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MODELLING OF THE FDI RECIPIENTS' HETEROGENEITY IN RUSSIAN FOOD PROCESSING INDUSTRY

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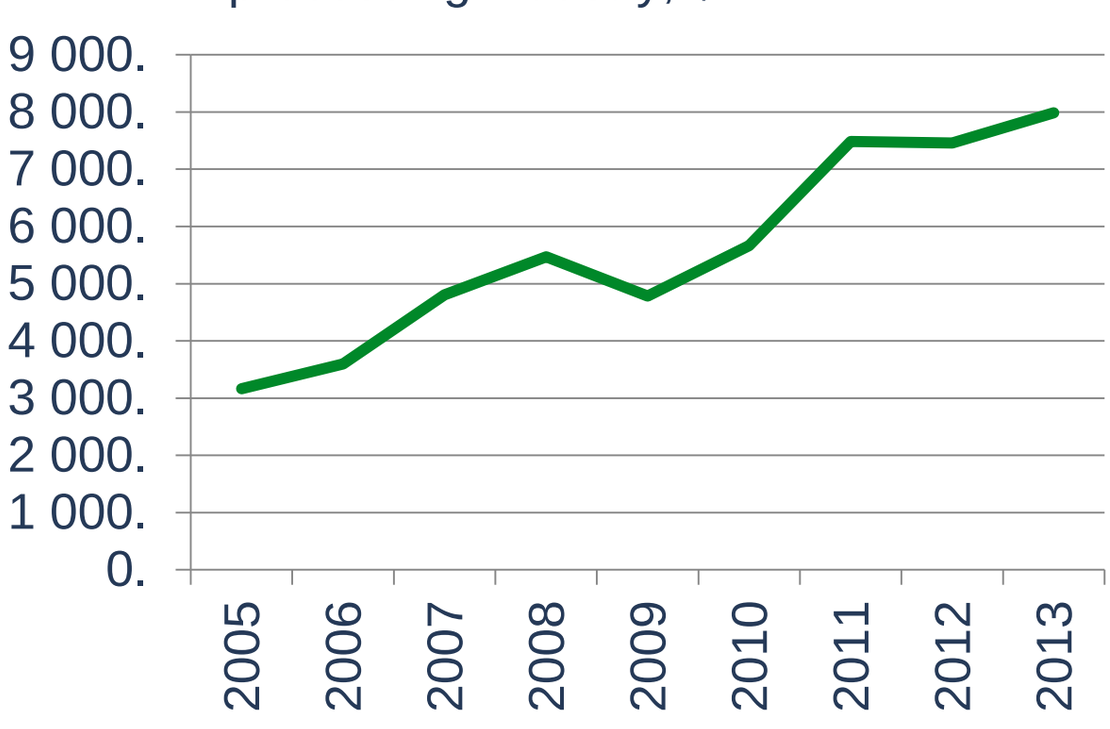
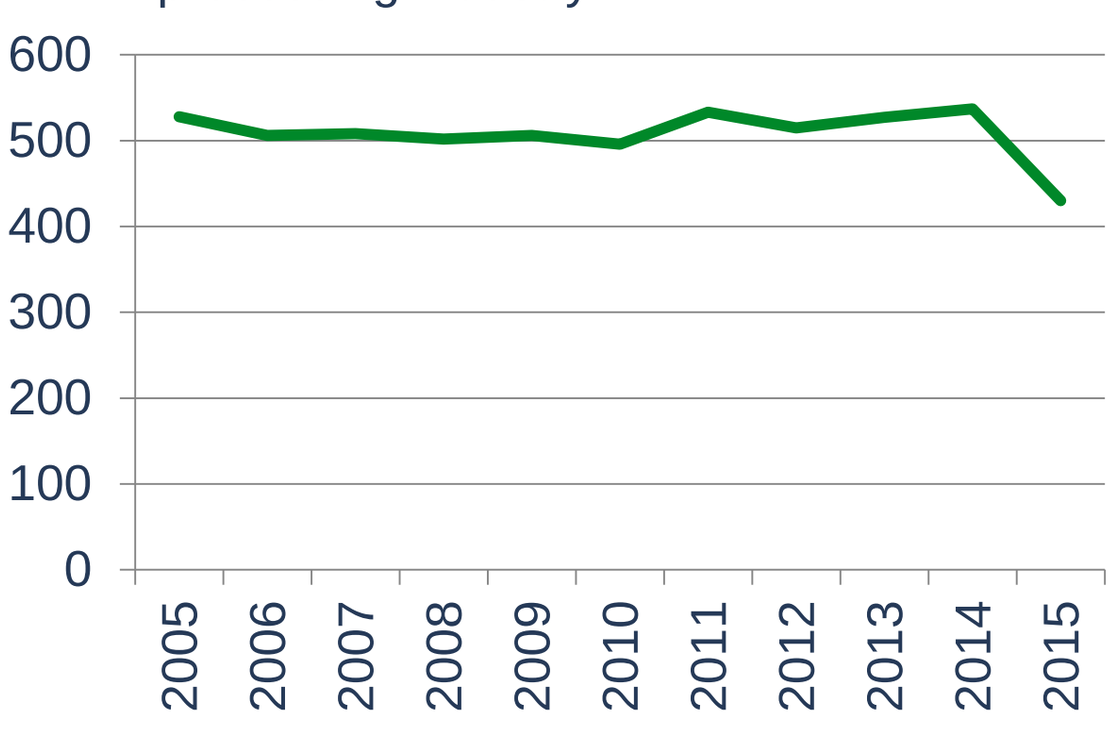
MOTIVATION

