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Farm diversification – a target of the Common Agricultural Policy?

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Abstract

Further coordination between the EU funds and policies is increasingly called for such that the territorial aspects would be included as the major element into the future policies. It is often argued that the farms are key actors in preserving rural livelihood. Since the farms have become more efficient and thus they need less labour input per output, the farm diversification could be a possible future direction. Hence, the family farm structure could be maintained simultaneously as the farm productivity could be increased through improved factor efficiency. In this paper, farm diversification is considered in a framework of regional development such that reallocation of agricultural subsidies from traditional agriculture to the farm diversification is simulated. The rural-urban Social Accounting Matrices are used as base year data for the CGE-model. The results suggest that transferring CAP payments from the primary agriculture as income support to the diversified activity does not promote rural development and economic activity at the regional level provided that agriculture and food industry are in a central role in the rural economy. In contrast, if the relative position of agriculture is already of minor importance, diversified activities could produce extra income to the local economy. In conclusion, all the simulations generated higher positive GDP effects on the urban areas compared with the rural areas; the result suggesting the agglomeration of the economic activity within a rural region.

Introduction

Both the regional and agricultural policies of the European Union are reconsidered for the new EU programming period, which begins in 2014. Future policies face tightening EU budget constraints and, in addition, the EU agricultural policy is expected to further comply with WTO commitments and free trade pressures. Regarding both regional and agricultural policies, the underlying denominators for future policy objectives are sustainability, competitiveness, and social and economic cohesion.

Assembly for European Regions (2010) calls for coordination between the EU funds so that the objectives and means of the rural development and the cohesion policies would be more coherent. The incorporation of territorial perspectives into future policies would contribute to the emergence of better targeted policies. These, in turn, would help ensure that the territorial strengths and potentials would be efficiently utilised, and that the support and assistance would better respond to local needs. EU Commission (2010), for one, stresses that the CAP reform must continue so that it would further promote competitiveness and the efficient use of taxpayers' resources. In addition, it should bring policy returns for European citizens. However, the ability of the CAP as a promoter of EU regional cohesion has been criticised (e.g. Shucksmith, Thomson & Roberts 2005; Esposti 2007).

Recently, the regional and territorial impacts of the CAP have been closely analysed. For instance, Rizov (2004) concluded that the redistribution of the CAP support clearly impacted on rural development and household welfare. Shucksmith et al. (2005), in turn, argued that the CAP has uneven territorial effects especially in terms of its first pillar. However, they admitted that the second pillar, at least in some cases, may be more consistent with cohesion targets. Esposti (2007) found that CAP expenditure had no counter treatment effect, and that its positive impact on growth is marginal. Daniel and Kilkenny (2009) concluded that both coupled subsidies and single farm payments decrease spatial agglomeration. Nevertheless, only the single farm payment policy raised welfare in both rural and urban regions.

In Agenda 2000 reform, the Commission launched a new model of European agriculture that is based on two pillars. The first pillar contains the traditional price and market policy, and the second pillar a policy component for rural areas and the environment. It further introduced voluntary modulation, which enabled member states to transfer funds from the first pillar to the second pillar. Since the member states utilised this option only marginally, an obligatory modulation was introduced in the Fishler reform, and it took effect from 2005 onwards. The major targets for the CAP second pillar and the EAFRD (European Agricultural Fund for Rural Development) for the period 2007-2013 are a) improving the competitiveness of agriculture and forestry, b) improving the environment and the countryside and c) improving the quality of life in rural areas, and enhancing diversification of rural economies e), and LEADER initiatives (EU Official Journal

2005). Concerning the future prospects of the CAP second pillar, Burrell (2009) argues that there appears to be a clear commitment of further strengthening it among policy makers. In addition, according to Esposti (2007), the second pillar should contain less sectoral and more economy-wide measures that would be explicitly designed to combine with structural policies at the regional or at the local level.

It is a common argument that farms are key actors in preserving rural livelihood. Since farms have become more efficient and thus need less work per output, the possible future direction could be the diversification of the farm activities. Agriculture ties people down to remote areas, and farm diversification could bring additional employment, economic activity and customers to these areas. Therefore, farm diversification might be an expedient to maintain family farm structure and still be able to increase productivity through improved factor efficiency.

However, because of the variety of the problems, types and characteristics of the rural areas within the European Community, a selective, area-specific approach to diversification is preferable. Whitby (1991, 158) argues that the regions should aim at attracting industries capable of building strong local linkages (e.g., food processing industries) or for which there is an increasing local demand (e.g. health and recreation services). The importance of service sectors for rural areas is highlighted, for example, by Bryden and Bollman (2000) and Rizov (2004). On the other hand, many regional analysists argue that there is a clear relation between a region's exports and its overall growth. The export base theory of growth states that the growth of a region specifically depends on the growth of its export industries (see for example Richardson 1976).

This paper concerns CAP modulation in the regional development framework in a way that the natural handicap payments (LFA) and the Environmental Scheme, that in practice take the lion share of the CAP second pillar in Finland, are not the objects of the analysis. It should be borne in mind that simulations do not aim at reflecting the exact sums or shares of modulation funds, rather modulation simulations reflect the principle of modulation: the transference of funds from the CAP first pillar, i.e. direct payments to the CAP second pillar, i.e. rural development.

The modulation is simulated in two different ways. The first approach maintains the subsidies inside the agricultural activity through farm diversification. Due to the strong structural change of Finnish agriculture during EU membership, other farm related economic activities, in addition to the traditional agriculture, have become increasingly important for farms and for rural areas in Finland. Finnish research on farm diversification, however, concentrates on the fields of sociology and business economics and management (Rantamäki-Lahtinen 2002, 2009; Vesala, K.M. 2005; Vihinen & Vesala 2007). Hence, the paper offers a new perspective on research into farm diversification in Finland by linking the diversified activity to the overall regional economy by exploiting SAM multiplier and general equilibrium models. The first simulation aims at exploring whether diversified agriculture has potential for backing up regional economic development.

