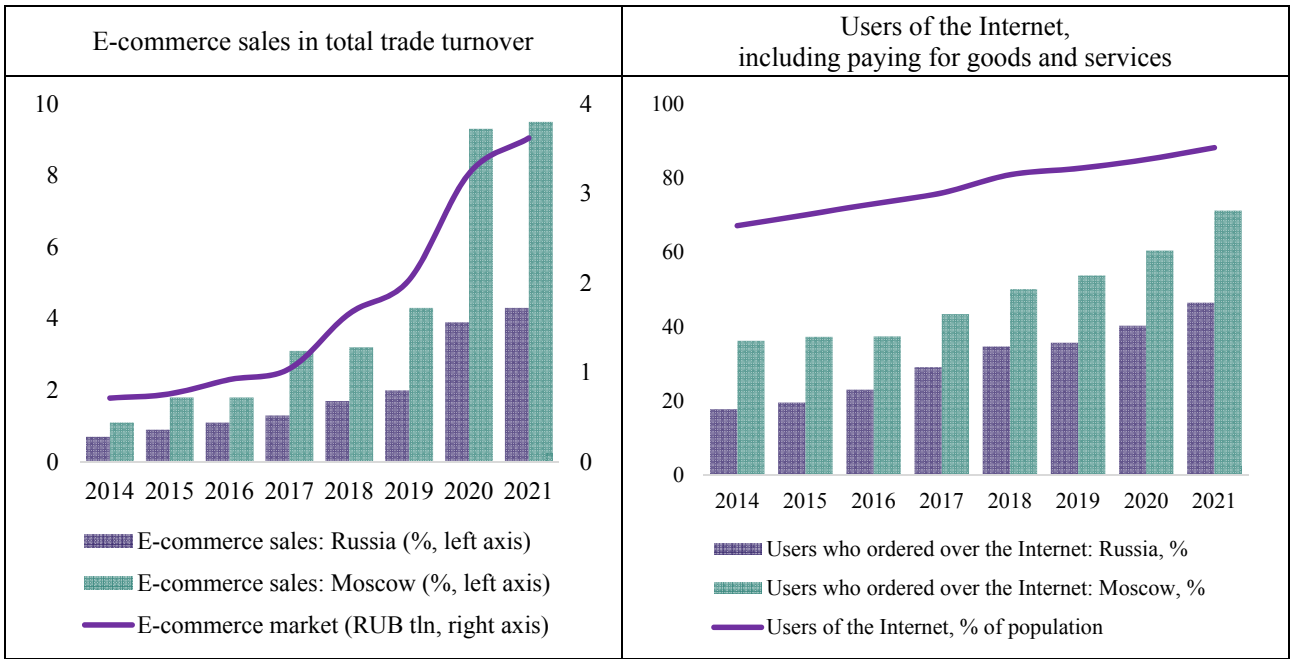

Fig. **E-Commerce Development in Russia**

Source: Compiled by the authors according to Fedstat and Akit.

the development of e-commerce, such as high-tech exports, gross capital accumulation and others, for a sample of 24 countries. The "share of Internet user" factor was second in the power of influence on the development of e-commerce (after the volume of output).

To test the hypothesis of the decreasing pressure of the Internet spread on inflation in countries, the authors developed a model (1) with fixed effects. The selection of regressors model (1), forms of functional dependency and method of assessment of analysis of factors of inflation is based on earlier relevant studies, namely [2] and [18] papers.

$$Infl_{it} = \gamma_i + \beta_1 Economy_{it} + \beta_2 Money_{it} + \\ + \beta_3 NER_{it} + \beta_4 Internet_{it} + \varepsilon_{it}, \quad (1)$$

where $Infl_{it}$ — annual inflation on country i in the period t; $Economy_{it}$ — one of the variables $rGDP_{it}$ (real GDP growth rate), IPI_{it} (industrial growth rate), $Unemp_{it}$ (unemployment rate) of the i country's economic activity in the period t; $Money_{it}$ — money supply growth rate in country i in the period t; NER_{it} — share of nominal exchange rate of a country's national currency i to the USD in the period t; $Internet_{it}$ — share of Internet users in the country i in the period t; i — fixed country effect i; it — random model error.

