The impacts of agricultural policy scenarios on development of remote rural areas – the case study of the Bruntál and Ostrava districts

Dopady scénářů zemědělské politiky na rozvoj odlehlých venkovských oblastí – případová studie okresů Bruntál a Ostrava

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Abstract: The paper presents the results of simulations for the Bruntál district as a remote rural area and Ostrava as an adjacent urban centre, based on the Computable General Equilibrium model. The model assesses spatial impacts of various agricultural policy and other economic conditions on the regional development of the study areas. The model utilizes a regional Social Accounting Matrix with economic inter-linkages between the rural-urban localities in the study areas. Four agricultural policy scenarios are assessed. All scenarios have negative impacts on the economy of the Bruntál district. Nevertheless, the scenario based on the switch of funds from the Pillar 1 to the Pillar 2 of the Common Agricultural Policy and on the degressive modulation of direct payments shows to be the most significant for the agricultural sector and the overall economy of the district.

Key words: remote rural area, rural-urban links, models, simulation, agriculture, spatial analysis, regional economy

Abstrakt: Příspěvek představuje výsledky simulací pro okres Bruntál jako odlehlou venkovskou oblast a Ostravu jako přilehlé městské centrum, založených na modelu CGE (Computable General Equilibrium). Model hodnotí teritoriální dopady variant zemědělské politiky a jiných ekonomických podmínek na rozvoj v obou regionech. Model využívá regionální matici SAM (Social Accounting Matrix), popisující vzájemné ekonomické vztahy mezi oběma regiony. Jsou vymezeny čtyři scénáře zemědělské politiky. Všechny scénáře vykazují negativní dopad na ekonomiku okresu Bruntál. Nicméně scénář Společné zemědělské politiky EU, založený na přesunu zdrojů z Pilíře 1 do Pilíře 2 a na degresivní modulaci přímých plateb, vykazuje nejvýznamnější dopady do zemědělského sektoru a celkové ekonomiky okresu.

Klíčová slova: odlehlá venkovská oblast, vztahy venkov-město, modely**,** simulace, zemědělství, prostorová analýza, regionální ekonomika

Since the eighties of the last century, changes in the economy of European rural areas have been induced by the agricultural policy reforms, international trade liberalization and globalization of the world economy, strengthening the role of structural funds and rural development policies. Agriculture, that was usually considered as the most important sector in the rural productive system, has suffered a setback both in the economic and social terms, while manufacturing and services have spread. As a result, the economic structure of rural areas is becoming increasingly similar to that of urban areas (Saraceno 1994). Majerová (2007) states that European countryside distinguishes itself in the diversity, which was connected in the past with the categories of development of "rural" and "urban" space. At present, the growing "fuzziness" and changeover of both spaces is emphasized. The interest in the countryside and the issue of rural regions is regulated nowadays especially by the question of its further development.

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Economic problems necessarily play an important role (Hubík 2007).

León (2005) mentions that rural areas fulfil the functions that are now essential to the lifestyles of the urban population. Beyond the traditional productive function, rural areas have become an environment for the residential living and leisure. The residential function and tourism are increasingly important. Nevertheless, rural regions generally suffer from a slower economic growth than urban regions. It arises mainly from the different factor endowments and from their mixture. Roberts (2005) notices that rural economies are typically dependent on the performance of relatively few key factors. As a consequence, they tend to be vulnerable to the short-term instability and low growth rates. However, a security of the quality of life, sustainability of traditions and development in rural municipalities and the connected maintenance of the character of landscape represent an area to which the responsible authorities should also pay a higher attention (Svatošová 2008).

Interdependences between rural and urban areas have been investigated in the recent years using econometric models and tools (Kilkenny 1993; Roberts 1998; Balamou, Psaltopoulos 2006). The selection of techniques or models depends mainly on the focus of the evaluation and on the policy actions to be evaluated. A general rather than partial equilibrium approach shall be applied for evaluating the impact of the development policy on a local economy. Such a model can be based on the Social Accounting Matrix (SAM) technique which allows the identification of the economic effects of policy measures on both investment and direct income transfers in a local economy (Psaltopoulos et al. 2006). All public payments included in the SAM are explained by the standard Computable General Equilibrium (CGE) model. The model therefore follows the SAM disaggregation of factors, activities, commodities, and institutions (Lofgren et al. 2002).

The aim of the paper is to present the elements, characteristics and results of the CGE model which is utilized for the assessment of the spatial impacts of agricultural policy scenarios on the regional development in a remote rural area, represented by the Bruntál district, with links to the urban centre of Ostrava in the Czech Republic. Also an outline of construction and calibration of the regional Social Accounting Matrix (SAM) forming the data inputs in the CGE model are introduced.