The second approach transfers subsidy cuts to regional investments so that support is not channelled to a specific activity or area. The first investment simulation channels funds into an increased investment demand for business and trade services and electronic equipment. The second channels funds so that demand for construction and machinery investments is increased in both the regions. In addition, one third of the modulation funds is channelled into increased demand for extraction goods in North Karelia, and for timber in South Ostrobothnia. This distinction follows the regionally defined sector emphases.

Social Accounting Matrix

According to Pyatt and Round (1985), a Social Accounting Matrix represents macroeconomic and mesoeconomic accounts of a socioeconomic system by capturing the transactions and transfers between the economic agents included in that particular system. A SAM aims at recording and portraying all the economic activities, such as consumption, production, accumulation, and distribution taking place during an accounting period.

Since the 1970s, SAMs have been increasingly constructed particularly for the purposes of developing country research (for example Pyatt & Thorbecke 1976; Hayden & Round 1982). At the moment, country level SAMs are widely used. By contrast, due to a high data requirement, regional, and particularly bi-regional SAMs, are not as common. However, for example, Round (1985) constructed a bi-regional SAM for analysing the relationship between East and West Malaysia, Roberts (1998) built a SAM in order to consider the spatial diffusion of rural-urban spillovers in Grampian, Scotland, and Balamou and Psaltopoulos (2006) a SAM analysing rural-urban interdependencies and their diffusion patterns in southern Greece. In Finland, regional level SAMs have been constructed by, for example, Nokkala and Kola (1999) and Törmä for his RegFin CGE model (e.g. Törmä 2002). All of these studies are based on the Statistics Finland's regional input- output tables for years 1995 or 2002.

The SAM used in this research was built in order to capture the rural-urban linkages of the study areas. The data was collected from various secondary and primary sources. The regional input-output tables of Statistics Finland (2006), relating to the year 2002 were used as core information in building the Social Accounting Matrix for Southern Ostrobothnia. The tables comply with the concepts and definitions of the European System of Accounts (ESA95) and with the UN System of National Accounts 1993. The industrial classification used in the SAM is based on the national standard industrial classification TOL2002. The product classification follows the activity-based product classification CPA of the European Union (Statistics Finland 2007). The regional make and use tables served as control totals for the disaggregated accounts of the SAM. According to Statistics Finland (2006), most of the data used in compiling regional I-O tables were obtained from registers, other databases and the data files of basic statistics. The most important sources have been regional accounts, national accounts (especially their supply and use tables), statistics on industrial structure and products, structural statistics on service industries, statistics on foreign trade, the register of enterprises and establishments, corporate taxation reports, statistical databases of central and local governments, statistics on agriculture and forestry, and the Household Budget Survey. In order to be able to complete the division between urban and rural areas, other sources of information were also used. Some of them overlap with the sources for the I-O tables. However, more precise information at the municipality level was needed and used. This kind of information was attained, for example, from the regional statistics source of Statistics Finland (ALTIKA), databases of local public and private actors, and information provided by the tax authorities. Compared to the regional I-O- tables, the SAMs are far more detailed as factors of production, households, government accounts, Rest of the World and Savings-Investments accounts are concerned. All the core information relates to the calendar year 2002. Regardless of the availability of high quality and relatively extensive secondary data in Finland, primary data was also collected for the SAM construction in order to fill the still remaining information gaps. Accordingly, both the business and the household surveys were carried out during autumn 2006. However, since the major part of the material was collected for other research purposes, the surveys are not covered here in detail.

In the end, the SAM was balanced by using a cross entropy method, and the program was run by using GAMS software. The program corrects imbalances in the data by minimising the entropy distance of the cells of the estimated SAM subject to the constraint that row and column totals should be equal (Robinson et al. 2000).

The general structure of the rural-urban SAMs are shown in Appendix 1. The SAMs have 27 accounts for rural and 25 accounts for urban activities. The commodities accounts are not spatially disaggregated. There are ten different factor accounts that are spatially distinguished according to the rural/urban industry shares. Labour factor division is two- fold, namely white collar and rural blue collar workers in rural and urban areas. However, in this article the labour market is integrated, implying that the labour force can move freely inside the region. The capital accounts are rural capital, urban capital and agricultural capital. The agricultural land factor is separated and accounts for rural housing rent and urban housing rent are distinguished. In addition, there are six different household groups, accounts for government, the rest of the world account that includes both rest of Finland and other countries and account for savings and investments.

Computable General Equilibrium Model

The computable general equilibrium modelling method is based work done already in the 1950s by Kenneth Arrow and Gerard Debreu regarding the theoretical structure of the Walrasian general equilibrium. The first operational applied general equilibrium model, in turn, was developed by Leif Johansen (1960) in the late 1950s. Since then, due to the progress in theory, data and computing techniques and power, CGE models have been applied to a wide range of topics, and are constantly growing in importance as a tool of research and policy analysis. Wing (2004) characterises computable general equilibrium models as simulations that combine the abstract general equilibrium structure with realistic economic data in order to solve numerically for the levels of supply, demand and price supporting equilibrium across a specific set of markets. Thus Walrasian general equilibrium prevails when supply and demand are equalised across the interconnected markets in the economy described by the model. The CGE model used in this research draws on the standard stationary general equilibrium framework made available by the International Food Policy Research Institute (IFPRI). Thus, the full list of the equations and the specific structure of this constant returns to scale model are provided in Lofgren et al. (2002). The model is slightly modified in order to follow the core structure of the SAMs, which also serves as base year data for the Computable General Equilibrium model. The modifications are specified in Phimister et al. (2006). The diagrams of the production technology is presented in Appendix 2 and the product flows in Appendix 3, followed by the following equations in Appendix 4: production technology (equations 1 and 2), value added (3), factor demand (4), output aggregation function (5), output transformation function (6), composite supply (Armington) function (7), and income of domestic, nongovernment institutions.