Information on model (1) regressors, data sources and expected inflation impact is presented in *Table 3*. The base data set contains information for 194 countries from 1990 to 2020, including 37 developed countries and 22 emerging markets (frequency of observations — annual). A substantial portion of the base data has not been used in the regression assessment, as comparable country-specific data on the money supply has only been available since 2002.

When the NER variable is formed, the exchange rates of national currencies against the USD are calculated in a direct quotation (number of units of national currency per USD). For the US and euro zone countries, the annual share of the nominal effective exchange rate index calculated by the IMF (NEER index in direct quote) is used as the NER variable. Thus, the authors use the "hybrid" variable NER: on the one hand, the data of the nominal effective exchange rate index allow to take into account information

(accessed on 14.05.2022).

Table 1

Theoretical Mechanisms of E-Commerce's Impact on Prices

Source	Mechanism of e-commerce impact	Paper
Factor productivity	Growth of factor productivity → lower production costs → downward pressure on prices	[2, 3]
	Reduction the input prices → lower production costs → reduction the price of goods	[4, 5]
Volume of international trade	Reduction the cross-border restrictions → price arbitration implementation → lower prices in the exporting country, higher prices in the importing country	[6, 7]
	Reduction the transport costs of international trade (iceberg costs) → decline in prices	[8, 9]
Firm's monopoly power	Growth of food variety → growth of elasticity of demand for goods by price → reduction of the mark-up of the company → decline in prices	[5, 10]
	Emergence of large internet firms → implementation of economies of scale and network effects → decline in prices	[11]
Costs of searching for information	Reduced costs of search frictions by the consumer, growth of consumer market power → decline in prices	[10]
	Incentives for firms to differentiate supply and allow search costs → strategy of obfuscation → price variance	[12, 13]
Pass-through effect of the exchange rate to prices	Greater and faster effect of exchange rate into online prices → downward pressure on prices	[14]

Source: Compiled by the authors.

about the euro zone and the USA; on the other hand, the nominal exchange rate of national currencies to the USD allows for the inclusion of information on a large number of developing countries for which the IMF does not calculate the NEER index. The use of the "hybrid" NER variable allowed the authors to increase the number of available observations by about 1.5–2 times compared to the sample available when using only NEER index data.

The *Appendix* presents the results of the model evaluation (1). Model specifications (1) differ by control variable "*Economy*". Calculated for three periods (total available period; 2002–2009 — before the global financial crisis; 2010–2020 — after the global financial crisis) and for four samples of countries (all countries; developed countries; emerging economies; developing countries).

Table 2

Impact of E-Commerce on Inflation in Countries

Country, paper	Principal conclusion of the study
Spain [16]	The increase in the share of Internet sales by 10 p.p. leads to a decrease in the company margin by 4 p.p. and a slight decrease in inflation
Euro area countries (Kulakov & Vinogradov, 2020)	Development of e-commerce has disinflationary impact in 19 euro-zone countries, but the effect will be exhausted as e-commerce growth rates stabilize
Japan [6]	Development of e-commerce reduces price dispersion and inflation by 0.9% in cities with high levels of education
Canada [11]	Development of e-commerce has no significant impact on inflation, while its share is statistically small
India [15]	The introduction of Internet terminals reduces the power of intermediaries in agricultural markets and increases producer prices

Source: Compiled by the authors.

Table 3

Data Source and Description of Regressors in Model (1)

Variable	Variable identification	Data source, range of values	Expected sign of impact
Inflation, annual %	$Infl$	IMF, 1990–2020	Dependent variable
Variables of the business environment ($Economy$)			
Real GDP, annual %	$rGDP$	IMF, 1990–2020	– *
Industrial production index, annual %	IPI	IMF, 1990–2020	+
Unemployment, annual %	$Unemp$	IMF, 1990–2020	–
Traditional inflation factors			
Money supply, annual %	$Money$	IMF, 2002–2020	+
Nominal exchange rate against the USD (in direct quotation) or nominal exchange rate index (in direct quotation), annual %	NER	IMF, 1990–2020	+
Variable of research interest			
Share of Internet users, %	$Internet$	World Bank, 1990–2020	–

Source: Compiled by the authors.

