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Estimation of socio-economic impacts of the RDP 2007-2013 on the food processing sector in Poland

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Outline

o RDP overview

o Evaluation purpose and questions

o Evaluation approach

o Data

o Major findings

o Strengths and weaknesses

o Lessons learnt and recommendations

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RDP 2007-2013 in Poland

Various RD measures supported food processors located in rural areas:

DIRECTLY

M 123 on adding value to agricultural and forestry products.

For instance, by:

- Introducing new and/or modernisation of the existing facilities and improvement of their use;
- Reducing production costs
- Reaching compliance with EU standards
- Improving cooperation with primary agricultural producers
- Improving food quality, safety and traceability
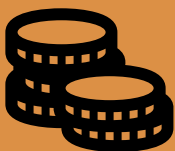
Approx. EUR 856 million invested

INDIRECTLY

Axis 1 – Measures improving the competitiveness of the agricultural and forestry sector

For instance:

- M 124 on new products, processes and technologies;
- M 125 on agricultural and forestry infrastructure

Axis 2 – Measures improving the environment and the countryside through land management

- M 215 on Animal welfare

Axis 3 – Measures supporting diversification of economic activity

- M 301 on rural infrastructure,
- M 313 on tourism activities,
- M 321 on basic services
- M 322 on village renewal

Axis 4 – LEADER

- M 412 and M 413 on Local development strategies
- M 421 on cooperation projects
- M 431 on running the local action group

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Evaluation challenge

Assessing impacts when multiple RDP measures affect food processors, for instance:

◦ A change of economic performance of _supported food processing enterprises_ occurred as a **direct effect** of RDP measures, e.g. M123

◦ A change of economic performance of _supported food processing enterprises_ occurred as an **indirect effect** of RDP measures, e.g. M142, M215

◦ A change of economic performance of _non-supported food processing enterprises_ occurred as an **indirect effect** of RDP measures targeted towards agriculture or food processors

◦ A change occurred through specific **measures targeted on the _overall development of rural areas,_** incl. infrastructure, e.g. M321, M322

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Evaluation purpose

Commissioning Institution: European Commission DG – Joint Research Center

Purpose: Estimation of net effects of RDP 2007-2013 on food processors by applying recently developed advanced evaluation methodologies based on a quasi-experimental evaluation design (counterfactuals) and using structural regional data available at the NUTS-4

Timeline: April – September 2018

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Common Evaluation Questions

- **Programme related CEQ n. 1:** *To what extent has the RDP contributed to the growth of the whole rural economy? (especially of the food processing sector)*

- **Programme related CEQ n. 2:** *To what extent has the RDP contributed to employment creation? (especially in the food processing sector)*

- **Measure related CEQ n. 20**: *What other effects, including those related to other objectives/axes, are linked to the implementation of this measure (indirect, positive/negative effects on beneficiaries, non-beneficiaries)?*

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Evaluation elements

Main impact indicators:
◦ Employment in the food processing sector

Additional impact indicators:
◦ Number of food processing enterprises
◦ Number of food processing enterprises crossed-off from the firm registry (e.g. due to bankruptcy)

Judgement criteria:
◦ Due to RDP (2007-2013) employment in the food processing sector increased
◦ Due to RDP (2007-2013) the number of food processing enterprises increased
◦ Due to RDP (2007-2013) the number of food processors crossed-off from the registry decreased

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Methodological challenges

◦ In theory, the application of advanced quasi-experimental evaluation methodologies (e.g. PSM-DID) could be possible **if *firm-level datasets for food processors existed (!)*** – at least some effects could be analysed

◦ However, **spillover** effects of **RDP measures targeting overall development of rural areas** (e.g. via improvement of rural infrastructure, support of other employment opportunities for rural population, etc.) could **not** be analysed using above approach

◦ Similar problems would appear while trying to estimate the impact of the RDP on **food processors** affected *indirectly* by the measures targeting **agricultural producers**

◦ Application of **Partial Equilibrium** (PE) or **Computational General Equilibrium** (CGE) modelling tools to ex-post evaluation of effects on the food processing sectors appears as **still challenging** (*inter alia* due to limited availability of detailed and updated input-output structures and corresponding price responses <elasticities> for various categories of food processors)

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Evaluation approach

Applied quantitative methodologies:

- Binary Propensity Score Matching combined with DID => **net effects of M123**

- Modified Mahalanobis Distance Matching combined with DID => **net effects of M123**

- Combined Coarsened Exact Matching (first stage) with PSM-DID approach (second stage) => **net effects of M123**

- Generalised Propensity Score Matching (dose derivative function) => **all RDP measures**

Unit of analysis: NUTS-4 level (Poland: powiat)

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Unit of analysis: Why NUTS-4 level?