Dynamics in foreign activity measures in Food processing industry in Russia

- Accumulated inward FDI in Food processing industry, $mln



- Number of companies with FDI in Food processing industry



$\rho \approx 0.35$

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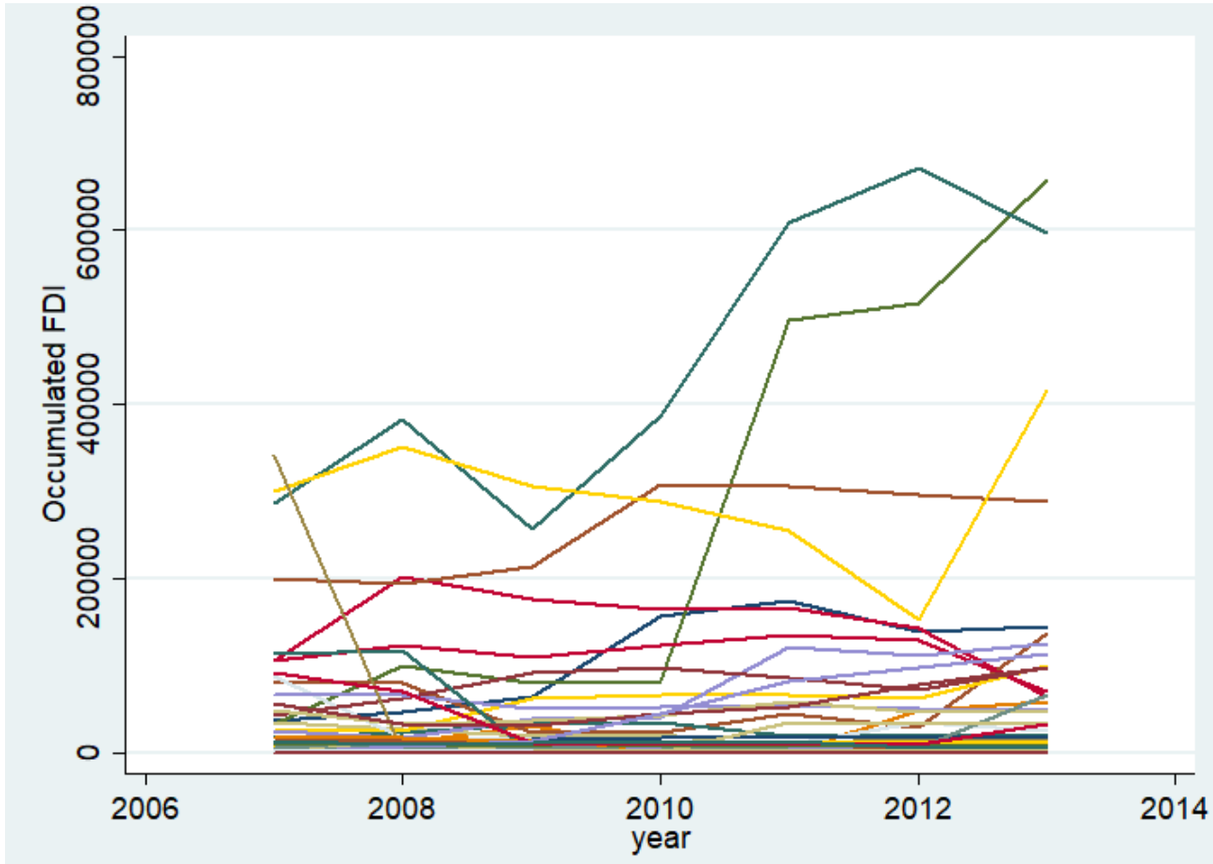
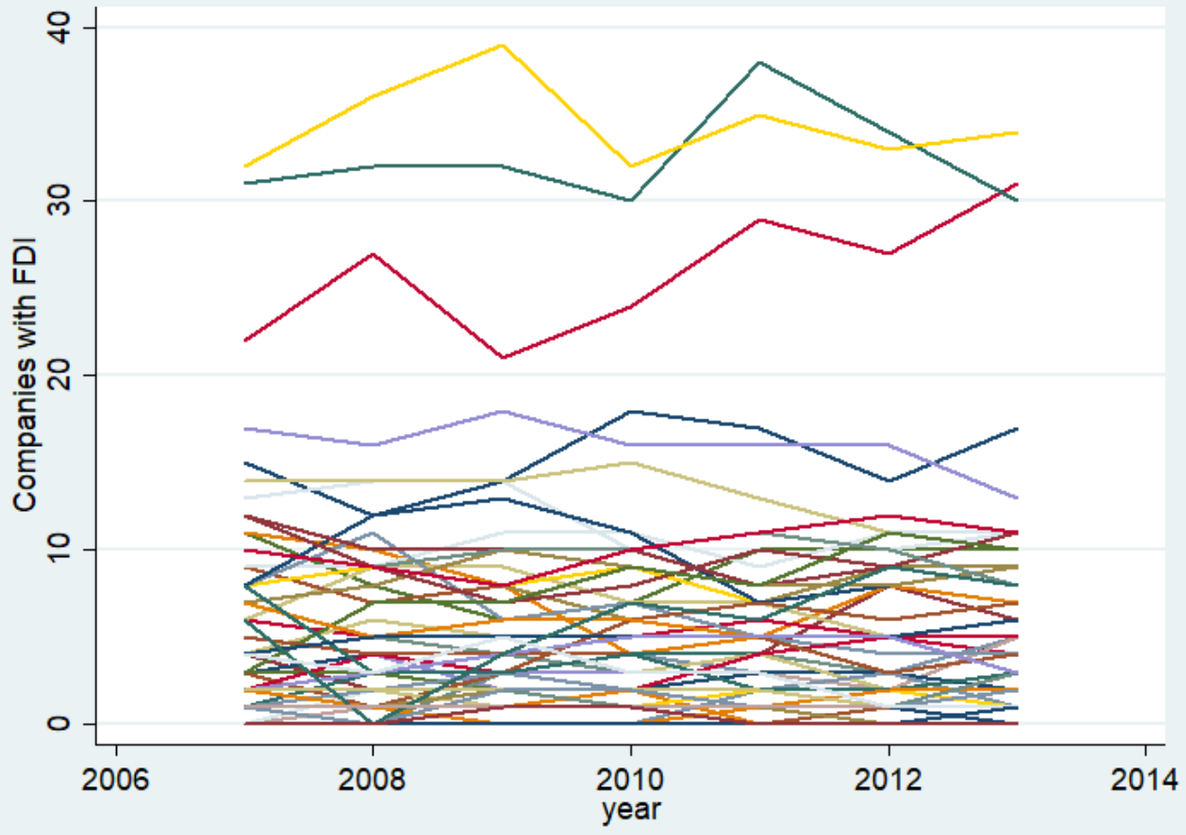
MOTIVATION

Dynamics in foreign activity measures in Food processing industry in Russia

** without Moscow city and Moscow region*





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PROBLEM STATEMENT

Main purposes of the research:

- Propose an approach to the analysis the regional heterogeneity of the FDI recipients in Russian food processing industry
- Investigate the dependence of foreign capital presence from previous activity of foreign investors
- Compare the agglomeration effects on foreign participation on firm and regional levels

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THEORETICAL BACKGROUND

Firm level

- The main idea – modelling of the decision to invest taking into account other agents (e.g. Pusterla, Resmini, 2007; Spies, 2010):

Invest if $\pi_{ij}(Foregn\ Investor_i, Recipient_j\ (Firm, Region)) > \pi^*_{ij}$

- Do not know the investor – we can see only the recipient
- Determinants illustrate different motives to invest

Regional level

- Aggregation to the regional level – number of companies with FDI (number for cases with positive decision to invest)

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THEORETICAL BACKGROUND

Agglomeration effect of FDI: the objects (firms and regions) in the sample cannot be treated as totally independent. This dependence may be treated as the investment climate in a region (the investment activity in neighboring regions).