Note: * According to the quantitative theory of money, under other equal conditions, positive growth rates of real output have a decreasing effect on inflation. At the same time, in a longer period, when the condition "at other equal" is not performed, a positive sign of influence is possible, which is explained by the growth of aggregate demand, demand for money and nominal money supply.

Table 4

Influence of Internet Spread on Inflation in Country Groups [Evaluation Results for Model (1)]

Group of countries	Period	Inflation sensitivity to the percentage of Internet users, p.p.	Specification of the model (1) with the result
Developed countries	2010–2020	–0.09**	1
		–0.12***	2
		–0.09**	3
Developing countries	2002–2009	–0.25*	3
Total	2002–2020	–0.04*	2

Source: Authors' calculation.

Note: *, ** and *** indicate the value of model coefficients at 1%, 5% and 10% of significance levels respectively.

According to the results the models and specifications are characterized by the expected sign of the influence of the regressors on the dependent variable: significant positive impact of nominal exchange rate depreciation and unemployment reduction on inflation, as well as negative impact of growth of real output,[7] industrial production and money supply on inflation was found. These results are consistent with the assumptions described in *Table 3*.

Five of the reviewed model specifications (1) found a significant negative impact of the Internet on inflation. Coefficients of significant results of influence of variable interest on inflation are presented in *Table 4*.

If the Internet penetration variable is significant, it puts downward pressure on inflation in the group of developed and developing countries. The result obtained does not contradict the theoretical conclusions presented earlier in *Table 1*. Greater quantitative impact achieved for a group of developing countries (at the time of the highest Internet penetration) and less for a group of developed countries (2010–2020). The difference in quantitative estimates may be due to higher inflation in developing countries. It should also be noted that in the overwhelming number of specifications presented in *Appendix*, the significant impact of the variable interest on inflation have not been identified. For the all sample of countries, only the quantitatively small downward pressure of Internet penetration on inflation was found throughout the time horizon.

Thus, the panel data study for groups of countries reveals only some circumstances in favor of the downward pressure of Internet users on inflation. One possible explanation for this is the high institutional heterogeneity within the groups.

IMPACT OF E-COMMERCE ON INFLATION IN RUSSIA

As shown in *Table 2*, a number of countries do have significant negative effects on inflation. To verify this hypothesis on the data of the regions of Russia, a model (2) of the following type has been constructed:

$$Infl_{it} = \gamma_i + \beta_1 External_t + \beta_2 Ecommerce_{it} + \\ + \beta_3 Economy_{it} + \beta_4 ExpGRP_{it} + \varepsilon_{it}, \qquad (2)$$

where $Infl_{it}$ — annual inflation in the region i in the period t; $External_t$ — one of the variables $Brent_t$ (Brent price), $Dollar_t$ (ruble to dollar exchange rate) with macroeconomic

[7] Real GDP growth has had a negative impact on inflation for the group of developing countries and for countries as a whole. For the group of developed countries, a positive sign was obtained at real GDP ratio, which is due to a small number of observations and some short-term trends [including the "period of great moderation" (Great moderation)].

Table 5

Data Source and Description of Regressors in Model (2)

Variable	Variable identification	Data source, range of values	Expected sign of impact
Regional consumer price index, annual %	*Infl*	Rosstat, 2014–2020	Dependent variable
Share of budget expenditures of GRP, %	*ExpGRP*	Rosstat, 2014–2020	+
Variables that describe the state of the economy (*Economy*)			
Unemployment, annual %	*Unemp*	Rosstat, 2014–2020	–
Wage growth rates in the regions, annual %	*Wages*	Rosstat, 2014–2020	+
Variables that describe the external conditions (External)			
Ruble against the USD, annual % (in direct quotation)	*Dollar*	Bank of Russia, 2014–2020	+
Brent oil price, annual %	*Brent*	Investing.com, 2014–2020	–
Variable of research interest			
Share of Internet sales in total retail sales, %	*Ecommerce*	Rosstat (EMISS), 2014–2020	–

Source: Compiled by the authors.

impact from the outside world in the period t; $Ecommerce_{it}$ — share of Internet sales in total retail sales in the region i in the period t; $Economy_{it}$ — one of the variables $Wages_{it}$ (salary growth rate), $Unemp_{it}$ (unemployment rate) with economic activity in the region i in the period t; $ExpGRP_{it}$ — share budget expenditures in GRP in the region i in the period t; i — fixed region effect i; it — random model error.