◦ The structure and performance of **individual regions** play an important role in RD programme **selection process**

◦ The **primary allocation** of RD funds **is pre-determined** (and takes place) first at a **territorial level** (open calls in the second step)

◦ While the RDP support to individual **regional units** is **not randomly assigned (**regional socio-economical characteristics play an important role) a significant **selection bias** would occur

◦ While regions differ in their characteristics, some are **not only** more or less likely to obtain RD programme support, but also to receive **higher/lower support intensity**

◦ Numerous ex-ante evaluations strongly recommend strengthening of the RDP **targeting** - by giving **more emphasis** to **territorial** aspects of RDP

◦ High quality **data available** (in many EU countries)

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GPSM approach in Poland: main steps (1)

1. **Preparing dataset:**
   o Selection of **rural** NUTS-4 regions => by dropping observation on urban NUTS-4 (66)
   o From all 380 NUTS-4 regions => 314 rural NUTS-4 regions were selected
2. **Selection of model covariates** (14) at a regional level NUTS-4:

Model covariates (14)	
Total population	Value of fixed assets
Natural population growth	Investment in enterprises
Urban population (% of total)	Gross salary
Employment per 1000 population (=> possible impact indicator)	Number of dwellings per population
Unemployment rate (=> possible impact indicator)	Environmental pollution, i.e. emissions of dust/smog
Rural unemployment rate (=> possible impact indicator)	Environmental pollution, i.e. emission of gas
Environmental pollution, i.e. % of sewage cleaned	Other public funds received by the given region (NUTS-4) from other EU/national programmes (incl. EU structural funds)

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GPSM approach in Poland: main steps (2)

3. Estimation of the parameters of the support function (RDP support intensity = f(covariates)

4. Assessment of the validity of normal distribution using Kolomogorov-Smirnov tests for normality

5. Calculation of GPS as the conditional density of the actual support intensity given the observed covariates

6. Testing the balancing property of the estimated GPS function (5 steps)

7. Estimation of the RDP impact on selected impact indicators describing the growth and performance of food processors using a flexible function (polynomial approximation) of support intensity and GPS

8. Estimation of the average potential outcome for each potential level of support t and the entire dose-response function

>>> For further details, see: Hirano et Imbens (2004)

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Data

Table 1. Unit of measurements for the impact indicators

Impact indicators	Unit of measurement
Employment in food processing sector	Number of fully employed persons per NUTS-4 region
Number of food processing enterprises	Absolute number of firms; => a change in years 2006-2013
Number of food processing enterprises crossed off from firm registry	

Table 2. Further information on data used for the impact indicators

Information on data used	… in relation to beneficiaries and control-group
Data source	Regional Data Bank: Statistical Office (GUS, Poland)
Unit of analysis	NUTS-4 (314 rural regions)
Data series/frequency	2006-2013
Data confidentiality issues	For the indicator on employment (271 NUTS-4 rural regions); data for 43 regions is not available (probably 1 large enterprise, etc.)

