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ECONOMIC IMPACT EVALUATION OF THE EUROPEAN PROGRAM FOR RURAL DEVELOPMENT IN BURGUNDY: ALLOWANCE FOR SELECTION BIAS. [1]

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Abstract: Since the 1988 structural funds reform, the European Union has spent substantial amounts on support for rural areas "in decline" with a view to stimulating development and especially economic development. The final evaluation of the objective 5b Programs in Burgundy has provided an opportunity to explore the Program's impact on the economic development of areas receiving aid. An array of demographic, economic, and social variables defined from locally available statistical and administrative databases allows us to examine the pattern of changes in population, jobs, household incomes, and local added value. The economic effects specifically induced by the Program are analysed by using and adapting micro-econometric evaluation tools (matching and double difference methods) often used for employment policy assessment (Heckman *et al.*, 1999). The main concern is to correct "selection bias" when evaluating the Program's effects by comparing changes in areas receiving aid and those not receiving aid. Apart from its methodological interest, this research shows the positive impact of the Program on attracting population and on agricultural added value, but also the less apparent impact of this Program on other economic sectors targeted by a large proportion of the aid.

Key Words : *Objective 5b European Policy – Policy Evaluation – Selection Bias*

JEL Classification: R58, O21, H72, C13

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1. Introduction

The Guidance section of the European Agricultural Guidance and Guarantee Fund (EAGGF) is often considered as the "poor parent" of CAP (Berriet-Solliec and Daucé, 2001). Nevertheless the initial goal of speeding up the adjustment of agricultural structures has always be retained since the creation of EAGGF and especially in the objectives 5a and 5b of the 1988 Structural Funds reform. The objective 5a concerns sectorial measures but in conformity with Regulation (EEC) 4253/88 objective 5b deals with rural areas which present economic or/and social difficulties and are considered "in decline". Sectorial measures are also included in regional programs in a coherent set. In the spirit of the reform a greater attention has to be paid to appraisal, monitoring and evaluation of stuctural measures and ex post evaluation will be based on impact indicators. But whereas programs frequently include anticipated impacts the real effects on regions included under objective 5b are seldom analysed. Our study focuses on this problem and is part of the ex post evaluation of the second Objective 5b program conducted in Burgundy (France) from 1994 to 1999.

Although, in the early evaluations of Objective 5b policy in Burgundy, the policy analysis stage was conducted thoroughly, the quantitative analysis and effect measurement stage was not as far-reaching and left scope for improvement (Daucé, 1998). However, it was possible to construct performance indicators from which to characterise the physical realisations and their corresponding financing and to characterise the agents benefiting directly from public-sector support. This analysis was extended by thematic developments inquiring into changes in behaviour and into the main results obtained. Conversely, it was difficult both to evaluate the effects that were specific to the policy implemented and to construct suitable summary indicators of development in the sector or the geographical area. These limitations stem from three main difficulties. The first relates to access to infra-national data and *a fortiori* to infra-regional data. The second is the difficulty of building an array of indicators with which to pin down local economic growth or to propose one or more overall growth indicators that go beyond the variables conventionally used in evaluation: employment, investment and location of firms (Dormard, 1999; Bondonio and Engberg, 2000). Finally, we came up against the familiar difficulty for evaluators of separating the effects specific to a policy, that is, of measuring the difference between what actually occurred when public-sector aid was made available and what would have happened had there been none.

Since the Objective 5b programs were multi-sector packages designed to bring about "integrated" economic development of the geographical area, it seems appropriate to assess their overall effects on local economic growth. In this perspective, this paper suggests lines of inquiry that seek to go beyond the earlier limits. First, we seek to evaluate the effects on local economic growth of the Objective 5b policy relying on the broadest possible range of economic development indicators.

Second, we choice among the methods implemented for evaluating regional development policies. We leave aside the "standardization" (such as shift & share) or "regression residuals" methods, such as those suggested by Moore and Rhodes (1973) and focus instead on what are known as "reference group" methods (Isserman and Mersfield, 1982; Ray, 1999). The formers consider the impacts of regional policy as a residual. For example, in the case of shift & share method, the reference is the national change. And, one applies the structural features observed at this level to the different study areas: the difference between the observed change and the "structural" change is analysed as entirely due to the policies operating regionally. The latter methods draw on methods of comparative analysis between areas receiving aid and areas not receiving aid. In such analyses, it proves important to allow for selection bias. Several statistical methods and many estimators of causal effect have been suggested to correct for selection bias in evaluations made from non-experimental data (Heckman and Holtz, 1989; Heckman and Smith, 1996). They have been largely developed and implemented with

regard to social or employment policies (Grosmann and Baldwin, 1994; Heckman *et al.*, 1997 and 1999; Magnac, 2000). However, some authors used them for evaluating regional or local development policies. Papke (1994), Boarnet and Bogart (1996) and Bondonio and Engberg (2000) evaluated with them the impact of enterprise zone programs on local employment in different US States. Rephann (1993) attempted to measure the regional impact of US highway development and Ray and Hite (2000) sought to estimate the impact of public infrastructure investments on the economic development of rural counties in the Southern United States.