Accordingly, the model consists of a set of linear and nonlinear simultaneous equations that determine the behaviour of the economic agents in the model. These equations also include a set of macroeconomic constraints that cover factor and commodity markets, balances for government, current accounts, and savings and investments. The closures applied are defined more precisely in the next paragraph. The Social Accounting Matrix is used not only as base year data for the CGE model but also to calibrate the coefficients of the model equations together with the production, trade and consumption elasticities. According to Devarajan & Robinson (2002), there are two different groups of parameters that need to be estimated for CGE models. The first group consists of share parameters such as intermediate input costs, consumer expenditure shares, average savings rates, import and export shares, government expenditure shares, and average tax rates. These are endogenous parameters that are estimated by using the information available in the base year SAM. For example, from value added (equation 3 in appendix 4) and factor demand (equation 4) functions, efficiency parameter in the CES value added function, and CES value added function share parameter for factor f in activity a ($\alpha_a^{va}, \delta_{f\,a}^{va}$) can be estimated directly from the SAM.

The second group of parameters are elasticity parameters that describe the curvature of structural functions. These elasticities were obtained from the previous Finnish research (Vaittinen 2004; Törmä & Lehtonen 2009). The elasticity values are listed in Appendix 5. Finally, given the elasticities of substitution and the expenditure shares of the SAM, the parameters of the model can be solved in order to reproduce the benchmark year data. GAMS software was used to solve the model.

Simulations

In order to simulate the subsidy transfer from agriculture to other farm activities, an additional farm-related activity was included in the SAMs. Because the total output of these diversified activities on the regional level is relatively small, not all the different industries or activities that the diversified farms are engaged in were included as such. Instead, a representative diversified activity was constructed so that in South Ostrobothnia, the activity consists of 26% of food manufacturing, 6% of trade, 17% of tourist services and 50% of business services. The corresponding structure in North Karelia is 19% of food manufacturing, 6% of trade, 19% of tourist services and 56% of business services. These shares and the activities reflect the actual farm accounting data collected from South Ostrobothnia and North Karelia so that the shares of manufacturing and services are equivalent, and the most important activities are included. The structures of the production processes were differentiated and the inputs and the input shares of the diversified activities differ from those of actual agriculture. Accordingly, each of the industries included in the representative diversified industry has an individual input structure, productivity per employer and share of capital incomes. These figures and shares were derived from the corresponding local rural activities. However, since these rural activities are an aggregate of all the firms i.e. both large and small firms, it was necessary to presume that the productivity of these often very small farm-related enterprises were below the equivalent industries' averages. In the end, the figures were cross examined with the figures attained from the farm accounting information concerning diversified farms.

The 2005 farm accounting (TIKE 2006) provided information on the working hours used for other activities at the regional level. These working hours were transformed into man-years. Further, the shares of wages and capital incomes were counted by using the information collected for the SAMs concerning the numbers of entrepreneurs and employees working for agriculture. Finally, the share of the output of the diversified farms of the original agricultural activity account output was 21% in South Ostrobothnia and 13% in North Karelia. In the model, it is presumed that diversified activities are 25% more efficient than traditional agriculture measured in terms of output per working hour. However, the average efficiency of the corresponding rural activities, i.e. food manufacturing, trade, tourism and business services was much higher than this 25% compared to traditional agriculture. "Diversified activity" wages are channelled to several household types, while all the capital income is channelled to the agricultural households. The agricultural land factor and the related factor incomes were left under the agricultural activity.

Three different simulations were carried out. All of them aim at reflecting the so called modulation from the CAP first Pillar direct payments to the rural development measures of the CAP second Pillar. Regarding all the three simulations, 30% of the total regional agricultural subsidies were cut and transferred. Among other things, Table 1 presents the base year values and the simulation values of subsidies and the parameter *ta*, which is a share of the industry's activity tax of the industry's gross output value. The total agricultural subsidy (subsidy is allocated to the activity tax account as a negative receipt, whereas activity taxes are there as positive receipts) in South Ostrobothnia was 192.6 million EUR, and thus the 30% cut amounted to 57.8 million EUR. Similarly in North Karelia, the agricultural subsidy was 70.8 million EUR, and the corresponding 30% cut was 21.24 million EUR.

Table 1. Base and simulation values of output, subsidy, tax and parameter *ta*.

	Agriculture, SO	Diversified, SO	Agriculture, NK	Diversified, NK
Output, mill EUR	383.418	102.330	144.284	21.294
Subsidy base, mill EUR	-192.600	-5.116	-70.800	-1.491
Tax base, mill EUR	42.513	4.454	19.891	1.519
Atax base, mill EUR	-150.087	-0.663	-50.909	0.028
ta0	-0.391	-0.006	-0.353	0.001
Subsidy cut, mill EUR	-57.780		-21.240	
Atax sim, mill EUR	-92.307	-58.443	-29.669	-21.212
ta sim	-0.241	-0.571	-0.206	-0.996

In practice, the policy simulations adjust the activity tax rate on the activity output such that *TASIM(A,SIM)=TA0(A)*; in which *TASIM(A,SIM)* is a rate of the activity tax or subsidy by activity by simulation, and *ta0(A)* is a share of activity tax on the producer gross output value. In the diversified farm simulation, the subsidy is transferred to the diversified activity as an income subsidy, whereas concerning the investment simulations the corresponding sum is transferred to increased investment demand. The "Modern investment" simulation allocates the funds to the increased investment demand for the investments of business services, electronic equipment and trade services, each of which having equal shares. Similarly, the "Traditional investment" simulation distributes the funds to the investment demand for construction, machinery and timber/extraction goods. Table 2 illustrates the impacts of the simulations on the investment demand for the simulated investment goods. For comparison, the figures in brackets show the changes in the goods whose demand has not been exogenously increased in that particular simulation.