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Major findings (1)
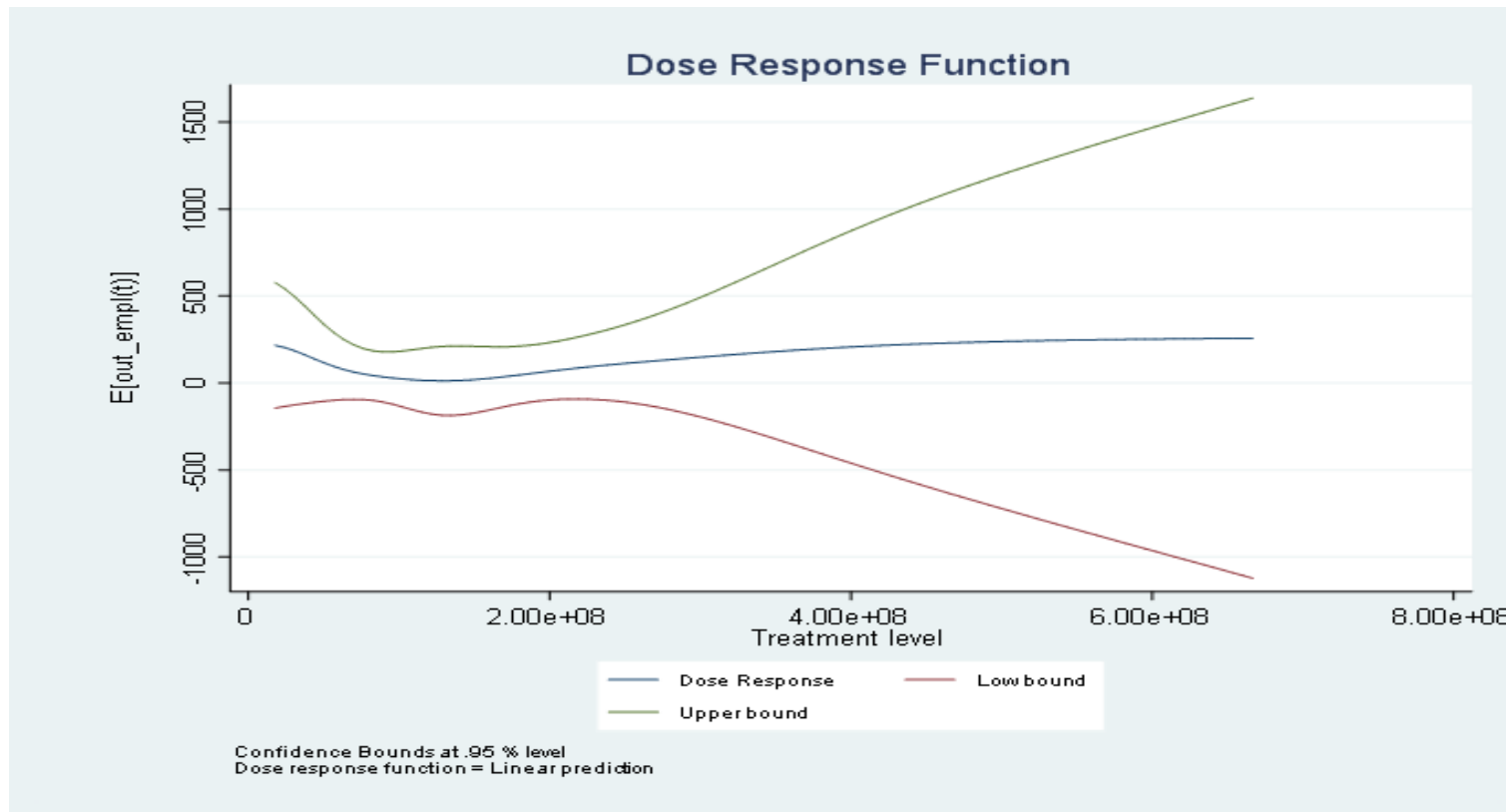## from binary PSM-DID and adjusted Mahalanobis Distance Matching

Table 3: Impact indicators showing the net effects of RDP M 123 - Adding value to agricultural and forestry product

Findings	Number of food processing enterprises Time reference: 2009/10 – 2015/16	Number of food processing enterprises crossed off Time reference: cumulative 2009-2016	Employment in food processing enterprises (number of fully employed persons) Time reference: 2006-2013
Total (Poland) - trend	+3,621 (100%)	+13,011 (100%)	+6,610 (100%)
Effect of M123	+513 (14%) – small positive	+1,323 (10%) – small negative	-57,807 (highly negative)
Effect of other factors	+3,108 (86%)	+11,688 (90%)	+64,417 (highly positive)

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Major findings (2)
GPSM matching

Figure 1. Net effects of all RDP measures on the change of employment in food processing sector

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Major findings (3)
GPSM matching

Figure 2: Net effects of all RDP measures on the change in number of enterprises in food processing sector