In the next Section, we recall the principles and the content of the European programs for rural development, we set out in Section 3 the choice, origin and significance of economic development indicators selected for the analysis. We show how the Burgundy's 5b areas evolved over the period compared with the other parts of Burgundy. We then present in Section 4 the problems related to selection bias and the main methods used to correct them in a comparative approach with non-experimental data. Then, in Section 5, we present and analyse the main findings obtained as a result of applying these methods to the specific impact on the economic development of the 5b area in Burgundy. Finally, Section 6 presents some concluding remarks about the limitations of the results obtained and suggests lines for further investigations.

2. European programs for rural development as applied in Burgundy (1991-1993, 1994-1999)

2.1 End-purposes and principles of implementation

The introduction of rural development programs is a consequence of the 1988 reforms of the European structural funds, which entailed a substantial increase in their financial endowment. The Objective 5b programs were developed as part of an enhanced and extended policy compared with the previous period. They were designed to restore the economy in rural areas that had been hit particularly hard by ongoing decline in the agricultural sector. The European Union considers that it is essential to safeguard these areas for reasons of social cohesion and balanced regional development. Rural development programs propose to reinforce the economic structure of these areas so as to develop their potential for growth and to make up for backwardness in the provision of rural facilities for the population and for firms.

The programs are jointly financed by the EU and by countries and comply with European principles of concentration, partnership, coherence, additionality and subsidiarity (European Communities, 1989). The first of these principles means that aid is concentrated on the most vulnerable areas at sub-regional scale. The areas to which the Objective 5b European structural policy applies are defined on the basis of criteria laid down in Regulation (EC) 2052/88 [2]: high level of agricultural employment in the total employment, low farming income particularly in terms of agricultural added value per unit of labour, low level of socio-economic development in terms of per capita GDP. The areas thus defined do not generally match any administrative division. In France, the delimitation unit of these areas is the canton.[3] The other principles are reflected by the construction of multi-fund, partnership programs implemented at regional scale as part of a multi-annual programme ensuring that the objectives and instruments of the various financing parts involved are coherent (especially French planning agreements between the state and regional authorities, *Contrat de Plan État-Région*).

Financing is mostly assigned to economic development for which three main priorities are defined: development and diversification of farming and forestry; development of small and medium-sized businesses; and development of rural tourism. These measures are supplemented by actions designed to help in developing human resources, to protect the environment and to improve living conditions

[2] These criteria were amended slightly for the second stage of structural fund reform (1994-1999).
[3] "Cantons" are French political areas, which elect the *Conseillers Généraux*, members of the Local Council at the "Department" level. About teen communes (French municipalities) make up a canton.

(European Commission, 1996). Thus, relying on the most widespread activities and structures in rural areas, these programmes aim at bringing about integrated economic development with an ambition to make up for "lagging behind in development".

Objective 5b was implemented in two waves: an initial program (locally called the *Programme de développement des zones rurales* or *PDZR* – rural area development program) for the period 1991 to 1993 and a subsequent program based on similar principles and criteria of eligibility covering the period 1994 to 1999. The successive application of these two programs to areas with similar boundaries means that we can analyse nearly 10 years of public policy in Burgundy.