This idea was investigated and may be called

- “agglomeration effect” (e.g. Buccellato, Santangelo , 2009),
- “within-county effect” (e.g. Casi, Resmini, 2014),
- “spillover effect”,
- “effect of third agents” or “third-country effects” (e.g. Baltagi, Egger, 2007),
- “spatial effect” (e.g. Blonigen at al., 2007 and Ledyaeva, Pankki, 2007).

Publication bias – positive and significant spillover effect of FDI (Demena, 2015)

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METHODOLOGY

Roadmap of the research

1. Modelling of the probability to have a foreign owner (firm level)
2. Modelling of the number of companies with foreign ownership in a region (regional level)
3. Estimation of regional agglomeration effect on the probability to have FDI and on the number of companies with FDI in a region and the analysis of the estimates on individual and regional levels
4. Analysis of heterogeneity of regions in terms of the agglomeration effects

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METHODOLOGY

Binary choice model

- modelling of the probability to have a foreign owner (share of foreign capital is more than 10%, $fdi_{i,t} = 1$) of the company
- several binary choice models on a firm-level taking into account moderating regional and heterogeneity of companies from different regions
- the model is estimated for each year separately
- binary choice model with regional moderating effects:

$$P(fdi_{i,t} = 1) = P\left(fdi^*_{i,t} > 0\right),$$

$$fdi^*_{i,t} = \alpha + \delta \cdot fdi_{i,t-1} + Firm'_{i,t}\beta + Region'_{j,t-1}\gamma + \varepsilon_{i,t},$$

$\varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)$, – iid, uncorrelated with regressors;

i – company, j – region;

$Firm'_i$ – a set of company characteristics,

$Region'_j$ – a set of regional characteristics.

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METHODOLOGY

Count data model

- modelling of the number of companies with foreign direct investment and of companies with foreign ownership in a region ($FC_{j,t} = f$)
- several count-data models on a regional level for each year separately
- Poisson regression model:

$$P(FC_{j,t} = f) = F(Region_{j,t}),$$

t – year, j – region; $Region'_{jt}$ – a set of regional characteristics;

$F(z_{j,t} = z) = \frac{exp(-\mu_{j,t}) \cdot \mu_{j,t}^{z}}{z!}$ – Poisson distribution function, where

$$\mu_{j,t} = exp\left(\alpha + Region'_{j,t}\gamma\right)$$

- Negative binomial regression model

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METHODOLOGY

Investigation the agglomeration effects

for a micro-level binary choice model:

- a time lag of ownership status of this company,
- a time lag of amount of food industry companies with FDI, accumulated FDI and inflow of FDI in the region of modelled company (moderating agglomeration effects), spatial lags;

for a regional-level count data model:

- a time lag of amount of food industry companies with FDI in the region, spatial lag,
- a time lag of accumulated FDI and inflow of FDI, spatial lags.

Spatial lags are imposed to the model as a proxy to the investment climate in the area. As a vector for all regions: $SpatialLagOfFDI_{t-1} = W \cdot FDI_{t-1}$

As a component of a vector for region i: $SpatialLagOfFDI_{t-1,i} = \sum_{j=1}^{N} \omega_{i,j} \cdot FDI_{t-1}$

W – a spatial weighting matrix (here – inverse distance between capitals of regions), $\omega_{i,j}$ – component of a matrix W (the value of the inverse distance between capitals of regions i and j).