Dose Response Function

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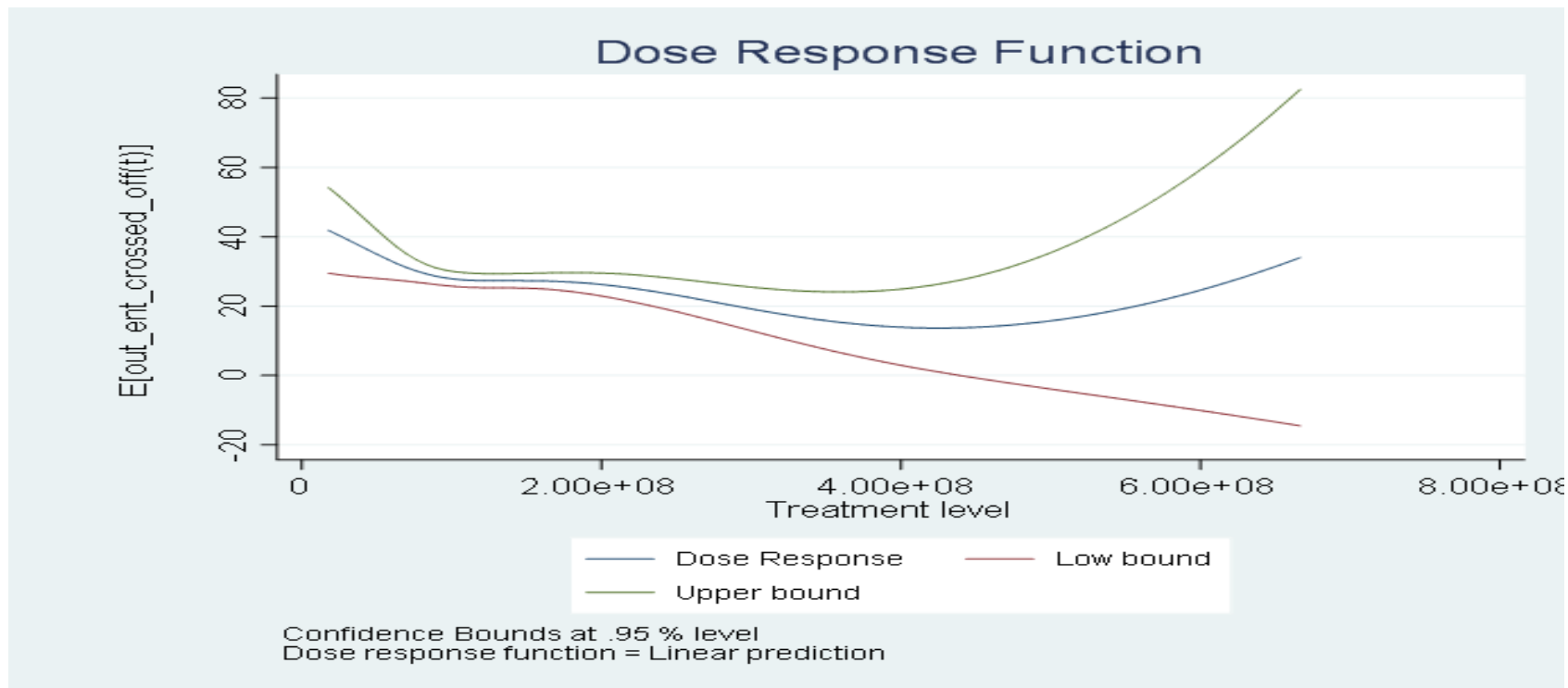
16
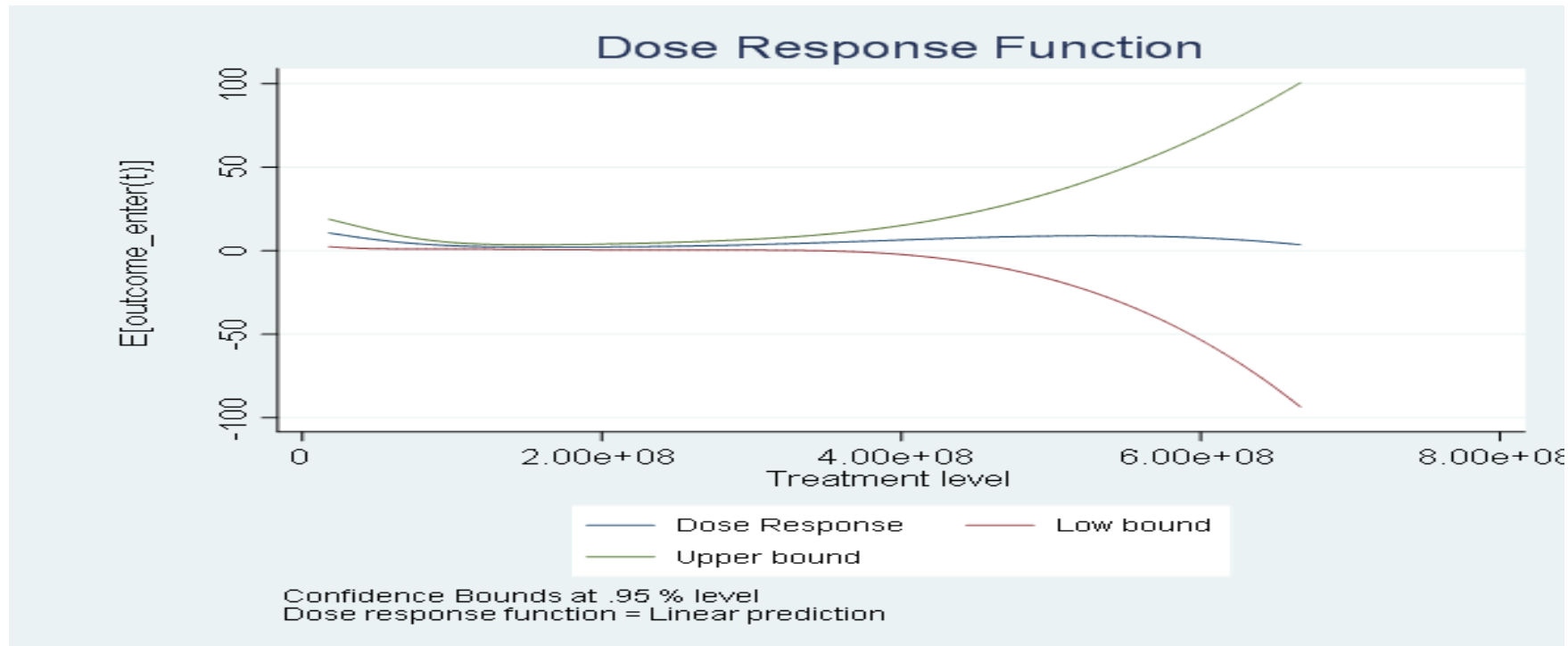
Major findings (4)
GPSM matching