2.2 Eligible rural areas in Burgundy

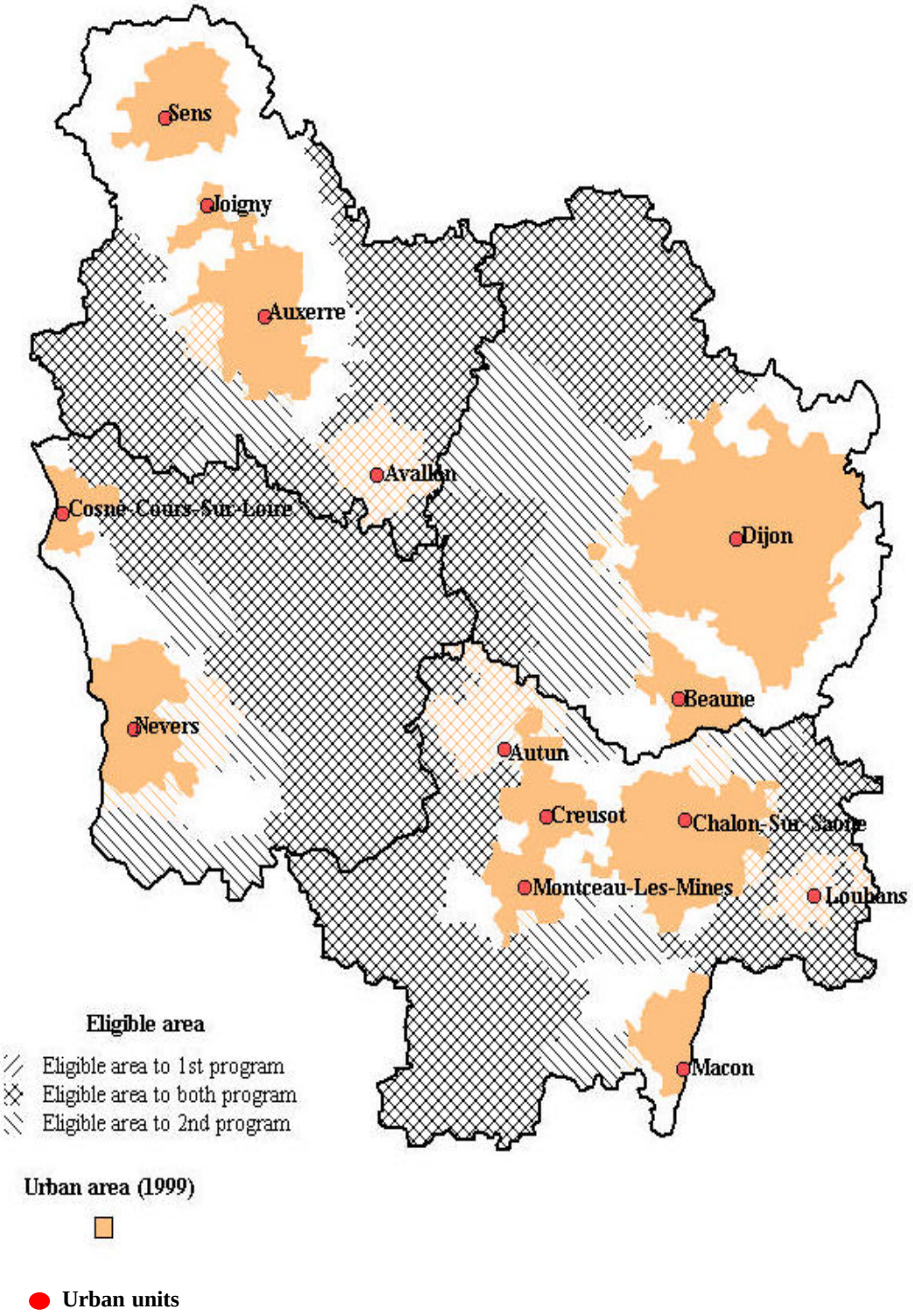
A significant share of Burgundy was eligible under the program. The eligible area for the initial program accounted for 22% of the region's population and 47% of its land area. All of this was included again in the second program which took in a further 19 cantons, extending, the eligible population and land area to 28% and 62%, respectively (Map 1 and Table 1). As might be expected, Objective 5b areas in Burgundy correspond almost exclusively to the predominantly rural areas (Table 1), especially for the second program: only 11,9 % of eligible population, living in 7,3% of eligible land area, was localised in communes belonging to the predominantly urban areas. But it worth noting that in Burgundy, the eligible area extends beyond a few periurban communes and includes (in the second program) two small urban centres (Avallon and Louhans). While 41% of Burgundians live in predominantly rural area, this category of area makes up 93% of the area eligible for aid. These are mostly communes belonging to the remote rural areas where there is little employment and to rural centres and their surrounding areas. However, it should be observed that almost a third (in the second program) of the predominantly rural area in Burgundy is ineligible under the program because of its denser industrial activity and more profitable agriculture (vineyards, market-gardening).

Table 1 – Breakdown of the Burgundy's 5b area by the urban area zoning

	Number of communes			Population 1990 (1000 inhabitants)			Surface (1000 km²)		
	5b area 91-93	5b area 94-99	All of Burgundy	5b area 91-93	5b area 94-99	All of Burgundy	5b area 91-93	5b area 94-99	All of Burgundy
Size	812	1137	2044	369.2	451.6	1609.7	15.0	19.5	31.6
Urban centres	0.9	0.5	3.0	10.2	4.3	41.0	1.1	0.6	3.6
Periurban areas	6.0	6.2	22.6	6.4	7.6	18.0	5.7	6.7	18.8
Predominantly urban area	*6.9*	*6.7*	*25.7*	*16.5*	*11.9*	*59.0*	*6.8*	*7.3*	*22.4*
Rural areas under weak urban influence	15.7	19.7	24.6	10.2	13.8	11.4	13.5	17.1	22.4
Rural centres	1.2	1.1	1.4	15.1	15.0	8.2	2.0	1.9	2.1
Periphery of rural centres	20.2	19.9	14.2	12.7	13.2	5.8	16.9	17.0	13.8
Remote rural areas	56.0	52.6	34.1	45.4	46.1	15.6	60.8	56.7	39.3
Predominantly rural areas	*93.1*	*93.3*	*74.3*	*83.4*	*88.9*	*41.0*	*93.2*	*92.7*	*77.4*
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: INSEE, RP 90 (1990 ZAU boundaries)

