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Formation of sects in a religious market

Kirill Bukin [a,*], Mark Levin [a]

[a] *National Research University Higher School of Economics, Moscow, Russia*

Abstract

This paper is an extension of the recent work by the authors where a simplifying assumption of no costs of entry to the religious market was set. In the present paper, the religious market is regulated in the sense that a sect in order to establish itself in a market has to bear costs of entry. In the case of one official denomination the strict sect attracts less flock, and the monopoly church will acquire more church-goers and even marginally religious people will hesitate between joining the church and staying nonreligious. In case of prohibitively high costs the sect will shrink to zero and the church will take control over almost all population with the remaining small group of nonbelievers. A comparative statics problem in the case of the two official churches was also considered. In stage one of the game these churches choose their position in the strictness interval with the subsequent emergence of sects. The more costly is entry the less populated will be the strict sect and even the moderate sect will turn more liberal with the loss of some of its members.

Keywords: religious market, strictness of a denomination, non-religious community, sect.
JEL classification: C02, C31, C63.

1. Introduction and literature review

There is no exaggeration in stating that, since the 1970s, the number of publications on the economics of religion was growing in an almost geometric progression.

One of the most comprehensive reviews on the economics of religion was written by Iyer (2015) and it included over 150 publications. She has tried to include sources covering the subject area almost in full. We will be interested in just a fraction of them. In what follows, the terms “church” and “denomination” will be used interchangeably.

In one of the first-ever published research on economics of religion, Azzi and Ehrenberg (1975) were interested in incentives for the participation in

* Corresponding author, E-mail address: kbukin@hse.ru

church-related activities. By introducing a multi-period utility maximization model, they found at least three such reasons: believers view their afterlife consumption as being related to their participation. Secondly, they derive current satisfaction from church membership and thirdly there are some social pressures that may suggest that participation will positively affect individual success.

It would be fair to say that the economics of religion as a branch of economics started with the pioneering work of Iannacone (1998). He was the first to apply the club goods theory to religious markets. He has shown that, in such markets, there are entry costs, churches compete for the churchgoers and denominations offer differentiated goods. Religious capital, as a term, was introduced and it was shown that the welfare of the parish depends on its value.

In Innacone's series of papers (Iannacone, 1992, 1994, 1998), it was shown that rational consumers of religious goods choose denominations and, at the same time, denominations act as firms offering goods at a market.

The fight against free-riding is a task always faced by the churches. Iannacone has shown that the most effective way of preventing such behavior would be to set rules for the churchgoers that restrict their secular activities. The term "stigma screening" reveals the fact that strict churches have fewer free-riders, higher contributions and stable participation in church life. Moreover, such restrictions make opportunity costs of secular life higher. McBride (2008) presented in detail the practices of the Church of Jesus Christ of Latter Days Saints (LDS, Mormons) along with the stigma screening. McBride was the first to show that the LDS Church produces "high-quality club goods" and "also attempts to identify members' contribution levels and selectively reward high contributors" (pp. 396–397). The LDS Church has worked out the menu for religious goods and the monitoring procedures that enable the clergy to assess the inputs from the individuals. McBride points out that "stigma-screening and menu-monitoring… should be understood as complementary methods for meeting diverse religious goals" (p. 397).

Iannacone made a distinction between churches and sects. If compared to churches, sects exhibit norms which are alien to the prevailing norms of a society. Within the range of strictness, sects are usually more restrictive and they tend to impose unproductive costs such as stigma, sacrifice and behavioral rules. At the same time, sects are quite effective in expelling members who consume religious goods and who give back nothing in return.

Dietary restrictions, strict dress code and many other prohibitions enable flock behavior to be controlled. These restrictions make secular life costly and give a signal about a person's adherence. There is a connection between a formal expression of belonging to a sect and the extent of their participation in the build-up of religious capital both in terms of material and spiritual input.

In 1995 and 1997, Iannacone published papers, with the co-authors, in which they tried to answer two interrelated questions: why do some churches grow rapidly and others lose members and what is the role of government regulations affecting the well-being of denominations?

The answer to the first question is quite simple: churches with high participation rates and abundant resources tend to grow and denominations with low participation tend to decline. Moreover, there is a positive correlation between

the strictness of a church and religious giving. That explains why strict churches with stable participation rates survive albeit not necessarily grow.