Table 2. Quantity of investment demand, million EUR.

	South Ostrobothnia				North Karelia			
		QINV				QINV		
	SAM value	Base	Modern	Traditional	SAM value	Base	Modern	Traditional
C-mining	2.46				1.86	1.83	*(2.00)*	13.14
C-timber	-1.05	-0.88		33.59	-1.58			
C-mach	58.87	54.24	*(59.17)*	95.54	59.66	56.5	*(61.84)*	74.43
C-eeq	82.34	76.97	117.54	*(86.51)*	83.96	79.26	97.57	*(88.85)*
C-constr	402.93	379.62	*(414.14)*	461.24	325.24	311.15	*(340.55)*	359.89
C-trade	10.61	9.52	43.95	*(10.7)*	10.67	9.52	21.25	*(10.67)*
C-busserv	102.57	100.57	143.28	*(113.03)*	92.51	90.83	110.23	*(101.82)*

The simulations were conducted as follows: *AGPAYSIM1(SIM)* is an exogenous transfer that increases demand for the investment of business services such that *AGPAYSIM1(SIM)=qbarinv('C-busserv')*, where *qbarinv(C)* is an exogenous (unscaled) investment demand.

Results

The macroeconomic impacts of the modulation shocks at the regional economies of South Ostrobothnia and North Karelia are presented in Table 3. The first column shows the base values in millions EUR derived from the Social Accounting Matrices. The second column presents the percentage changes from the base values caused by a 30% cut in agricultural subsidy, and the corresponding money transfer to the diversified activities. Similarly, the third and fourth columns show the effects of a 30% agricultural subsidy cut and transfer to increased investment demand.

Table 3. Macroeconomic indicators.

South Ostrobothnia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Private Consumption	2448.79	-0.01	-1.06	-0.45
Investments	718.55	1.28	24.06	28.49
Exports	2442.42	-0.11	-0.6	-0.59
Imports	2534.21	0.12	3.98	4.73
GDP at Factor Costs	3424.46	-0.02	0.51	1.04
North Karelia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Private Consumption	2036.25	-0.01	-0.41	-0.25
Investments	630.52	1.39	11.03	13.93
Exports	1888.51	-0.07	-0.38	-0.47
Imports	2047.64	0.24	2.06	2.72
GDP at Factor Costs	2931.69	0.02	0.23	0.4

The changes go into the same direction in both of the regions apart from the total GDP effect under the diversified simulation. However, the degrees of the changes varied. At least two factors should be noticed when interpreting these results, i.e. the importance of agriculture and food industries in the regional level, and the size of the money transfers. The transfer measured in EUR was more than twice as large in South Ostrobothnia compared with North Karelia. In addition, if one compares these sums with the regional GDPs, their shares were very small: 0.007 % in North Karelia and 0.017% in South Ostrobothnia. The share of agriculture of the regional GDP was 4% in North Karelia and 9.3% in South Ostrobothnia. When the food industries (both rural and urban) were also accounted for, the corresponding percentages were 15.5 for South Ostrobothnia and 5.3 for North Karelia.

The traditional investment transfer boosted regional investments most in both of the regions. The diversified simulation also resulted in positive changes in investments. Imports increased while exports and private consumption slightly decreased. The indicators presented in Table 3 are further detailed and explained below. In addition to the rural and urban totals, the aggregate figures of rural primary, rural and urban manufacturing and rural and urban services sectors were counted. The subsidy transfer benefited not only the diversified farms but also both rural and urban aggregate manufacturing. In North Karelia, services also gained. As for the investment simulations, Traditional investment resulted in greater total gains and especially the value added of manufacturing, but also of services, increased. Spatially, the urban area earned a higher GDP increase compared with the rural area in all the simulations. Rural GDPs and value added of agriculture and food industries decreased, whereas the value added of diversified farm activity increased.

Table 4. Regional GDP at factor costs.

South Ostrobothnia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
GDP total area	3424.46	-0.02	0.51	1.04
Rural area	2587.25	-0.04	0.39	0.99
Primary	460.4	-0.42	-1.15	-1.12
Secondary	796.64	0.13	0.92	3.57
Tertiary	1330.21	0.00	0.62	0.17
Urban area	837.21	0.05	0.85	1.18
Primary	15.22	0.00	0.00	0.07
Secondary	182.86	0.21	1.61	4.74
Tertiary	639.13	0.00	0.65	0.19
Diversified' activity	66.19	5.21	0.05	0.04
Agriculture	253.33	-2.13	-2.14	-2.12
Food industry, rural	157.79	-0.29	-1.20	-1.25
North Karelia	**BASE mill EUR**	**Diversified farms, %ch**	**Modern investment, %ch**	**Traditional investment, %ch**
GDP total area	2931.7	0.02	0.22	0.39
Rural area	1724	-0.01	0.13	0.36
Primary	348.8	-0.33	-0.83	-0.60
Secondary	523.8	0.16	0.62	1.40
Tertiary	858.5	0.02	0.22	0.11
Urban area	1207.7	0.05	0.35	0.45
Secondary	321.9	0.14	0.53	1.28
Tertiary	885.8	0.02	0.29	0.15
Diversified' activity	13.15	13.30	0.04	0.04
Agriculture	104.4	-2.74	-2.72	-2.72
Food industry, rural	24.52	-0.28	-1.60	-1.64

Table 5 shows the employment and capital rent effects. Since the labour market was integrated for the simulations, employment differences between the rural and urban areas are not reported. Employment increased under both of the investment simulations so that Traditional generated higher employment effects and, in addition, blue collar employment increased more. Investment simulations resulted in relatively more jobs in South Ostrobothia compared with North Karelia. With the Diversified farm simulation, the positive employment effect was stronger in North Karelia. Since agriculture in Finland is predominantly based on family farms and small entrepreneurship (not limited companies), the major income effects on agricultural households came through capital incomes rather than wages. Agricultural land rents fell drastically, while the drop in agricultural capital rents was steadier, and even positive in South Ostrobothnia.