Map 1 –Burgundy's cantons eligible to the two objective 5b programs (1991-1993 & 1994-1999)



2.3 The resources and fields of intervention of Burgundy's programs

The rural area development programs draw on public financing from highly diverse sources in pursuit of multi-sectorial objectives. The financial resources allocated to this program are quite substantial standing at € 170 millions for the first program and € 230 millions for the second one, that is, € 119 per inhabitant per year over the first period and € 84 over the second. However, these financial resources do not correspond entirely to European subsidies. A large part is actually national funding from the national and local governments that is traditionally given to 5b areas. The European funds allocated to the 5b programs in Burgundy give a more precise idea of public financial help to 5b areas: they make up respectively 29% and 50% of the total financial resources for the two successive programs.

The content of the programs in Burgundy is arranged around two main approaches: maintaining and developing activities, and optimising development factors. The first relates to the development of economic activity by enhancing local resources. The public authorities seek to influence the behaviour of private-sector agents by providing incentives to modernise production facilities and to develop skill levels in firms. This objective involves a set of mostly sector-based actions borrowed, by and large, from national and local mechanisms. New business creation and activity diversification are also among the objectives in the farming and forestry sectors. The second strategic objective is to optimise development factors. This involves both improving living conditions through the production of public goods (infrastructures, amenities, and services) and mobilising human resources to achieve social cohesion and economic development.

These different objectives involve some sixty actions allowing a wealth of individual operations to be financed (nearly 18,000 from 1990 to 1999). Table 2 summarises the breakdown of public spending by intervention field under the two programs.

Table 2 – 5b programs subsidies spending in Burgundy by intervention field

Total public spending (EU funds and national spending)	1990-1993 5b program	1994-1999 5b program
Total public spending (millions €)	177	232
including EU spending (millions €)	*51*	*116*
- Farming and forestry	22 %	22 %
- Commerce, services and industry (small firms)	14 %	11 %
- Tourism, environment	29 %	26 %
- Living conditions, infrastructures	28 %	25 %
- Human resources	4 %	13 %
- Others	3 %	3 %
Total	100 %	100 %

Source: from Daubard et Lépicier, 2001

Measures relating to living conditions and infrastructures occupy a predominant position, reflecting the importance that the program designers ascribe to restoring the balance of living conditions for rural populations. In terms of economic development, the Burgundy's program primarily targets the traditional sectors in rural areas. Less effort is made for secondary and tertiary businesses, which may be interpreted, given the employment structure of the 5b area, as reduced commitment to these sectors under the PDZR. Among tertiary activities, tourism receives strong support allowing new activities to be developed that enhance certain amenities in rural areas. Although it was initially a subsidiary concern, action on human resources has become significant under the second program and covers primarily the skill levels and vocational training of the work force whether in employment or unemployed.

Ultimately, the PDZR programs differ very little from traditional rural policies, which are characterised by relatively high spending on infrastructure to meet the needs of the population, the development of activities that are closely tied to the area, and by the reduced scope for industrial, commercial and self-employment activities.

3. Indicators of local economic development

3.1 A broad array of indicators to measure local economic development

The multi-sector aim and the goal for local economic development displayed by the 5b program in Burgundy lead us to measure its impact in terms of local economic growth. No synthetic indicator such as local added value is available and data available at the canton level are scarce. Thus, we built up the broadest possible array of indicators to provide a better understanding of the different parts of the program. While it is the cantons that are eligible under the program, all the indicators selected were collected for all the cantons of Burgundy.

First, the programs were designed to **maintain the local population** or even to attract new inhabitants while, at the same time, improving living conditions. To measure their impact, we selected some usual indicators from population censuses such as the ***change in population*** and the ***migratory balance*** between two censuses. We added an indicator of the change in household income. The period between the latest French population censuses (***1990 and 1999***) includes both programs and so we will evaluate the aggregate effect of both programs. The household income indicator was built on the basis of information from the French Tax Department (*Direction générale des Impôts - DGI*). We used the ***net taxable income of local households for 1994 and 1997*** relative to the number of inhabitants respectively observed for 1990 and 1999. Beyond the conventional difficulties inherent in this tax source and the way our ratios are built, it should be observed that the chosen indicator provides only imperfect coverage of the program and can only be used to measure its short run effects.

The 5b program impact on **local economic growth** may be analysed from various standpoints: changes in employment, in number of firms and plants, in proxy variables for local added value. It was impossible to build all theses indicators from a single source. We had to resort to various sources that do not always cover the same domains or the same periods.