The Bruntál district (NUTS 4 level) is situated in the northeast borderland of the Moravian-Silesian region (NUTS 3 level) and shares borders with Poland and the Slovak Republic. The district is relatively far from the direct connection with the capital of the Czech Republic and from the stimulating economic environment of the more developed EU countries. The absence of a direct approach to the highway network represents another significant negative aspect. The district has been negatively affected by structural changes caused by the reduction of coal mining and heavy industry, leading to regional unemployment, negative migration, overall decrease of inhabitants, unfavourable structure of settlements, low quality of services etc. On the other hand, the adjacent urban centre, Ostrava, is the capital of the Moravian-Silesian region and one of the most important residential, industrial and intellectual centres in the Czech Republic.

METHODOLOGY AND DATA

Computable general equilibrium models are widely used for policy analyses, especially in the academic spheres of more developed countries (Lofgren et al. 2002). Usually all CGE models implicitly use the Social Accounting Matrix as a starting point for the model calculation. The SAM provides the base years values of indicators, which in conjunction with other data (e.g. physical quantities and elasticities) are used to calibrate a CGE model (Phimister et al. 2006). The SAM is an essential data framework which allows model calculations of the flows within an (regional) economy (Roberts 2000). The basic SAM structure used in the CGE model includes multiple accounts for activities, commodities, factors of production, households and other institutions. The productive activities of firms, the production factors (labour, land and capital) and the household accounts are spatially disaggregated into rural and urban regions.

The construction of the regional SAM is the first step for the CGE calculations. On the regional level, it usually represents a labour demanding process with data collection and expert estimates. First of all, the GRIT-RAS technique[1] has to be used to regionalize the Czech Commodity-by-Industry Input-Output (I/O) table (basic year 2002), thus "mechanically" producing the Regional Input-Output tables for the Bruntál and Ostrava districts. Further, the "superior" data from the survey distributed to the firms and households in the

[1] The procedure of the Generation of Regional Input-Output Table (GRIT) is designed for the quantification of the regional input-output indicators from the national input-output tables and from other data sources. The RAS technique is a mathematical tool to provide the data consistency in the regional tables (Jensen et al. 1979).

study areas are utilized to construct an "unadjusted" SAM for the study areas. Two kinds of questionnaires are used in the survey (the Business Questionnaire and the Household Questionnaire). They are oriented on issues such as economic structures, production and consumption functions, market structures, transport costs and factor mobility. However, much of the data from the surveys is not of a good quality or reliability. So the construction of the SAM also has to apply expert estimates and other sources (published official data)[2]. In order to cover the non-I/O components in the regional SAM, the data provided by the Czech Statistical Office is used, especially the data from the 2001 Population Census. In order to overcome the problems with data inconsistencies, the balancing technique is used in a GAMS code[3].

The structure of the regional SAM for the districts of Bruntál and Ostrava follows the regional SAM developed by Phimister et al. (2006). The specification of the Czech regional activities, commodities, factors of production and institutions is based on:

– structural characteristics of the districts;
– spatially differentiated production activities and non-spatially differentiated commodities;
– the explicit inclusion of the transport sector;
– requirements to consider heavy industry, private and public services and construction in the models;
– the fact that the regional flows, specific to activities, are determined by the primary data collection and this necessitates the aggregation of sectors into homogeneous categories (i.e. "Other Manufacturing" and "Other Services").

Table 1. The Czech regional SAM for the study areas Bruntál and Ostrava

Activities (Production)	Wholesale trade
Agriculture, forestry – Rural	Retail trade
Manufacture of basic metals and fabricated metal products – Rural	Hotels and restaurants
Other Manufacturing – Rural	Other Services (Public and Private)
Construction – Rural	Transport
Wholesale and retail trade – Rural	
Tourism – Rural	*Factors* (added value)
Other Services (Public and Private) – Rural	Unskilled Labour Rural
Manufacture of machinery and equipment – Urban	Skilled Labour Rural
Other Manufacturing – Urban	Unskilled Labour Urban
Construction – Urban	Skilled Labour Urban
Wholesale and retail trade – Urban	Capital
Other Services (Public and Private) – Urban	Land Housing Rural
Transport	Land Agricultural Rural
	Land Housing Urban
Commodities (Intermediate Consumption)	Agricultural Capital
Agricultural products and forestry	Agricultural Rents
Food products and beverages	
Textile and textile products	*Households**
Wood and wood products except furniture	Rural Commuter
Chemical products	Rural Other
Basic metals and fabricated metal products	Urban Commuter
Machinery and equipment	Urban Other
Electrical energy production	Rural agricultural
Other manufacturing	
Construction work	*Other Institutions*
	Government
	Rest of the World
	Saving – Investment