Table 5. Employment and rent effects, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Employment			
White collar	0.07	1.03	1.87
Blue collar	0.07	1.05	2.29
Factor rents			
Rural Capital	0.1	2.13	3.73
Agricultural Land	-25.33	-25.41	-25.22
Agricultural Capital	4	-19.11	-18.98
Urban Capital	0.12	2.62	3.44
North Karelia	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Employment			
White collar	0.1	0.47	0.67
Blue collar	0.12	0.42	0.84
Factor rents			
Rural Capital	0.97	0.44	0.64
Agricultural Land	-24.01	-23.85	-23.82
Agricultural Capital	-4.25	-21.73	-21.69
Urban Capital	0.09	0.87	0.69

Both domestic sales and imports of aggregate products and services increased as a result of all the simulations, though sales and imports of secondary sectors’ products increased the most. Simultaneously, exports decreased. In contrast, domestic sales, exports and imports of food products decreased due to the simulations. The food industry is export oriented in South Ostrobothnia, accounting for 33% of the total export incomes of the region, whereas North Karelia is a net importer of food products. (Table 6)

Table 6. Domestic sales, exports and imports, %ch.

South Ostrobothnia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Quantity of domestic sales				
All products	4563.70	0.05	1.12	2.43
Primary	541.9	-0.47	-1.13	-0.73
Secondary	972.4	0.46	3.45	10.87
Tertiary	3049.4	0.01	0.78	0.31
Agri products	424.17	-0.61	-1.52	-1.52
Food products	174.23	-0.27	-1.06	-1.02
Quantity of exports				
All products	2442.40	-0.11	-0.60	-0.59
Primary	168.7	-0.40	-1.20	-2.37
Secondary	2120.5	-0.10	-0.56	-0.47
Tertiary	153.2	0.01	-0.56	-0.44
Agri products	57.34	-1.08	-3.05	-2.94
Food products	808.78	-0.29	-1.22	-1.29
Quantity of imports				
All products	2534.20	0.12	3.98	4.73
Primary	97.7	-0.01	0.48	2.90
Secondary	1587.3	0.15	3.39	6.16
Tertiary	849.3	0.09	5.47	2.27
Agri products	50.50	-0.14	0.04	-0.06
Food products	286.86	-0.25	-0.88	-0.74
North Karelia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Quantity of domestic sales				
All products	3782.7	0.11	0.65	1.17
Primary	310.2	-0.27	-0.65	0.26
Secondary	782.1	0.54	2.26	4.88
Tertiary	2690.5	0.03	0.33	0.19
Agri products	115.32	-0.75	-1.85	-1.86
Food products	45.66	-0.21	-1.13	-1.13
Quantity of exports				
All products	1888.5	-0.06	-0.38	-0.46
Primary	165.4	-0.33	-1.13	-1.52
Secondary	1554.2	-0.04	-0.30	-0.37
Tertiary	168.8	-0.01	-0.37	-0.26
Agri products	48.86	-1.10	-3.68	-3.65
Food products	150.15	-0.28	-1.73	-1.79
Quantity of imports				
All products	2047.7	0.23	2.06	2.72
Primary	84.5	-0.02	0.31	10.39
Secondary	1269.1	0.27	1.92	2.93
Tertiary	694.1	0.20	2.51	1.41
Agri products	22.91	-0.41	0.02	-0.03
Food products	180.37	-0.14	-0.52	-0.46

Both foreign and government savings increased (Table 7). In the model, the Current-Account Balance for the rest of the world equation is:

$$\sum_{c \in CM} pwm_c \cdot QM_c + \sum_{f \in F} trnsfr_{row\ f} = \sum_{c \in CE} pwe_c \cdot QE_c + \sum_{i \in INSD} trnsfr_{i\ row} + \overline{FSAV} \quad (30)$$

[import spending + factor transfers from RoW = export revenue + institutional transfers from RoW + foreign savings].

Since the exchange rate was fixed in the simulation, and imports increased and exports decreased, the increase in foreign saving can be interpreted as increasing "foreign" investments. Correspondingly, the government balance imposes equality between current government revenue and the sum of current government expenditures and savings.

Table 7. Foreign and government savings, %ch.

South Ostrobothnia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Foreign savings	213.05	2.73	54.22	63.08
Government savings	86.53	5.12	80.71	115.36
North Karelia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Foreign savings	164.78	3.68	29.87	39.17
Government savings	82.04	1.78	29.62	34.96

At the aggregate level, both producer and consumer prices increased (Table 8). The directions of the total value added prices, however, varied in the different regions. The value added price of agriculture decreased in all the simulations in both of the regions by around 20%. The most important factor was the falling value of agricultural assets. The corresponding decrease for the food industries were 0.2–1.3%. By contrast, the producer and consumer prices of agriculture and food products slightly increased in all the simulations. This is reasonable, since the supply of agricultural products decreased.