Information on model regressions (2), data sources and the expected impact of regressions on inflation is presented in *Table 5*.

As a variable that characterizes the development of e-commerce, the indicator of the share of sales via the Internet in the total volume of retail trade, calculated by Rosstat for the regions of Russia. The set of explanatory variables is formed on the basis of economic assumptions about the relationship of variables, as well as based on publications of domestic researchers devoted to the analysis of the peculiarities of inflation processes in regions [19, 20].

The data being analyzed has a panel structure and consists of 82 objects (subjects of Russia) over 7 time periods (2014–2020). Assessment of the model (2) is carried out both using the pool model and using fixed effects. In the course of the implementation of the empirical strategy, estimates of the coefficients presented in the *Table 6*. Specifications 1–4 are assessed using a combined MNC, specifications 5–8 are fixed-effect models.

Assessment of model (2) has shown a significant impact of the indicators set out in *Table 5* on inflation in the regions of Russia. Rise in the dollar exchange rate leads to higher prices for imported goods and

Table 6

Influence of E-Commerce Spread on Inflation in Russian Regions [Evaluation Results for Model (2)]

	Specifications assessed by MNCs				Specifications of models with fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dollar	0.16*** (0.004)		0.16*** (0.004)		0.15*** (0.006)		0.14*** (0.004)	
Brent		−0.11*** (0.003)		−0.12*** (0.003)		−0.09*** (0.005)		−0.10*** (0.004)
Ecommerce	−0.27*** (0.09)	−0.43*** (0.15)	−0.15 (0.09)	−0.23* (0.12)	−1.02** (0.41)	−1.50** (0.62)	−0.99** (0.40)	−1.27** (0.55)
Unemp	−0.07** (0.04)	−0.08* (0.03)			0.16 (0.14)	0.32 (0.22)		
ExpGRP	0.03* (0.02)	0.04** (0.02)	0.10* (0.06)	0.10* (0.06)	0.37*** (0.08)	0.44*** (0.10)	0.57*** (0.08)	0.60*** (0.09)
Wages			0.06 (0.09)	0.35*** (0.10)			0.09 (0.06)	0.37*** (0.08)
Constant	4.08*** (0.23)	5.98*** (0.25)	2.16*** (0.70)	2.26*** (0.72)				
R^2 — within	0.76	0.46	0.65	0.46	0.82	0.55	0.80	0.62
R^2 — within (adj)	0.76	0.46	0.65	0.45	0.78	0.45	0.76	0.54
Number of observations	486	486	488	488	486	486	488	488

Source: Compiled by the authors.

Note: Robust standard errors are indicated in the brackets; *, ** and *** indicate the significance of the model coefficients at 1%, 5% and 10% significance levels respectively; R^2-within (adj) — adjusted coefficient of determination of within-group regression.

overall price growth. Rise in oil value leads to strengthening of national currency, lower prices of imported goods and lower rate of price growth. Rise in unemployment rate leads to lower price growth, in line with the Phillips curve concept. Higher budget expenditures (as a% of GRP) and higher nominal wages lead to higher prices. These trends reflect the growth of economic activity, which stimulates demand growth and upward pressure on prices.

According to the evaluation of the model (2), the spread of Internet commerce in the regions of Russia has a disinflative effect. Depending on the specification of the model (2), an increase in the share of online sales by 1 p.p. leads to a decrease in regional inflation by 23–150 basis points. At the same time, no significant downward inflationary impact of the spread of Internet commerce was found by the authors in the non-temporary 2020 panel data. The result confirms the authors' hypothesis about the increased role of e-commerce as a macroeconomic indicator. The significant deflationary impact of the spread of online trading in the medium term could be a factor requiring analysis and consideration in national monetary policy decisions.

CONCLUSION

Currently in Russia there is an intense development of e-commerce, which actualizes the study of the impact of this process on macroeconomic indicators, in particular prices.

A considerable amount of research theoretically supports the downward pressure of the development of e-commerce on prices. Individual country studies confirm the deflationary effect of the spread of e-commerce, while large-scale studies for groups of countries are hampered by the lack of comparable data on online trade volumes. These terms may justify the use of a variable percentage of Internet users as a proxy variable, since access to the Internet is a prerequisite for the existence of e-commerce. The authors' econometric analysis revealed some evidence in favor of a decreasing inflationary pressure on the growth of the number of Internet users over the separate periods of 2002–2020.