*Rural commuter: at least one member of household commutes to work in Ostrava (urban) or elsewhere (rest of the world – RoW); rural other: members work in the Bruntál district; urban commuter: at least one member commutes to work in the Bruntál district (rural) or elsewhere (RoW); urban other: members work in Ostrava, agricultural: resident in the Bruntál district (rural)

[2] Based on the approach of Pouliakas et al. (2007)

[3] In the GAMS code (the General Algebraic Modelling System), the model is explicitly linked to the country data, including a standard SAM that follows the format required for the standard CGE model and a set of elasticities (Lofgren et al. 2002).

Table 1 shows the structure of the Czech regional SAM for the rural district of Bruntál and for the urban area of Ostrava (Bednaříková 2007). The activities and commodities of the Czech regional SAM were defined according to the Czech classification of economic activities (the Czech Statistical Office). The factors distinguish agricultural capital (i.e. farm property and equipment) and agricultural rents (i.e. for agricultural land). The labour and land factors are spatially differentiated, it is not so in the case of capital. Household accounts are linked to the household categories defined as rural versus urban (commuters, others) and rural agricultural.

In order to apply the adjusted SAM in the IFPRI CGE software[4], further data is required for the calibration process, e. g. elasticities. The values of elasticities used in the CGE model for the Bruntál district are as follows[5].

Trade elasticities

a) Armington function[6]: the elasticity of substitution between the imported and domestic (regional) outputs in domestic demand. The value is set to 2.0 for all commodities;

b) Constant Elasticity of Transformation (CET)[7] is the elasticity of transformation of the domestic marketed outputs between exports and domestic supplies. The value is set to 1.6 for all commodities.

Production elasticities

a) Elasticities of substitution:
   – between factors of production ("bottom of the technology nest"): 0.93 for all rural and urban activities
   – between aggregate factors and intermediate inputs ("top of the technology nest"): 0.73 for all activities
b) Commodity output aggregation elasticity: 1.3 for all commodities

Household consumption elasticities

a) Frisch parameter for the household linear expenditure system (LES) demand: –1
b) Expenditure elasticity of home demand by the commodity/activity: 1
c) Expenditure elasticities of market demand for the commodity by household (rural or urban): 1 (except for the transport commodity that is set equal to 0.0001).

In order to operate the model, closure rules have to be set for both factor markets and macroeconomic balances. The closure rules have no influence on the base application of the model, but have a considerable impact on the results of simulations of policy scenarios. For the simulations in the case of the Czech regions, the following closure rules are set:
– Because of a high level of the unemployment in the Bruntál district, the Keynesian labour market closure rule is chosen. For each activity, the wage is fixed and the labour supply represents a market-clearing variable for the single labour market.
– The government is flexible with fixed direct tax rates.
– Rest of the World is specified by the flexible foreign savings and the fixed real exchange rate.
– For the relation savings/investments for all non government institutions: variable marginal propensity to save to fixed capital.

The CGE models are a standard tool for the empirical economic and policy analyses whose basic framework applies settings ranging from the world to the disaggregated regions within a country (Lofgren at al. 2002). The models summarize the behaviour of the representative agents in an economy (producers, consumers, factors of production suppliers and institutions). The CGE model used for the Czech regions is based on a standard framework as given by IFPRI. The standard CGE model consists of a set of linear and nonlinear equations. Production and consumption behaviours

[4] IFPRI CGE software means the implementation of the model in the GAMS (the General Algebraic Modelling System) developed by the International Food Policy Research Institute (IFPRI) (Lofgren et al. 2002).

[5] Based on Pouliakas et al. (2007)

[6] Imperfect substitutability between imports and domestic output sold domestically is captured by a constant elasticity of substitution (CES) aggregation function in which the composite commodity that is supplied domestically is produced by domestic and imported commodities entering this function as inputs. When the domain of this function is limited to commodities that are both imported and produced domestically, it is often called an Armington function. The elasticity of substitution between commodities from these two sources is the transformation of for which the lower limit is minus one (Lofgren et al. 2002).

[7] Constant Elasticity of Transformation (CET) function expresses the aggregated domestic output allocated between exports and domestic sales on the assumption that suppliers maximize sales revenue for any given aggregate output level, subject to the imperfect transformability between exports and domestic sales (Lofgren et al. 2002).

are expressed by a number of nonlinear profit and utility maximization conditions. The equations also include a set of constraints that have to be satisfied by the system as a whole for the factor and commodity markets and for macroeconomic aggregates (balances for savings/investments, the government, the current account and the Rest of the World).