Table 8. Price changes, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Price of Value Added	1.11	0.07	0.35
Agriculture	-22.04	-22.11	-21.95
Food industry, rural	-0.31	-1.27	-1.32
Producer price	0.03	0.55	1.4
Agri products	0.24	0.79	0.74
Food products	0.01	0.09	0.14
Consumer price	0.03	0.27	0.88
Agri products	0.21	0.70	0.66
Food products	0.00	0.03	0.05
North Karelia	Diversified farms	Modern investment	Traditional investment
Price of Value Added	2.45	-0.27	-0.16
Agriculture	-19.66	-19.53	-19.5
Food industry, rural	-0.20	-1.14	-1.17
Producer price	0.05	0.34	0.72
Agri products	0.17	0.95	0.93
Food products	0.03	0.31	0.34
Consumer price	0.02	0.13	0.29
Agri products	0.14	0.79	0.77
Food products	0.01	0.06	0.07

The incomes of the agricultural households decreased. Concerning the diversified simulation, the agricultural households in North Karelia were more vulnerable. By contrast, urban firms and all the working households (except agricultural households) gained because of the investment simulations, while incomes of other households, i.e. pensioners, unemployed and students simultaneously decreased. In addition, rural firms in North Karelia were among the losers. (Table 9)

Table 9. Income of domestic firms and households, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Rural firms	0.18	0.65	3.04
Urban firms	0.16	3.48	4.62
Agricultural HHs	-0.28	-9.84	-9.39
Rural working HHs	0.05	0.57	1.49
Rural other HHs	0.00	-0.25	-0.08
Rural commuter HHs	0.06	0.52	1.58
Urban working HHs	0.06	0.82	1.72
Urban other HHs	0.00	-0.06	0.12
North Karelia	Diversified farms	Modern investment	Traditional investment
Rural firms	1.05	-0.77	-0.45
Urban firms	0.11	1.03	0.81
Agricultural HHs	-2.40	-9.14	-8.99
Rural working HHs	0.27	0.11	0.4
Rural other HHs	0.04	-0.05	-0.03
Rural commuter HHs	0.10	0.31	0.53
Urban working HHs	0.10	0.27	0.49
Urban other HHs	0.00	-0.01	-0.01

6.4 Discussion

Both of the investment shocks resulted in positive total impacts in terms of the gross regional domestic product and regional employment in both of the regions. This result suggests that as the activity specific subsidy was allocated to regional investments, the production factors moved to more efficient industries that were able to generate more returns and employment. Traditional investments, (i.e. construction and machinery) created stronger positive effects in comparison with Modern investments, (i.e. electronic equipment and business and trade services).

By contrast, transfer of the income subsidies from traditional agriculture to diversified activities resulted in different effects in the study regions such that the regional total GDP effect was positive in North Karelia, while in South Ostrobothnia it was negative. This can be traced back to the importance of the food cluster in South Ostrobothnia. Through its linkages to the local economy, agriculture can generate higher economic outcome and thus use the income support more efficiently. In addition, the decreasing export incomes of the food products outweighed the increased domestic sales of the products and services of diversified activities. An additional factor was the falling rent of agricultural land.

In North Karelia, the farm structure, the relative importance of the agriculture and food industry for the regional economy, the structure of diversified activities, and the relative importance of urban area differ from those of South Ostrobothnia. As a result of the farm diversification shock, employment and domestic sales of secondary and tertiary sectors increased relatively more in North Karelia, and the whole region benefited in terms of GDP. Shucksmith et al. (2005) have also suggested that the CAP second pillar, at least in some cases, may contribute cohesion targets. More generally, however, previous research has found evidence both against (Shucksmith et al. 2005; Esposti 2007), and for (Rizov 2004; Daniel & Kilkenny 2009) the ability of the CAP to promote rural development. A common positive impact for all the agricultural policy simulations of this research was that both foreign and government savings increased and thus boosted local investments.

The results suggest that transferring CAP payments from actual agriculture as income support to diversified activity does not promote rural development and economic activity measured at the regional level when the agriculture and food industry are at the core of the rural economy. By contrast, if the relative position of agriculture is already of minor importance, diversified activities could produce welcome extra income for the local economy. However, in both cases, agricultural households suffered. In a conclusion, all the simulations generated higher positive GDP effects to the urban areas compared with the rural areas, thus suggesting agglomeration development.