The French population censuses could be used to measure the ***change in local employment*** by accounting the active population in employment at their place of work. The 1999 data was then set against data from earlier censuses (1982 and 1990). As with the population, it is the impact of the two programs that we will analyse. While this data is meaningful in terms of the local economy, it is known to mask large divergences between sectors. In order to extend the analysis to changes in sector employment, we turned to a French plant database: the annual social data returns (*Déclarations annuelles des données sociales - DADS*) which allow measuring the ***salaried employment and its change*** over time. We used the only records available (***1995 and 1999***): our variable allows us to evaluate only the short run effects of the second program. Furthermore, we had to select the most reliable sectors in terms of employment location: the variables obtained cover salaried employees of plants with at least one employee in manufacturing sectors or in market services. Our measurement of sector-based employment therefore mainly omits all agricultural employment, public-sector employment and self-employed firms, in addition to some other sectors.[4]

The analysis of changes in the ***number of local plants*** comes from the same database (DADS ***1995 & 1998***). Then, the same restrictions apply. This indicator is combined with an indicator of ***changes in the number of farms*** taken from the 1988 and 2000 agricultural censuses, the latter indicator covering both PDZR programs.

[4] For reasons of reliability of data on plant location we had to remove the sectors for utilities (water, gas and electricity) (G2A-G2B), building (H01-H02), post office and telecommunications (N10), financial intermediaries (L01) and manpower services (N32).

Building indicators of **local economic growth** raises harder problems than constructing indicators of changes in employment and plant number. To do this, Berriet-Solliec *et al.* (2001) suggested to use a tax database, the local business tax. This is a local tax levied on industry, commerce and services for plants located in the tax area (commune or group of communes); but local authorities, farms and self-employment plants are permanently exempted from this tax. The local business tax base is calculated from two main factors: an estimate of the rental value of the property (built or unbuilt land, equipment and tools), and a proportion (18%) of the wage bill paid by the local plants. Because of its definition (remuneration of production factors), Guengant (1997) compared this local business tax base with the local added value and we used it in this way as an indicator of local economic activity and its growth. In order to assess the global economic impact of the two PDZR programs, we collected data required for computing the ***local business tax base by canton in 1990 and 1997***. However, this indicator has its limitations. As with the DADS database, the omission of farms, of self-employment plants and of the public sector among the economic activities included in the local business tax base is problematic because of the aims of the PDZR programs and of the significance in the 5b areas. This measurement of the policy impact will therefore be limited to analysing the impact of aid on economic growth of non-farming market sectors excluding self-employment plants. In addition, only a small part of the wage bill paid by local businesses (18%) is included in the local business tax base. Then, there is an imbalance between the proportion of the return on capital and that of labour remuneration in this indicator, with the former factor largely dominating the latter.

We introduce two further indicators in order to offset some of these limitations. The first is designed to measure the effects of the program on the agricultural sector. We used the ***standard gross margin for the canton*** as indicated by the results of the ***1988 and 2000*** farm censuses. This measurement seems to be close to a local agricultural added value, but it differs from this in some respects. It is calculated on the basis of the physical characteristics of farms located in the canton. These physical characteristics (distribution of the land area by crop, livestock and its distribution by category of animals) are then attributed a standard coefficient for the gross margin (established at the regional level). Alongside this, we again used the 1995 and 1998 DADS database to evaluate first the ***aggregate gross wages paid locally and the change in them for 1995 and 1998***, and second their distribution between industry and market services. To the same limitations as before, this indicator covers only a part of the local added value, that corresponding to remuneration of the labour factor, omitting return on capital (which is better viewed through the local business tax base) and profit.

Despite the different limitations explained above, this set of indicators provides some idea of the initial and final situation in the Objective 5b area and allows the impact of the program to be evaluated by comparison with the remainder of Burgundy. However, there is one field that is poorly covered by our indicators although it is significant in the program. This is the activity conducted through non-farming and self-employed occupations, which relates in particular to commerce, to small firms industry and to tourism, which are all sectors on which the program focuses. Only the population census data (active population at their place of work) cover these sectors, which are excluded from the DADS database (local plants, sector-based employment and earnings) and from the local business tax base.

3.2 Recent changes in the Burgundy's Objective 5b area: preliminary analysis.

Table 3 provides a picture of the initial and final economic and demographic situations in the Burgundy's Objective 5b area, on the basis of the array of indicators proposed above. The situation of this area is compared with that prevailing elsewhere in Burgundy by distinguishing the cantons entirely within an urban centre [5] from the others. We will call the latter as "other rural Burgundy's areas".

[5] These are cantons where 100% of the population lives in an urban center.