Figure 3: Net effects of all RDP measures on the change in number of food processing enterprises crossed-off from registry

Dose Response Function

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Strengths and weaknesses
GPSM matching based on regional data (e.g. NUTS-4)

Strengths	Weaknesses
✓ Effective tool (based on counterfactuals) for impact evaluation if all (or almost all) units received programme support (at various intensity levels)	❖ Estimating programme effects is more difficult compared to PSM or PSM-DID
✓ It allows to estimate not only the average effect of support but also the marginal effects depending on the support intensity level obtained	❖ It requires a relatively large number of observations
✓ Very flexible approach concerning the functional form of the treatment model (the latter can be empirically tested)	❖ It requires abundant data on the main characteristics and economic performance of programme supported units prior and after the programme
✓ Straightforward application, i.e. it does not require construction of formal model like PE or CGE	❖ GPSM requires high quantitative skills of the evaluator
✓ Uses publicly available territorial statistics NUTS-4, NUTS-3 (national level) or NUTS-2 (EU-28)	❖ It will not generate reasonable results if other important observable characteristics explaining differences in support intensity were NOT explicitly included into the model
✓ Can be applied using data at farm, community and regional level	

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Lessons learnt and recommendations
for AIRs in 2019 and ex post evaluation

o **Data:** verify the availability of adequate regional data (structure, performance of regions) at NUTS-4 or NUTS-3 level

o **Human resources:** 15-25 Full Time Equivalent Days **per impact indicator**

o **Survey for non-beneficiaries:** Not necessary, if regional data is available

o **Skills:** contract evaluators with high quantitative skills – look carefully at CVs

o **Software:** econometric packages e.g. STATA, R, …

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Thank you

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<u>Further information:</u>

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http://le.uwpress.org/content/90/2/260.full.pdf+html

o Michalek J. (2012), *"Counterfactual impact evaluation of EU rural development programmes - Propensity Score Matching methodology applied to selected EU Member States", Volume 2 – A regional approach"*, European Commission, JRC Scientific and Policy Reports, pp 1-83
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o The impact of varying per capita intensities of EU Funds on regional growth: Estimating dose response treatment effects through statistical matching. Final Report; in: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), April 2016.

o Becker, S. O. et, al., „ Too much of a good thing? On the growth effects of the EU's regional policy ", in: *European Economic Review*, 56, 2012; pp. 648-668

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