The study is supplemented by an econometric verification of the hypothesis of the downward pressure of e-commerce development on inflation in the regions of Russia. Analysis of panel data for 82 Russian entities revealed the deflationary effect of the spread of e-commerce in the period 2014–2020.

The authors expect that as e-commerce develops in Russian areas, the accounting of Internet trade as a disinflationary component in monetary policy choices will be updated.

ACKNOWLEDGEMENTS

The article was prepared as part of the research work of the state assignment of the Russian Academy of National Economy and Public Administration (RANEPA). Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia.

REFERENCES

1. Samuelson P. The transfer problem and transport costs, II: Analysis of effects of trade impediments. *The Economic Journal*. 1954;64(254):264–289. DOI: 10.2307/2226834
2. Hsing Y., Morgan Y.-C., Phillips A.S., Phillips C. Internet usage and economic growth: The case of Mexico. *Quantitative Economics and Management Studies*. 2020;1(6):383–389. DOI: 10.35877/454RI.qems224
3. Kithinji E., Onono P. Effect of electronic commerce on output and total factor productivity in Kenia. *Journal of Economics and Political Economy*. 2020;7(2):101–130. URL: https://ir-library.ku.ac.ke/bitstream/handle/123456789/22699/Effect%20of%20electronic%20commerce%20on%20output%20and%20total.pdf?sequence=1&isAllowed=y
4. Autor D.H., Dorn D. The growth of low-skill service jobs and the polarization of the US labor market. *American Economic Review*. 2013;103(5):1553–1597. DOI: 10.1257/aer.103.5.1553
5. Csonto B., Huang Y., Tovar C.E. Is digitalization driving domestic inflation? IMF Working Paper. 2019;(271). URL: https://www.imf.org/en/Publications/WP/Issues/2019/12/06/Is-Digitalization-Driving-Domestic-Inflation-48786
6. Jo Y., Matsumura M., Weinstein D. The impact of e-commerce on relative prices and consumer welfare. NBER Working Paper. 2019;(26506). URL: https://www.nber.org/system/files/working_papers/w26506/w26506.pdf
7. Jensen R. The digital provide: Information (technology), market performance, and the welfare in the South Indian fisheries sector. *The Quarterly Journal of Economics*. 2007;122(3):879–924. DOI: 10.1162/qjec.122.3.879
8. He Y., Li J., Wu X., Jiang J. Impact of e-commerce on international trade — based on a Icemerg cost model. *International Journal of Trade, Economics and Finance*. 2011;2(3):175–178. DOI: 10.7763/IJTEF.2011.V2.99
9. Krugman P. Increasing returns and economic geography. *Journal of Political Economy*. 1991;99(3):483–499. URL: https://pr.princeton.edu/pictures/g-k/krugman/krugman-increasing_returns_1991.pdf
10. Dinerstein M., Einav L., Levin J., Sundaresan S. Consumer price search and platform design in internet commerce. *American Economic Review*. 2018;108(7):1820–1859. DOI: 10.1257/aer.20171218