As for question two, the authors think that simple deregulation is the major factor of change in the life of religious institutions. Authors provide many examples when the government policy aimed at deregulation of the religious market brings competitiveness and new religions emerge. Grzymala-Busse (2014) compares practices of the liberal churches and strict ones aimed at preserving denominations. Contrary to the liberal churches that are ready to forego some doctrines and rites in order to keep churchgoers numbers stable, strict denominations form self-contained clubs that base their survival not on proselytism or conversion, but on encouraging large families and fertility. She has found that the main mechanism that helps them not only to survive, but to expand, is the growing cost of exit of its members.

A similar narrative can be applied to the Ultra-orthodox Judaism. A detailed analysis of its determinant in the 21st century was undertaken by Berman (2000). This research embraces the history of the birth of the Ultra-orthodox Judaism as retaliation against the transition to the market economy in the 19th century and the spread of the reformed Judaism. The club goods theory explains mutual insurance within the communities. Berman traces the connection between fundamentalism and fertility. In modern Israel, Berman states, "subsidies to Ultra-orthodox club exacerbate distortionary sacrifices and prohibitions, causing reductions in labor supply and increases in fertility" (p. 946). By using the club goods approach, Berman manages to explain the puzzles for a social scientist. These puzzles are: how to explain religious practices of the Ultra-orthodox becoming more time-consuming and stringent, their women fertility rate is still on the rise — a rarity in modern society and, finally, although on average these families are poor, the Ultra-orthodox men prefer to stay as students in yeshivas (religious schools) until they reach the age of 35 or even 40. Berman suggests that the third "puzzle" can be explained by signalling to the club their commitment. Here again, the religious sacrifices screen out the free-riders.

McBride (2015) argues in his recent paper that even strict sects tolerate free-riders since they are seen as potential members of a denomination. As an individual's religious capital increases, the incentive to free-ride decreases. Children from religious families are another source of future members for denominations. Shy (2015) has elaborated the dynamic model of a denomination with overlapping generations.

Levy and Razin (2012) have decided to find out how the religious beliefs are formed. They managed to set a game theory model in which the individuals interacting with the believers inside the church, as well as the outsiders following in these interactions the simple prisoners' dilemma game, envisage the response from the Almighty to their behavior (cooperate or confront). Religious beliefs are defined as a statistical relationship between an individual's behavior and the likelihood to experience negative or positive utility shocks. As a result of these interactions and the beliefs formations, an individual either joins the church or remains non-religious. Although the concept of strictness is not used in this paper, still only those individuals who see a clear connection between reward/punishment and their activities join the church. This model sheds

light on motivations to become religious. A spiritual motivation arises as individuals believe that cooperation is rewarded. A material motivation arises as religious individuals enjoy an equilibrium higher level of cooperation from others. Still this model could not help understand the prospects of the religion as an institution in the near future.

Let us consider several papers that can be grouped together under the title "spatial models of the religious market". The name originates from the pioneering work on the industrial organization (Hotelling's spatial model). Montgomery (2003) defines the utility of a religious individual by the formula $U_j(x, e) = -e + e_j - d(x - x_j)^2$, where j — denomination's number, e_j — its exogenous efforts on religious community well-being, x_j — its location on the strictness interval where the density of the individuals' distribution is uniform. Montgomery's research follows the prior work of Barros and Garoupa (2001). In their paper, the main area of research is placed on the relationship between the strictness of a church and the number of its followers. They have shown that the monopoly church should be relatively liberal. A church seeks to maximize the welfare of its members — that is in effect the church's objective function. A church sets its position on the strictness interval, taking into account the attitude of the people toward strictness, the "capacity" of its religious capital and the presence of its rivals. The authors also consider the two-period game in which the leader makes the first move by setting its position on the strictness interval and trying to deter the follower.

In Montgomery (2003), the state does not prevent a denomination from its entry. Still there are entry costs to bear and an empty niche to fill. The objective function of a church is given by the formula $V_j = m_j - \frac{1}{2}e_j^2$, where m_j — the size of the denomination and e_j — its efforts. A simultaneous game is considered when the churches choose their efforts and the strictness levels.