Table 3 – Comparison between the Burgundy's 5b area and the non-5b area

	5b area	Non 5b area (excl. urb. cent.)	Non 5b area (incl. urb. cent.)	Total Burgundy
Number of cantons	84	75	17	176
1982 Population density (inhab/km²)	24.1	52.2	1096.0	50.5
1990 Population density (inhab/km²)	23.2	55.7	1080.1	50.9
1999 Population density (inhab/km²)	22.6	57.8	1052.3	51.0
82-90 Change in population (% per year)	-0.52	0.80	-0.18	0.10
90-99 Change in population (% per year)	-0.28	0.42	-0.29	0.00
82-90 Migratory balance (% per year)	-0.12	0.64	-0.75	-0.03
90-99 Migratory balance (% per year)	0.15	0.32	-0.65	-0.03
94 Net taxable income/inhab. (FF 94)	36252	43611	43774	41597
97 Net taxable income/inhab. (FF 97)	40728	47159	47792	45595
94-97 Change in net taxable income (%/year)	3.08	3.94	2.08	3.11
1982 Employment density (/km²)	8.4	16.0	566.7	19.5
1990 Employment density (/km²)	7.5	16.3	576.9	19.3
1999 Employment density (/km²)	7.3	16.9	590.6	19.6
82-90 Change in employment (%/year)	-1.30	0.22	0.22	-0.17
90-99 Change in employment (%/year)	-0.33	0.45	0.26	0.18
95-98 Change in empl. (DADS, %/year) *	1.26	2.00	0.63	1.25
95-98 Change in industrial empl. (%/year) *	0.42	0.54	-0.18	0.26
95-98 Change in market services empl. (%/year) *	2.42	3.60	1.13	2.13
88-00 Change in farm numbers (%/year)	-3.98	-3.43	-4.11	-3.75
95-98 Change in number of plants (%/year) *	1.91	2.08	2.38	2.17
95-98 Change in ind. plant number (%/year) *	1.02	0.99	0.36	0.82
95-98 Change in market service plant number *	2.17	2.41	2.66	2.47
1988 Standard gross margin/ha	361	733	653	502
2000 Standard gross margin/ha	370	787	627	527
88-00 Change in standard gross margin (%/year)	0.20	0.60	-0.34	0.41
1983 Local business tax base/inhab (FF 83)	4490	5879	8294	6255
1990 Local business tax base/inhab (FF 90)	7616	10134	13808	10595
1997 Local business tax base/inhab (FF 97)	10195	13109	17905	13797
83-90 Change in business tax base (%/year)	6.28	7.90	6.38	6.92
90-97 Change in business tax base (%/year)	3.88	4.31	3.40	3.85
95 Total gross wages/inhab (DADS, FF 95) *	13072	17222	29238	19843
98 Total gross wages/inhab (DADS, FF 98) *	14478	18945	32272	21850
95-98 Change in total gross wages (%/year) **	3.02	3.87	2.89	3.27
95-98 Change in manuf. gross wages (%/year) **	2.40	2.62	2.86	2.66
95-98 Change in mkt. Services wages (%/year) **	4.06	5.40	2.92	3.87

Sources: *INSEE (1982, 1990 & 1999 Pop. Censuses, 1995 & 1998 DADS, 1994 & 1997 Income tax); SCEES (1988 & 2000 Agr. Censuses); DGI (Centres Départementaux d'Assiette).*

* The DADS database covers employees in plants with at least 1 employee in manufactured sectors and market services from which the following sectors have been removed: Utilities (water, gas, electricity) (G2A-G2B), Building (H01-H02), Post Office and Telecommunications (N10), Financial Intermediaries (L01), and Manpower Recruitment (N32). Farming and "Administered services" are not concerned.

** The figures here are for the total of all wages paid in the area as reported in the DADS 1995 and 1998.

Both level and changing variables show the "lag in development" of the Objective 5b area and how it has persisted compared with other rural areas of Burgundy. As expected, population and employment densities are less than half of those observed in the remainder of rural Burgundy: 23 *versus* 58 inhabitants per km^2 and 7 *versus* 17 jobs per km^2 in 1999. More symptomatic still of this disparity are the gaps observed in income, wages and local added value. In 1994 the net taxable income per capita in the 5b area was 20% lower than that of people living outside the 5b area and of urban centres in Burgundy. The difference was still 16% in 1997. Likewise, the differences in earnings per capita remained at about 30% in 1995 and in 1998, while similar disparities are observed for the local business tax bases in 1990 and 1997.

Moreover, all the evidence suggests that the recent period has failed to reduce the differences despite the implementation of the Objective 5b programs. Whichever indicator is chosen (except the change from 1995-1998 in the number of industrial plants), changes in the 5b area are consistently below those in rural areas of Burgundy not included in the PDZR area. Thus, although the population of the latter area grew by 0.42% per year between 1990 and 1999, that of the PDZR area fell by 0.28% per year over the same period. Similarly, total employment fell by 0.33% per year in the PDZR area whereas it rose by 0.45% per year outside this area. Comparable results are found for the agricultural standard gross margin, the local business tax base and the total gross earnings of local employees.

However, where data on changes before the beginning of the PDZR are available, it seems that the gap between the period with the PDZR and the previous period has been narrowed. This is clearly so for population change. In 1982-1990, the gap between the PDZR area and the non PDZR rural one was wide: -0.52% per year for the change in population in the former area versus 0.80% per year in the latter; -0.12% and 0.64% in terms of migratory balance. It narrowed significantly for the period with the PDZR programs (1990-1999): respectively -0.28% and 0.42% per year for population variation and 0.15% and 0.32% for migratory balance. Similar narrowing of the gaps in growth can be observed for total employment and for the local business tax base (a proxy for local added value).