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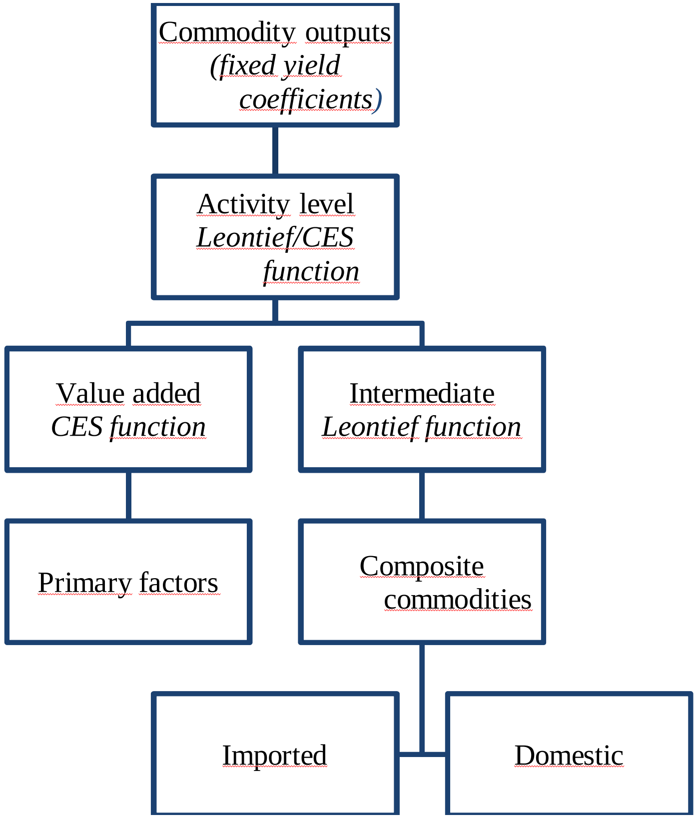
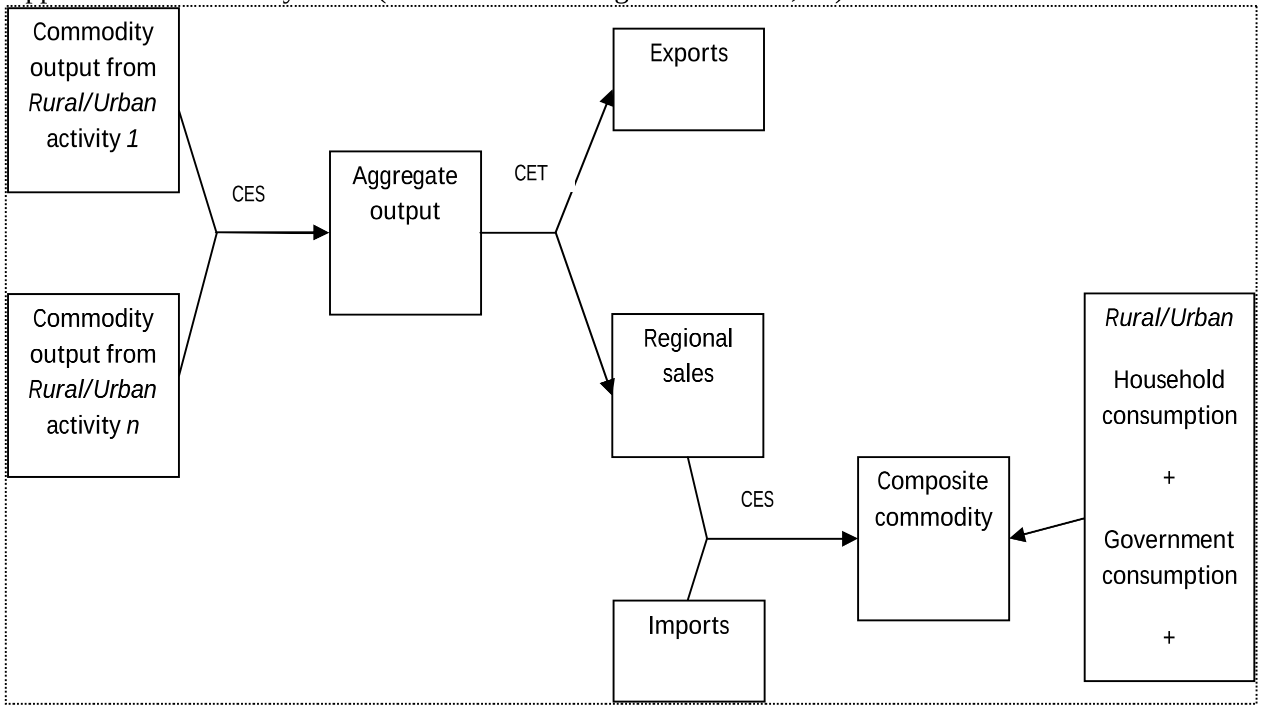
Appendix 1. The basic structure of the rural-urban SAM.

	Activities		**Commodities**	**Factors**		**Firms**		**Households**					
	Rural	Urban	Commodities	Rural	Urban	Rural	Urban	Rural	Urban	Government	ROW	S-I	Total
Rural activities			Marketed output										Gross output
Urban activities													
Commodities	Intermediate inputs							Consumption expenditures		Government consumption	Exports	Gross capital formation + change in stocks	Demand
Rural factors	Value added												Factor income
Urban factors													
Rural firms													Firm income
Urban firms													
Rural HHs				Factor income		Capital transfers		Inter-household transfers		Transfers to households	Factor income from ROW		Household income
Urban HHs													
Government	Net production and product taxes		Sales taxes	Factor taxes		Income taxes		Income taxes			Transfers from ROW		Government income
Rest of the World			Imports	Factor income to ROW						Transfers to ROW			Foreign exchange outflow
Savings-Investments						Savings		Savings		Savings	Foreign savings		Savings
Total	Rural gross input	Urban gross input	Supply	Factor expenditures		Firm expenditures		Household expenditures		Government expenditures	Foreign exchange inflow	Investments	

Appendix 2. Production technology (modified from: Lofgren et al 2002).



Appendix 3. Commodity flows (modified from: Lofgren et al 2002, 12).



Appendix 4: Selected model equations (Lofgren et al. 2002).

Production

Each activity represents the behaviour of a profit maximising producer by maximising the difference between earned revenues and the costs of factors and intermediate inputs. These profits are maximised subject to the production technology. The production technology is two-layered. At the top level, where value-added and intermediate inputs are combined in order to produce commodities or services, the technology is specified either by a Leontief function or a constant elasticity of substitution function (CES). In this research the model default, i.e. the Leontief function, is applied.

Leontief Technology: Demand for Aggregate Value added

$$QVA_a = iva_a \cdot QA_a \qquad a \in ALEO \qquad (1)$$

Leontief Technology: Demand for Aggregate Intermediate Input

$$QINTA_a = inta_a \cdot QA_a \qquad a \in ALEO \qquad (2)$$

where

$a \in ALEO(\subset A)$ = a set of activities with a Leontief function at the top of the technology net
iva_a = quantity of value-added per activity unit
$inta_a$ = quantity of aggregate intermediate input per activity unit

At the bottom level where value-added is formed, primary factors, i.e. the labour and capital mix is determined by a CES function.

Value Added

$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \alpha_{f\,a}^{va} \cdot QF_{fa}{}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \qquad a \in A \qquad (3)$$

For each activity, the factors are used up to the point where the marginal revenue product is equal to its wage (that is factor price or rent). These factor wages differ across activities.