The religious market of India is considered in Iyer et al. (2014). The authors apply the spatial model in order to show that a church plays a role (amongst others) as a provider of elementary education.[1] The current research was inspired by the paper of McBride (2008) where the strategic interaction of denominations goes on at an unregulated market. McBride asks a question: will economic growth necessarily lead to secularization of a society? McBride has noticed that, with the economy growth, the denominations' opportunities would also improve.

In Hotelling's modified model, the individuals choose their affiliations after the churches set their positions on the strictness interval. The objective function of the church is given by $V_d = Am_d - c$, where m_d is denomination size (number of followers), $A > 0$ is a parameter affecting the effectiveness of a church (the same for everyone), and c denotes entry costs.

McBride considers subgame-perfect Nash equilibrium (SPNE) in a three-period game. In period one, the existing churches set their positions on the strictness scale. In period two, the churches decide whether to leave the market (or hurry up until it is not too late for the entry). In the third period, the people choose their denominations.

[1] In Yang (2006), one may find the comprehensive analysis of the religious market in China.

McBride investigated some particular cases with 3 and 4 churches in the market. He found a cap on the number of churches under given parameters of the model. He managed to perform a qualitative analysis of the religious trends as a result of the change of attitude on strictness.

In the current research, the McBride's approach was seriously modified. We have included into the utility function of an individual, not only the desire for the closest strictness, but also the "capacity" of a given church which is related to the denomination size. Similar to McBride's model, we consider the unregulated religious market. That will allow us to consider the birth of sects that will find their position on the strictness interval along with the "official" churches.

2. Recent developments

In Bukin and Levin (2018), the sects can emerge without entry costs and they exist along with the official denominations. In contrast to the existing models, where agents seek the closest church in terms of strictness, the capacity of the church also matters to the people. This capacity directly affects religious capital acquisitions. The natural cap on the number of denominations in McBride (2010) was associated with the entry costs. In Bukin and Levin (2018), such a boundary does not exist. Although the majority of results in this paper are proven under the assumption of a uniform density of strictness amongst the agents, it is shown that the shift in religious preferences towards milder strictness will result in a monopoly church lowering its strictness. Another interesting result is that the overall number of non-religious individuals will grow despite the shift in strictness of the official church which leads to growing number of moderate believers joining the monopoly.

Hereafter we provide the main results from Bukin and Levin (2018).

In this paper, all denominations and sects that may arise maximize the number of church-goers.

Let m_d be the expected number of the flock affiliated with the church d. Then the objective function of a church will be maximized: $m_d \to \max$.

In McBride (2010), an agent i located on the strictness interval at s_i seeks the closest church in terms of strictness i.e. $-|s_i - s_d| \to \max$ (search amongst existing churches and sects).

In Bukin and Levin (2018), the agent's choice problem was reconsidered. Along with the choice of a church with the appropriate strictness, an agent looks for the "capacity" of a church which is associated with the size of its flock. Then the problem becomes $k\sqrt{m_d} - |s_i - s_d| \to \max$. Parameter $k > 0$ can be interpreted as the valuation of the religious capacity of a denomination across all individuals.

We begin with the case of the monopoly church.

The individuals are uniformly spread over the unit length strictness segment $[0, 1]$. Among these individuals there are moderate believers (in the neighborhood of $s = 0$) as well as the individuals who prefer strict faith. These may unite and later form a strict sect whose strictness will be $s = 1$. Moderately religious individuals may prefer to avoid the only official church in the market and their subsequent choice of strictness will be $s = 0$. The uniform distribution of strictness assumption will result in the symmetric output of the game which will be described below.

3. Game description

This is a symmetric information game consisting of 3 periods. In period 1, the church chooses its location on the strictness segment. In period 2, sects will arise and they choose their respective locations. In period 3, agents choose the most preferable church or sect to join. Due to the uniform distribution of strictness among individuals, it is clear that the monopoly church will choose the central location $s^* = \frac{1}{2}$.

The proof of the following two propositions that follow can be found in Bukin & Levin, 2018.

Proposition 1.

Let $k < \frac{1}{2}$. Then the agents distributed over $[0, \varepsilon]$, where ε is the root of the equation $k\sqrt{\varepsilon} - k\sqrt{1-2\varepsilon} = 2\varepsilon - \frac{1}{2}$, will stay non-religious, the agents distributed over $[1-\varepsilon, 1]$ will join the sect and the rest of the individuals will join the monopoly church.