Finally, judging from this "naive" comparison, the implementation of the PDZR programs in Burgundy does not seem to have enabled the area receiving aid either to reduce its "lag in development", nor to close the gap in growth. It may nonetheless have made possible a reversal, favourable to this area, in the trend of the components of its growth. The rates of growth of a few key indicators tend to move together over the recent period. It is, of course, too soon to draw any conclusions about the actual impact of the PDZR program(s) on the dynamics of the area receiving support. The initial characteristics of the supported area and the unsupported area are so different that there is no saying what would have happened in the area if the PDZR had not been introduced. And this is precisely the issue that selection bias correction endeavours to master.

4. Selection bias and policy evaluation based on non experimental data

Evaluating impact of the Objective 5b policy on the local economic development involves measuring the gap between the changes in the supported cantons where the policy is applied (policy on) and the way they would have evolved if the 5b programs had not been introduced (policy off). The causal effect *c* that we are seeking to evaluate can then be written:

$$c = E\left(y_1 \middle| Obj5b = 1\right) - E\left(y_0 \middle| Obj5b = 1\right) \qquad (1)$$

where $y_1 | Obj5b = 1$ is the value taken by variable *y* within the supported individuals (cantons in our case) and $y_0 | Obj5b = 1$ is the value that the same variable would have taken in the same population in the absence of the program (*Obj5b* is a dummy variable taking the value 1 for the cantons belonging to the 5b area and 0 otherwise).

It is, of course, impossible to measure such a value because the second term of equation (1) is unknown to us. As we made in the previous section, a comparison between the performances of cantons receiving support and those of unsupported cantons looks like a solution to our problem. But straightforward comparison leads to what calls a "naive" estimator of the causal effect. It is written:

$$c_{naive} = E\left(y_1 \middle| Obj5b = 1\right) - E\left(y_0 \middle| Obj5b = 0\right) \quad (2)$$

Clearly this estimator is not the same as what the equation (1) expresses for measuring the policy impact on the local growth of the recipient areas. The gap between both is a quantity b to be subtracted from c_{naive}:

$$b = E\left(y_0 \middle| Obj5b = 1\right) - E\left(y_0 \middle| Obj5b = 0\right) \quad (3)$$

This quantity, called the "endogenous selection bias", corresponds to the difference between the mean values of the performance variables in the supported and unsupported cantons if nobody obtains subsidies from the programs (Heckman and Holtz, 1989). It biases the measurement of the causal effect of the policy. The performance differences between the recipient cantons and the non-recipient cantons have two origins: the actual effect of the policy conducted and the initial difference between the two groups of areas. Apart from highly specific cases (which are quasi impossible to implement in economics) where selection bias may be taken to be zero,[6] failing to make allowance for selection bias will lead to mis-measurement of the effects of policies (see Heckman and Holtz, 1989 or Heckman *et al.*, 1999 for examples with employment policy).

The statistical methods used for correcting selection bias were initially developed from biomedical issues by investigating the experimental or non-experimental nature of the data collected. The applied economics literature includes two major families of methods designed to correct selection bias in evaluations of non-experimental data (Ravaillon, 2000; Heckman *et al.*, 1999). The first are based on statistical methods of matching. The original idea of Rosembaum and Rubin (1985) was to divide the sample up into sub-populations within which individuals are "similar" in terms of initial characteristics x considered as differentiating supported and unsupported areas. In each sub-population, the causal effect may then be approximated by the difference between the performance means of supported and unsupported individuals. Taking the mean of these estimates, weighted by the size of the sub-samples, gives the overall effect for the population as a whole. But, the number of sub-populations to be defined increases rapidly with the number of x characteristics selected. Under certain conditions, matching may be done by using the result of an estimate (of a qualitative model) explaining the probability of belonging to the Objective 5b areas by the set of characteristics x: $P\left(Obj5b = 1 \middle| x\right)$.

The second type of methods relates to methods with instrumental variables. Here we use variables z, which affect selection without affecting either the performance variable y_0 or the impact of the mechanism we are trying to evaluate. The instrumental variable is an imperfect selection indicator from groups of recipients and non-recipients. While the change of the difference of means between the two groups in respect to z is only due to selection bias, it can be eliminated by contrasting the sub-groups (sub-groups of recipients and non-recipient groups) depending on the characteristics z.

Following Crépon and Iung (1999) and Ravaillon (2000), we have selected and implemented three methods of selection bias correction and calculated their estimators from the causal effect of the impact of 5b policies.

[6] This is the case when experimental data obtained by random drawing of recipients and "processing" by the "double blind" method.