The applied CGE model (Pouliakas et al. 2008) was adapted to take into account the specific characteristics of the study regions. The model was calibrated with the purpose of ´imitating´ the functioning of the individual regional economies in the given base year. An important adaptation was the division between urban and rural sectors, labour and households, so the simulations are able to point out the conditions and shocks that might affect the urban and rural areas differently. The results of simulations form the basis for the policy interpretations and the following policy recommendations that could lead to a more targeted development policy for remote rural areas.

Using the model, the nature and magnitude of the rural-urban economic effects associated with changes in the level and structure of economy and agricultural policy in the individual regions are assessed. Four different CGE simulations were applied for the rural area of Bruntál and for the urban area of Ostrava. The four simulations include the change in the exogenous amount of labour available in the area through migration, the exogenous change in the demand for export or cost of imports, the changes in agricultural policy and the changes in transport infrastructure (Pouliakas et al. 2008).

Table 2. Impacts of agricultural policy scenarios on regional economy (changes in % compared with the basic year)

	30% reduction of Pillar 1	"Full decoupling"	Switch from Pillar 1 to Pillar 2	20% reduction of SAPS
GDP of Ostrava-Bruntál	–0.23	–0.84	–0.69	–0.77
GDP Bruntál	–0.56	–1.93	–1.77	–1.85
GDP of primary sector Bruntál	–8.93	–28.58	–28.66	–28.62
GDP of secondary sector Bruntál	–0.31	–1.17	–0.72	–0.95
GDP of tertiary sector Bruntál	0.08	0.13	0.09	0.11
GDP Ostrava	–0.14	–0.53	–0.39	–0.46
GDP of primary sector Ostrava	–	–	–	–
GDP of secondary sector Ostrava	–0.19	–0.69	–0.30	–0.51
GDP of tertiary sector Ostrava	–0.11	–0.45	–0.44	–0.44
Labour job losses in Bruntál	–2.17	–6.69	–6.37	–6.54
Labour job losses in agriculture in Bruntál	–13.9	–41.5	–41.60	–41.54
Agricultural land price in Bruntál	–1.44	–4.73	–4.75	–4.74
Agricultural rents in Bruntál	–14.90	–43.80	–43.9	–43.86
Consumer price of agricultural products in Bruntál	2.81	10.80	10.73	10.78
Consumption expenditure in agricultural households in Bruntál	–7.43	74.30	–23.78	28.02
Domestic production in agriculture in Bruntál	–7.09	–23.14	–23.19	–23.16
Export	–0.37	–1.29	–1.23	–1.26
Import	–0.20	–0.81	–0.64	–0.73
Income Tax	–0.46	–0.95	–1.40	–1.16
Wages of skilled in Bruntál	–0.76	–2.49	–2.23	–2.37
Wages of unskilled in Bruntál	–1.46	–4.59	–4.35	–4.48
Domestic consumption	–0.20	–0.95	–0.42	–0.60

Source: Pouliakas et al. (2008); Bednaříková et al. (2008)

RESULTS

This part presents the impacts of agricultural policy changes including new rural development measures. The agricultural policy scenarios include the following changes (shocks) compared with the present CAP (Pouliakas et al. 2008):

(a) 30% reduction of the CAP Pillar 1 coupled direct payments;
(b) full-decoupling: the CAP direct payments of the Pillar 1 are set to zero and the equivalent is converted into an income transfer for agricultural households;
(c) switch of the Pillar 1 funds to the Pillar 2 funds: direct payments are reduced by 100% and subsidies are transferred to rural development measures, specifically to Axis 3 of the present Rural Development Programme as investment supports;
(d) 20% reduction of direct payments through their modulation and the transfer of the subsidies to rural development measures, specifically to Axis 3 of the present Rural Development Programme as investment supports.

Table 2 shows the results of the simulations presented as impacts of the changes in agricultural policy according to the defined four scenarios on regional economy in the districts of Bruntál and Ostrava.

DISCUSSION

The decrease by 30% in the coupled direct payments indicates a rather marginal negative effect on the real GDP (–0.23%) in both regions. The loss in the GDP is higher in Bruntál (–0.56%) than in Ostrava (-0.14%). The most affected is the rural primary sector (–8.93%).