Now let us consider the case of the two official churches.

In period 1 of the game, two churches enter the market. As in the case of monopoly, non-believers and agents preferring strictness will form their communities. In contrast to the odd-numbered case, we show that the center of the strictness segment is vacant and can be filled in by an emerging additional sect.

Proposition 2.

Let $k < \frac{1}{2\sqrt{2}}$. Strictness segment will be split into sub-segments representing affiliations: non-believers fill in $[0, \varepsilon]$; church 1 covers $[\varepsilon, \frac{1}{2} - \delta]$; a sect will appear covering $[\frac{1}{2} - \delta, \frac{1}{2} + \delta]$; church 2 covers $[\frac{1}{2} + \delta, 1 - \varepsilon]$; strict sect fills in $[1-\varepsilon, 1]$. ε is the solution of equation $3\varepsilon - \frac{1}{2} = 2k(\sqrt{\varepsilon} - \sqrt{\frac{1}{2} - \frac{3}{2}\varepsilon})$, and $2\delta = \varepsilon$.

The proposition 2 result may seem unrealistic: how would the official churches allow for the sect establishment right in the middle of the strictness segment? However, in this particular model, sect formation does not bear any entry costs. When costs are imposed, the result may be different.

4. New results

Now let us consider the effect of entry costs imposed on the strict sect on the position of a monopoly church.

In the case of just one official church, the question arises whether its capacity in terms of church-goers will be affected by the government decision to hinder the appearance of a strict sect in the religious market. To model this hindrance, we will introduce entry costs making the evolvement of a sect with the maximum strictness level more costly.

Intuition tells us that as a result of this government interference, the sect will employ less flock, the official church will strengthen and acquire more church-goers

and, moreover, its growth will affect those individuals that hesitate between joining the church and staying non-religious. This affiliation change will make the community of non-religious people less inhabited. In the case of prohibitively high entry costs, the sect will shrink to zero and the monopoly will take control over the majority of individuals with a small proportion of non-religious people remaining.

Before we go ahead with the formal proposition, let us think over the game modification allowing for government interference.

First of all, the information becomes asymmetric. In period 0, the authorities set out laws aimed at making the formation of a strict sect difficult. Although this information is available to everyone, the monopoly church, choosing its strictness on the "strictness interval", is unable to assess the implications of the anti-sect law. That means in period 1, the monopoly prefers position at $s^* = \frac{1}{2}$ similar to the zero costs case. In period 2, the strict sect establishes itself at $s^* = 1$. In period 3, people decide either to join the official church or to join the sect or to choose the $s^* = 0$ level which can be interpreted as the formation of community of non-religious individuals.

To formalize the model, let us denote by c entry costs of a sect, non-religious individuals inhabit the segment $[0, \varepsilon]$, and the individuals with the high strictness preference inhabit $[1-\varepsilon', 1]$ given the "moderate" level of c costs. It is clear that both ε and ε' depend on c provided the fixed value of k. So we can use notation $\varepsilon(c)$ and $\varepsilon'(c)$.

Proposition 3.

In the game described above with $k < \frac{1}{2}$, the strictness segment is split into 3 sub-segments: non-religious individuals occupy $[0, \varepsilon]$, the church covers $[\varepsilon, 1-\varepsilon']$ and the sect followers inhabit $[1-\varepsilon', 1]$.

For each $k < \frac{1}{2}$, there exists $c_{\max} > 0$ such that for $c \geq c_{\max}$, the sect will not arise.

Moreover, for each such $c_{\max}$, the minimum sect dimension $\varepsilon'_{\min}$ exists such that $\varepsilon' \geq \varepsilon'_{\min}$.

The values of $\varepsilon(c)$ and $\varepsilon'(c)$ satisfy the system of equations and inequality

$$k\sqrt{\varepsilon} - \varepsilon = k\sqrt{1-\varepsilon-\varepsilon'} - \frac{1}{2} + \varepsilon \tag{1}$$

$$k\sqrt{\varepsilon'} - \varepsilon' - c = k\sqrt{1-\varepsilon-\varepsilon'} - \frac{1}{2} + \varepsilon' \tag{2}$$

$$c \leq \frac{1}{2} - k\sqrt{1-\varepsilon} \tag{3}$$

It can be also shown that $\frac{d\varepsilon}{dc}$ and $\frac{d\varepsilon'}{dc}$ are negative for $0 < c < c_{\max}$.