Factor Demand

$$WF_f \cdot \overline{WFDIST_{f\,a}} = PVA_a(1 - tva_a) \cdot QVA_a \cdot \left(\sum_{f \in F'} \alpha_{f\,a}^{va} \cdot QF_{fa}{}^{-\rho_a^{va}} \right)^{-1} \cdot \delta_{f\,a}^{va} \cdot QF_{f\,a}^{-\rho_a^{va}-1} \qquad (4)$$

$$a \in A \qquad f \in F$$

where

$f \in F\ (F')$ = a set of factors,
tva_a = rate of value-added tax for activity a,
α_a^{va} = efficiency parameter in the CES value added function,
$\delta_{f\,a}^{va}$ = CES value-added function share parameter for factor f in activity a
QF_{fa} = quantity demanded of factor f from activity a,
ρ_a^{va} = CES value-added function exponent,
WF_f = average price of factor, and
$\overline{WFDIST_{f\,a}}$ = wage distortion factor for factor f in activity a (exogenous variable).

Commodities

Each rural and urban activity produces commodities in fixed proportions. Domestic aggregated output is generated from the output of these different activities by using CES function.

Output Aggregation Function

$$QX_c = \alpha_c^{ac} \cdot \left(\sum_{a\in A} \delta_{a\,c}^{ac} \cdot QXAC_{ac}{}^{-\rho_c^{ac}}\right)^{-\frac{1}{\rho_c^{ac}-1}} \qquad c \in CX \qquad (5)$$

where

α_c^{ac} = shift parameter for domestic commodity aggregation function,
$\delta_{a\,c}^{ac}$ = share parameter for domestic commodity aggregation function, and
ρ_c^{ac} = domestic commodity aggregation function exponent.

Output Transformation Function (CET) reflects the assumption of imperfect transformability between domestic sales and exports.

CET Function (aggregate marketed domestic output = CET[export quantity, domestic sales of domestic output]

$$QX_c = \alpha_c^t \cdot \left(\delta_c^t \cdot QE_c^{\rho_c^t} + (1-\delta_c^t) \cdot QD_c^{\rho_c^t}\right)^{\frac{1}{\rho_c^t}} \qquad c \in (CE \cap CD) \qquad (6)$$

Imperfect substitutability between imports and domestic output sold domestically is captured by a CES aggregation function.

Composite supply (Armington) function

$$QQ_c = \alpha_c^q \cdot \left(\delta_c^q \cdot QM_c^{-\rho_c^q} + \left(1-\delta_c^q\right) \cdot QD_c^{-\rho_c^q}\right)^{-\frac{1}{\rho_c^q}} \qquad c \in (CM \cap CD) \qquad (7)$$

where

α_c^q = an Armington function shift parameter,
δ_c^q = an Armington fuction share parameter, and
ρ_c^q = an Armington function exponent.

Households

Households receive factor income both directly from industries and through firm accounts and from the rest of the world. In addition, the government pays income transfers to households. Households consume marketed commodities, save, pay taxes and transfer money to other institutions. Household consumption is allocated across different commodities according to linear expenditure system (LES) demand functions, derived from the maximisation of a Stone-Geary utility function (Lofgren et al. 2002, 10).

Income of domestic, nongovernment institutions

$$YI_i = \sum_{f\in F} YIF_{i\,f} + \sum_{i'\in INSDNG'} TRII_{i\,i'} + trnsfr_{i\,gov} \cdot \overline{CPI} + trnsfr_{i\,row} \cdot EXR, \quad i \in INSDNG \quad (8)$$

where

$i \in INSDNG\ (= INSDNG' \subset INSD)$ = a set of domestic nongovernment institutions,
YI_i = income of institution i (in the set INSDNG), and
$TRII_{ii'}$ = transfers from institution i' to i (both in the set INSDNG).

Appendix 5. Elasticity values.

Production elasticities

Elasticity of substitution between factors -bottom of the technology nest

Primary production		Manufacturing		Services	
Agriculture	0,5	Food industry	0,8	Trade	0,6
Forestry	0,4	Textile industry	0,9	Hotels and catering	0,6
Fishery	0,4	Wood processing	0,7	Transport	0,3
Mining	0,8	Paper industry	0,7	Financing	0,6
		Fuels	0,5	Business services	0,6
		Minerals	0,5	Estates	0,6
		Metal industry	0,5	Public services	0,8
		Machinery	0,7	Education	0,8
		Electronic equipment	0,8	Health services	0,8
		Transport equipment	0,8	Other (private) services	0,8
		Other manufacture	1,05		
		Energy	1,2		
		Construction	0,7		

Elasticity of substitution between aggregated factors and intermediate inputs -top of the technology nest

All industries 0,1

Output aggregation elasticity for commodity C

All commodities 6

Trade elasticities

Armington elasticity by commodity (imports)

All industries 2

CET elasticity by commodity (exports)

All industries 2

Household consumption elasticities

Frisch parameter for household LES demand

All households -1

Expenditure elasticity of market demand for commodity c by household h
(Source: Economic Research Service (ERS) - U.S. Department of Agriculture)

Primary goods		Manufactured goods		Services	
Agriculture products	0,4	Food products	0,4	Trade	1,3
Forestry products	0,4	Textiles	1	Hotels and catering	1,3
Fish products	0,4	Timber	1,2	Transport	1,2
Mining products	1	Paper products	1,3	Financing	1,2
		Fuels	1,2	Business services	1,3
		Minerals	1,2	Estates	1,2
		Metals	1,2	Public services	1,2
		Machinery	1,3	Education	1
		Electronic equipment	1,3	Health services	1,2
		Transport equipment	1,3	Other (private) services	1,3
		Other manufactured products	1,2		
		Energy	1,2		
		Construction	1,2		