In general, the full decoupling scenario generates higher negative impacts for the Czech regions compared to the first scenario. These estimates are largely due to the significantly negative projections for the primary sector, which – in general –are not outweighed by the gains in the non-agricultural sectors. The full decoupling scenario affects the economy both in the rural area of Bruntál (change in real GDP –1.93%) and in the urban area of Ostrava (–0.53%) even more negatively compared to the 30% cut in the coupled supports. Full decoupling therefore seems to be more constraining for the urban economic activity.

The results of the Pillar 2 simulation show that the switch of the Pillar 1 funds into the Pillar 2 generates mixed impacts for the Czech areas compared to the first two scenarios. Estimates for the Czech areas are more negative compared to the first scenario and slightly more positive compared to the full decoupling scenario (for the GDP in the Bruntál district –1.77% and in Ostrava –0.39%). The main loser under the Pillar 2 scenario is the rural primary sector (–28.66%). The impacts on the rural secondary sector are slightly negative (–0.72%) while the effects on rural services are rather positive (0.09%). The impacts on the urban area are similar to the coupled and fully decoupled scenarios. It suggests that both coupled and decoupled support to agriculture constrain the urban economic activity. These findings can be attributed to the higher outflows of factors from the regions associated with investment activity and possibly to the higher interdependence of sectors in the backward economy of the Bruntál district.

The effects generated by the 20% reduction of direct payments (through modulation) range between those estimated in the case of the full decoupling and the Pillar 2 scenarios. In general, the impacts are slightly similar to those of the Pillar 2 scenario and better than those associated with the full decoupling scenario. As in other scenarios, it is obvious that the negative impacts are mainly caused by the significantly negative projections associated with the primary sector which are not outweighed by the gains in the non-agricultural sectors. Compared to the full decoupling scenario, the increased modulation scenario seems to affect the Czech rural and urban regions more positively.

CONCLUSIONS

The paper presents an approach to the assessment of agricultural policy which tries to overcome the traditional sector approach by a territorial/spatial one.

All four agricultural policy scenarios show negative impacts on the economy of the Bruntál district. In all scenarios, the GDP losses are evident, driven by the losses particularly in the primary sector. The social effects from a larger reduction in the number of jobs in agriculture are especially important. There are clear differences in the agricultural households' consumption. An agricultural household is defined as a residential household in the rural part of the study area receiving agricultural subsidies. In the full decoupling scenario, the direct payments are set to zero and the equivalent amount of funds is transferred directly to agricultural households. Thus the households can spend more money which is manifested by a significant increase in the household consumption. The surprising increase in consump-

tion can be explained by the fact that for the Czech Republic, and likewise for the Bruntál district, a low number of agricultural households are characteristic and these are self-employed farmers among whom the income subsidies are reallocated. However, most of agricultural labour in the Czech Republic is represented by hired workers and the reallocated financial resources usually do not reach them in a proper ratio. In 2001, the proportion of households in the Czech Republic with a self-employed head amounted to 17% (Divila, Doucha 2005). The proportion of agricultural households in the Bruntál district is even lower.

The results of the simulations of the agricultural policy scenarios suggest a number of important conclusions (Bednaříková et al. 2008). With respect to agriculture and agricultural policy, it is necessary to take into account the small influence of this sector on the economy of the Brutal district. The present share of agricultural production and employment brings in the question whether any changes in the agricultural policy can increase the importance of the sector in the economy of Bruntál. The simulated scenarios indicate that the partial decoupling, linked only with small losses of agricultural enterprises in the district, has a very slight effect on agricultural productivity and its overall economic position.

Far more important for the agricultural sector and the overall economy of the Brutal district can be the scenario based on the transfer of supports from the Pillar 1 to the Pillar 2 through a degressive modulation of direct payments and the possibility of using up to 10% of the coupled payments for specific aims. Further changes in the policy can be expected after 2010 in the area of the LFA definition and the level of the LFA payments, including their degressivity. All of these policy changes should be manifested in the broader development of the multifunctional character of agriculture in Bruntál, thus in a higher level of incomes of farms due to their higher participation in the agro-environmental programmes and the diversification of agricultural activities into non-agricultural activities. It primarily concerns the agro-tourism development and, in general, the development of services linked to the general tourist potential of the area. This should lead not only to an improvement of the economic situation of farms but also to an increase of the (non-agricultural) employment on these farms.

It can be stated that even though the support of education (in the sense of human capital development) and support for industry should be the decisive policy objective, the changes in agricultural policy can lead to the increased synergy effects. These can be seen in the overall development of the service sector in the district on both the super-regional (e. g. services in the environmental area) and on the regional or local levels (e. g. services in the area of tourism).

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