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METHODOLOGY

Heterogeneity of regions

- Marginal effects for subgroups

- Multilevel modelling*
  - binary choice model with regional random intercept α_j, regional random slope $(\gamma + \gamma_j)$:

$$P(fdi_i = 1) = P(fdi^*_i > 0),$$

$$fdi^*_i = \alpha + \alpha_j + Firm'_i\beta + Region'_j(\gamma + \gamma_j) + \varepsilon_i,$$

$\alpha_j \sim N(0, \sigma_\alpha^2)$, $\gamma_j \sim N(0, \sigma_\gamma^2)$, – independent, uncorrelated with ε_i and regressors

  - Poisson regression model with regional random intercept α_j, regional random slope $(\gamma + \gamma_j)$:

$$P(FC_{jt} = f) = F(Region_{jt}),$$

$F(z_{jt} = z) = \frac{exp(-\mu_{jt}) \cdot \mu_{jt}^z}{z!}$ – Poisson distribution function, where

$$\mu_{jt} = exp\left(\alpha + \alpha_j + Region'_{jt}(\gamma + \gamma_j)\right)$$

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DATA

- On a firm level – RUSLANA Van Dijk data base;
- On a regional level – Russian Federal State Statistic Service (Rosstat) and Central Bank of Russia data bases;
- Research period is from 2008 to 2015 (annual statistics of 2224 Russian companies working in food processing industry located in 79 regions).

The sample was restricted on a base of the size of companies: more than 100 workers during the observed period. It was done because of possible unreliability of data on ownership structure for small companies. However the results on Ruslana and Rosstat are comparable to some extent.

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DATA

Amount of companies with FDI and without FDI in a sample according to RUSLANA Van Dijk									
FDI\year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Amount of companies with foreign capital <10% ("no FDI")	2105	2175	2066	2200	1997	1933	1922	2175	1940
Amount of companies with foreign capital >10% ("has FDI")	119	49	158	24	227	291	302	49	284
Total	2224								

Amount of companies with FDI according to Rosstat								
FDI\year	2007	2008	2009	2010	2011	2012	2013	2014
Amount of incumbent food industry companies with FDI	527	520	519	509	544	527	538	508

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RESULTS

The probability to have a foreign owner

	2009	2010	2011	2012	2013	2014
$\boldsymbol{fdi_{i,t-1}}$	**+++**	**+++**	**+++**	**+++**	**+++**	**+++**
$\boldsymbol{FC_{j,t-1}}$	**+**	**+**	**+**	**+**	**+**	**+**
$Spatial\ Lag\ of\ FC_{j,t-1}$	+	0	0	+	0	0
$\boldsymbol{Accumulated\ FDI_{j,t-1}}$	**+**	**+**	**+**	**+**	**+**	**+**
$Spatial\ Lag\ of\ Accumulated\ FDI_{j,t-1}$	0	-	0	-	0	0
$FDI\ Inflow_{j,t-1}$	+	+	0	+	+	0
$Spatial\ Lag\ of\ FDI\ Inflow_{j,t-1}$	0	-	0	-	0	0

Heterogeneity: groups of regions according to marginal effects
Multilevel models show no additional heterogeneous effects

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RESULTS

The number of companies with foreign direct investment (Negative binomial)

	2009	2010	2011	2012	2013
$\boldsymbol{FC_{j,t-1}}$	**+**	**+**	**+**	**+**	**+**
$Spatial\ Lag\ of\ FC_{j,t-1}$	0	0	0	0	0
$Accumulated\ FDI_{j,t-1}$	0	-	-	-	0
$Spatial\ Lag\ of\ Accumulated\ FDI_{j,t-1}$	-	0	0	0	-
$FDI\ Inflow_{j,t-1}$	0	0	-	0	0
$Spatial\ Lag\ of\ FDI\ Inflow_{j,t-1}$	0	0	0	0	-

Multilevel models show regional heterogeneous effects (on intercept)

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CONCLUSION

- Foreign ownership is stable → foreign investment is strategic and long-term;
- For companies there is a positive influence of foreign activity in the region the previous year on having a foreign owner (FDI) → the investment climate, agglomeration effect;
- In some regions for companies there is a negative agglomeration effect of foreign activity in neighboring regions the previous year on having a foreign owner (FDI) → competition effect;
- Regions may be clustered according to the marginal effects of regressors.

- Number of companies is stable in each region;
- No agglomeration effects (or negative);
- The inward FDI has no stable influence on the number of companies with FDI.

- *FDI inflow does not mean the creation of new companies but it may be treated as a guarantee the foreign owner will stay further and continue business*

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FURTHER STEPS

- Offshore and pure foreign investment;
- Various distance measures and weighting matrices;
- Specification of the models;
- …

The results of this investigation may be used

- for a correct modelling of the effects of foreign investment and ownership on companies and regions taking into account the endogeneity of these factors,
- for understanding general tendencies in foreign activity distribution among regions of Russia,
- for policy measures to deal with FDI in a particular region.

…the research is in progress…

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Thank you for attention!

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