Proof.

Equations (1) and (2) characterize the equilibrium individuals on the strictness segment. As for (3), this inequality describes the condition under which the strictest individual prefers to join the sect. Inequality (3) can be interpreted as a participation constraint for sectarian activity.

Table 1
Dependence of the strict sect parameters on value of k.

k	$c_{max}/\varepsilon_{min}$
0.45	0.077/0.069
0.40	0.130/0.051
0.35	0.180/0.038
0.30	0.225/0.030
0.25	0.277/0.016
0.20	0.325/0.008
0.15	0.368/0.005
0.10	0.413/0.0018

Source: Authors' calculations.

The system (1)–(3) will be solved numerically by the Wolfram Mathematica package. The results are presented in Table 1 and are approximate. See also the Appendix Table A providing information on k, c, ε, ε'.

The comparative statics statement follows from first-order differentiation of the equation (1). Then we get:

$$\left(\frac{k}{2\sqrt{\varepsilon}} + \frac{k}{2\sqrt{1-\varepsilon-\varepsilon'}} - 2\right)d\varepsilon + \frac{k}{2\sqrt{1-\varepsilon-\varepsilon'}}d\varepsilon' = 0 \quad (4)$$

The result will follow if we evaluate the sign of coefficient functions in this equation. It is based on inequality $\left(\frac{k}{2\sqrt{\varepsilon}} + \frac{k}{2\sqrt{1-\varepsilon-\varepsilon'}} - 2\right) < 0$ for all k and ε, ε' values presented in Appendix Table A and beyond (clearly, $\varepsilon(c)$ and $\varepsilon'(c)$ are continuous functions of c). It may seem strange that $\left(\frac{k}{2\sqrt{\varepsilon'}} + \frac{k}{2\sqrt{1-\varepsilon-\varepsilon'}} - 2\right) < 0$ for all k and ε, ε' values taking into account ε'_{min} in the denominator that can be small (see Table 1). However, at the same time, the smaller the ε'_{min}, the smaller the corresponding k value.

According to (4), the signs of $d\varepsilon$ and $d\varepsilon'$ are the same. Then they are negative given $dc > 0$. Otherwise for growing costs, the sects would be growing which contradicts the system of equations and common sense as well.

Now we turn our attention to the emergence of a strict sect in the case of the two official churches.

Proposition 4.

In the three stage game, when two official churches choose their strictness in stage one and three sects emerge in stage two, the rise in the costs of entry for the strict sect will lower its flock, will make the moderate sect more liberal, and will diminish the number of non-religious individuals.

Proof.

Since the first move is done by the official churches, they choose the same positions on the strictness interval as in the case of the free entry for sects. Denote them as earlier by s_1 and s_2. To describe the equilibrium positions of denominations and sect, we have to introduce four unknowns ε_1, ε_2, ε_3, ε_4 and let the costs of entry for the strict sect be c. We assume that the moderate sect can still emerge

without a hindrance. In order to find ε_i, $i = 1,2,3,4$, we have to solve the system of four equations and one inequality:

$$k\sqrt{\frac{1}{2}-\varepsilon_1-\varepsilon_2}-(s_1-\varepsilon_1)=k\sqrt{\varepsilon_1}-\varepsilon_1 \tag{5}$$

$$k\sqrt{\frac{1}{2}-\varepsilon_1-\varepsilon_2}-(\frac{1}{2}-s_1-\varepsilon_2)=k\sqrt{\varepsilon_2+\varepsilon_3}-\varepsilon_2 \tag{6}$$

$$k\sqrt{\varepsilon_2+\varepsilon_3}-\varepsilon_3=k\sqrt{\frac{1}{2}-\varepsilon_3-\varepsilon_4}-(s_2-\frac{1}{2}-\varepsilon_3) \tag{7}$$

$$k\sqrt{\varepsilon_4}-\varepsilon_4-c=k\sqrt{\frac{1}{2}-\varepsilon_3-\varepsilon_4}-(1-\varepsilon_4-s_2) \tag{8}$$

$$c\le 1-s_2-k\sqrt{1-\varepsilon_3-\varepsilon_4} \tag{9}$$

The last inequality represents the participation constraint for the strict sect. We consider it non-binding.