11. Charbonneau K., Evans A., Sarker S., Suchanek L. Digitalization and inflation: A review of literature. Bank of Canada Staff Analytical Note. 2017;(20). URL: https://www.banqueducanada.ca/wp-content/uploads/2017/11/san2017–20.pdf
12. Glenn E., Wolitzky A. A search cost model of obfuscation. *The RAND Journal of Economics*. 2012;43(3):417–441. DOI: 10.1111/j.1756–2171.2012.00180.x
13. Einav L., Kuchler T., Levin J., Sundaresan N. Assessing sale strategies in online markets using matched listings. *American Economic Journal: Microeconomics*. 2015;7(2):215–247. DOI: 10.1257/mic.20130046
14. Gorodnichenko Y., Talavera O. Price setting in online markets: basic facts, international comparisons and cross-border integration. *American Economic Review*. 2017;107(1):249–282. DOI: 10.1257/aer.20141127
15. Goyal A. Information, direct access to farmers, and rural market performance in Central India. *American Economic Journal: Applied Economics*. 2010;2(3):22–45. DOI: 10.1257/app.2.3.22
16. Lacuesta A., Roldan P., Serrano-Puente D. Effects of e-commerce on prices and business competition. Bank of Spain Analytical Articles. 2020;(4). URL: https://repositorio.bde.es/bitstream/123456789/14121/1/be2004-art38e.pdf
17. Kulakov M.V., Vinogradov A.A. Study on the impact of e-commerce development o inflation in the Euro area. *Nauchno-tekhnicheskie vedomosti Sankt-Peterburgskogo gosudarstvennogo politekhnicheskogo universiteta. Ekonomicheskie nauki = St. Petersburg State Polytechnical University Journal. Economics.* 2020;13(2):110–119. DOI: 10.18721/JE.13210
18. Yi M.H., Choi C. The effect of the Internet on inflation: Panel data evidence. *Journal of Policy Modeling*. 2005;27(7):885–889. DOI: 10.1016/j.jpolmod.2005.06.008
19. Perevyshin Yu., Sinelnikov-Murylev S., Trunin P. Determinants of price differentiation across Russian regions. *Ekonomicheskii zhurnal Vysshei shkoly ekonomiki = The HSE Economic Journal*. 2017;21(3):361–384. (In Russ.).
20. Sinelnikov-Murylev S.G., Perevyshin Yu.N., Trunin P.V. Inflation differences in the Russian regions: An empirical analysis. *Ekonomika regiona = Economy of Regions*. 2020;16(2):479–493. (In Russ.). DOI: 10.17059/2020–2–11

ABOUT THE AUTHORS

Alina M. Grebenkina — Cand. Sci. (Econ.), Researcher, Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia; Assoc. Prof. Lomonosov Moscow State University, Moscow, Russia
https://orcid.org/0000-0002-7264-5399
Corresponding author:
grebenkina-am@ranepa.ru

Maria N. Kuznetsova — Researcher at the Center for Central Banking Studies of the Institute for Applied Economic Research (IPER), Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia
https://orcid.org/0000-0002-3660-6587
kuznetsova-mn@ranepa.ru

Elena V. Sinelnikova-Muryleva — Cand. Sci. (Econ.), senior researcher at the Center for Central Banking Studies, Institute of Applied Economic Research (IPER), Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia
https://orcid.org/0000-0001-7494-2728
e.sinelnikova@ranepa.ru

Authors' declared contribution:
A.M. Grebenkina — theoretical literature review, international experience review, collection and analysis of data by countries, model No. 1 development and validation, description of the results.
M.N. Kuznetsova — collection and analysis of data by Russian regions, model No. 2 development and validation, description of the results.
E.V. Sinelnikova-Muryleva — statement of the problem, development of the conceptual framework of the article, scientific editing of the text, critical analysis of research results.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was submitted on 20.06.2022; revised on 03.07.2022 and accepted for publication on 05.08.2022.
The authors read and approved the final version of the manuscript.

Appendix

Evaluation Results for Model (1)

	2002–2020				2002–2009				2010–2020			
Specification 1 (Economy control variable — real GDP)												
	All sample	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**
rGDP (1 lag)	−0.39***	0.07*	0.02	−0.46***	0.1	0.25**	0.12	0.11	−0.53***	0.04	−0.02	−0.62***
	(0.06)	(0.03)	(0.07)	(0.08)	(0.07)	(0.08)	(0.14)	(0.09)	(0.08)	(0.03)	(0.08)	(0.11)
Money (1 lag)	0.3***	0.04**	0.14***	0.32***	0.1***	−0.00	0.08	0.11***	0.46***	−0.00	0.22***	0.48***
	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)	(0.03)	(0.02)	(0.04)	(0.04)
NER (1 lag)	−0.00	0.04**	0.14***	−0.00	0.31***	0.08**	0.31***	0.33***	−0.00	0.04***	0.1***	−0.00
	(0.00)	(0.01)	(0.02)	(0.00)	(0.02)	(0.03)	(0.04)	(0.03)	(0.00)	(0.01)	(0.02)	(0.00)
Internet (1 lag)	−0.00	0.01	−0.00	0.01	0.06	0.06	−0.09	0.09	0.02	−0.09**	0.03	0.02
	−0.03	−0.02	−0.02	−0.04	−0.05	−0.05	−0.06	−0.09	−0.06	−0.03	−0.03	−0.08
R^2 — within	0.13	0.16	0.3	0.14	0.31	0.24	0.47	0.32	0.16	0.24	0.37	0.17
R^2 — within (adj)	0.06	0	0.19	0.06	0.15	−0.06	0.26	0.17	0.05	0.06	0.25	0.05
Number of observations	1838	202	272	1364	642	75	81	486	1196	127	191	878
Specification 2 (Economy control variable — industrial production index)												
	2002–2020				2002–2009				2010–2020			
	All sample	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**
IPI (1 lag)	0.00	0.05***	0.01	0.00	0.05	0.15**	0.08	0.07	−0.01	0.03**	−0.01	−0.01
	(0.01)	(0.01)	(0.04)	(0.02)	(0.03)	(0.04)	(0.06)	(0.05)	(0.01)	(0.01)	(0.06)	(0.02)
Money (1 lag)	0.06***	0.04*	0.23***	0.05*	0.02	−0.02	0.07	0.02	0.07*	0.01	0.3***	0.05
	(0.01)	(0.01)	(0.04)	(0.02)	(0.02)	(0.02)	(0.06)	(0.03)	(0.03)	(0.02)	(0.05)	(0.04)