Let us apply the total differential to the equation (8).

Then we get:

$$\left(\frac{k}{2\sqrt{\varepsilon_4}}+\frac{k}{2\sqrt{\frac{1}{2}-\varepsilon_3-\varepsilon_4}}-2\right)d\varepsilon_4+\frac{kd\varepsilon_3}{2\sqrt{\frac{1}{2}-\varepsilon_3-\varepsilon_4}}=dc>0 \tag{10}$$

We know that $d\varepsilon_3 \le 0$ since the strict official church, due to the acquisition of the more strict individuals after the introduction of entry costs, becomes more numerous and attracts adjacent individuals from the left, hence we get $d\varepsilon_4 < 0$ since $\left(\frac{k}{2\sqrt{\varepsilon_4}}+\frac{k}{2\sqrt{\frac{1}{2}-\varepsilon_3-\varepsilon_4}}-2\right)<0$ (see the previous proposition).

A similar argument can be applied to the total differentials of the equations from (5) to (7). Finally we get:

$$\left(\frac{k}{2\sqrt{\varepsilon_1}}+\frac{k}{2\sqrt{\frac{1}{2}-\varepsilon_1-\varepsilon_2}}-2\right)d\varepsilon_1=-\frac{kd\varepsilon_2}{2\sqrt{\frac{1}{2}-\varepsilon_1-\varepsilon_2}} \tag{11}$$

That means that the differentials $d\varepsilon_1$ and $d\varepsilon_2$ have the same negative sign.

Due to the incurred costs, the positions of the churches and sects on the segment become asymmetric: now $\varepsilon_2 > \varepsilon_3$ and the average strictness of the moderate sect goes down.

If the government is rather inclined to control the strict church while leaving the moderate sect on its own, denominations will be located on the strictness segment similarly to the monopoly case. The strict sect will shrink; Church 2 will

gain additional followers both from the right and from the left. Church 1, which is less strict than Church 2, will have its own acquisitions: it will recruit supporters who could have chosen a moderate sect; some marginally religious people will prefer to join it as well.

Imposing costs on a moderate sect will not drastically change the picture. Let us suppose these costs are tolerable and will not lead to sect prohibition, then two official churches benefit from deterrence (prohibition will be beneficial for these churches even to a greater extent). Compared with the case when only the strict sect is deterred, the maximum allowable costs of entry $c_{\max}$ will decline.

The case of odd-numbered official churches almost copies the monopoly case. It is clear that the maximum allowable costs for the sect's entry will be lower compared with the monopoly church case.

5. Conclusion and prospects for further research

The current research was aimed at improving the model formulated in Bukin and Levin (2018). In the case of one official church, it was shown that the entry deterrence of a strict church will result in diminishing its population, increasing the number of the official church-goers and a moderate decline in non-religious agents. It was also found that the minimum sect size $\varepsilon'_{\min}$ exists. By even a negligible excess of the maximum entry costs, the sect will simply cease to exist. Similar results are valid in the case of the two official churches.

All previous research was based on the version of Hotelling's spatial model at a "frozen" time. It would be interesting to work out a dynamic model in which two concurrent processes are analyzed: in the presence of the secular trend in population, a strict sect due to its fertility rate retains its population or may even grow.

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Appendix

We present here the table with only some values of k, ε, ε' and c just to show how they are interrelated. Each time, when the costs of entry go up, it greatly affects the number of sectarians and, to a lesser extent, the number of non-religious people. Simultaneously, if in a society, the valuation of religious capital goes up (k becomes larger), then it will mostly affect non-religious people — their numbers will shrink.

Table A
Sectarian parameters for various values of k and c.

k	c	ε	ε'
0.45	0.05	0.136	0.099
	0.06	0.134	0.069
0.4	0.10	0.150	0.083
	0.13	0.148	0.051
0.35	0.15	0.169	0.068
	0.18	0.165	0.038
0.3	0.20	0.183	0.054
	0.22	0.181	0.035
0.25	0.25	0.196	0.041
	0.26	0.195	0.033
0.2	0.30	0.200	0.030
	0.32	0.200	0.013
0.15	0.34	0.220	0.027
	0.36	0.219	0.013
0.1	0.37	0.231	0.030
	0.39	0.230	0.018

Source: Authors' calculations.