Appendix (continued)

	2002–2020				2002–2009				2010–2020			
	All sample	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**
NER (1 lag)	0.15***	0.04**	0.1***	0.23***	0.15***	0.02	0.23***	0.21**	0.15***	0.04**	0.07**	0.23***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.05)	(0.07)	(0.02)	(0.01)	(0.02)	(0.03)
Internet (1 lag)	−0.04*	−0.01	0.03	−0.04	−0.02	0.01	0.04	−0.11	0.00	−0.12***	0.11	0.00
	(0.02)	(0.02)	(0.04)	(0.03)	(0.04)	(0.04)	(0.08)	(0.09)	(0.03)	(0.03)	(0.06)	(0.06)
R^2 – within	0.19	0.2	0.37	0.22	0.17	0.33	0.42	0.15	0.18	0.29	0.43	0.23
R^2 – within (adj)	0.1	0.02	0.21	0.1	0	0.04	0.14	0	0.06	0.08	0.26	0.08
Number of observations	685	172	147	366	237	64	53	120	448	108	94	246
Specification 3 (Economy control variable – unemployment)												
	2002–2020				**2002–2009**				**2010–2020**			
	All sample	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**	**All sample**	**DEV**	**EM**	**D**
Unemp (1 lag)	−0.00	−0.22	−0.19*	−0.00	−0.00	−0.56	−0.3	0.09	−0.00	0.09	−0.11	−0.00
	(0.00)	(0.13)	(0.09)	(0.00)	(0.1)	(0.49)	(0.2)	(0.14)	(0.00)	(0.11)	(0.11)	(0.00)
Money (1 lag)	0.14***	0.03	0.14***	0.15***	0.14***	−0.01	0.09	0.17***	0.14***	−0.01	0.18***	0.14***
	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.05)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
NER (1 lag)	0.16***	0.05***	0.13***	0.21***	0.19***	0.09**	0.21***	0.21***	0.14***	0.04***	0.1***	0.17***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.02)	(0.01)	(0.02)	(0.03)
Internet (1 lag)	−0.02	−0.01	−0.01	−0.01	−0.1	0.01	−0.05	−0.25*	−0.01	−0.09**	0.05	−0.04
	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)	(0.06)	(0.07)	(0.12)	(0.03)	(0.03)	(0.03)	(0.05)
R^2 – within	0.27	0.16	0.31	0.29	0.33	0.16	0.33	0.39	0.22	0.25	0.35	0.22
R^2 – within (adj)	0.18	−0.03	0.2	0.17	0.11	0	0.09	0.12	0.08	0.03	0.22	0.04
Number of observations	1039	167	291	581	358	62	102	194	681	105	189	387

Source: Compiled by the authors.

Note: DEV – developed countries, EM – emerging market economies, D – developing countries; standard errors are indicated in the brackets; *, ** and *** indicate the significance of the model coefficients at 1%, 5% and 10% significance levels respectively; R^2-within (adj) – adjusted coefficient of determination of within-group regression.