1. Weighted estimator: the causal effect may be evaluated by simple comparison of the individual performance means with suitable weighting. In our case, the causal effect estimator is written:

$$c_{pond} = E\left(y \frac{Obj5b}{P(Obj5b = 1|x)} \right) - E\left(y \frac{1 - Obj5b}{1 - P(Obj5b = 1|x)} \right) \qquad (4)$$

where $P(Obj5b = 1|x)$ is the probability that a canton receives Objective 5b aid given its initial characteristics *x* (the probability is here computed from a logit model), and where *Obj5b* is a variable indicating actual membership of the area covered by the Objective 5b program.[7]

2. Regression estimators: The causal estimator may also be calculated from regression of the performance variable on the characteristics *x* and on the variable of program belonging. In our case, we estimated the following model:

$$y = a_0 + a_2 Obj5b + x\, a_3 + e \qquad (5)$$

The estimator of the causal effect corresponds to $\hat{a}_2$.[8] Implementation of this estimator by regression may be simplified by substituting for the *x* characteristics' vector the estimated probability to be a recipient given the characteristics *x*, $P(Obj5b = 1|x)$. This approach has the advantage of allowing us to estimate more flexible functions by introducing, for example, this estimated probability and its square. We thus obtained two other variants of the estimator by regression $\hat{d}_2$ and $\hat{l}_2$ from the following models:

$$y = d_0 + d_2 Obj5b + d_3 P(Obj5b = 1|x) + h \qquad (6)$$
$$y = l_0 + l_2 Obj5b + l_3 P(Obj5b = 1|x) + l_4 [P(Obj5b = 1|x)]^2 + m \qquad (7)$$

3. Double-difference estimator: Finally, we sought to guard against any bias related to the unobservable individual characteristics affecting both the performance variable and the public aid variable. These can make up for the selection bias (Heckman *et al.*, 1998). To do this we used a set of variables *z* for which we had values for the period before the 5b policy was implemented, z_b, and the values for the period covered by the 5b program, z_a. Estimating the equation including the differences before and after the policy was introduced, that is, the equation:

$$y_a - y_b = q_1 Obj5b + (z_a - z_b) q_2 + x \qquad (8)$$

provides an estimator of the causal effect as $\hat{q}_1$.

By these methods we obtained five estimators of the causal effect of the Objective 5b policies. These estimators are compared with each other and with the "naive" estimator defined by equation (2).

[7] Notice that calculating the standard deviation of this estimator means allowing for the fact that $P(Obj5b = 1|x)$ is an estimate. We have not yet introduced this correction into the results set out below.

[8] It should be pointed out that chosen formulation assumes that the impact of the program on local growth does not vary with the initial characteristics *x* of the cantons. Otherwise, we would need to introduce an extra crossed term into the regression *x.Obj5b* (Ravaillon, 2000).

5. Application to the impact evaluation of 5b policy in Burgundy

Some of the methods applied for measuring the causal effect of 5b policies in Burgundy are carried out in two stages, the first involving an estimate of the probability that individuals (here cantons) will be included in the program. Although not central to the approach adopted in this paper, the results of this first stage are however interesting. First, they are informative about the quality of matching on which the control of selection bias is based. Secondly, they are instructive as to the way the eligibility criteria proposed by the European Union have been applied. These results are therefore presented first before those for the estimators of the causal effect of the 5b policy.

5.1 Membership of the 5b area and eligibility criteria

We look for the initial characteristics of the areas, which best explain their membership of the 5b area. To do this, we use a logit model, where the endogenous variable is a dichotomous variable taking the value 1 if the canton is included in the 5b area and 0 otherwise. In order to avoid bias related to urban-rural differences in economic and social dynamics and to achieve the best possible matching, the cantons selected for the analysis are those not belonging to an urban centre.

The explanatory variables, which call "conditioning variables", come from our various database of information. First we introduced variables that characterise the local population and changes in that population over the previous inter-census period (migratory balance, population density in 1990, proportion of elder). Second, we introduced local economic characteristics and its changes before the beginning of the programs: change in agricultural employment 1982-1990; proportion of agricultural employment in 1990; standard gross margin per farm in 1988; change in total employment 1982-1990; unemployment rate in 1990 relative to the active population; local business tax base per inhabitant in 1990; and change in this indicator from 1983 to 1990.

These variables overlap and explain the main eligibility criteria defined by the European commission for attributing 5b aids: low level of economic development, high level of agricultural employment; low level of farm income. These basic criteria were supplemented by an indicator measuring the degree of rurality of the canton and based on the share of the population in the canton living in *communes* belonging to the "predominantly rural area" (*EDR*). We consider as "rural" the cantons where 50% of its population live in *EDR communes.*

Table 4 shows the results of the estimates obtained with this set of variables. The second omits two variables that are not really necessary and/or bias the estimators. The 1983-1990 change in the local business tax base is both correlated with all of the other variables and its parameter is not significant. Although its parameter is highly significant, the taxable net income per household in 1994 is so closely related to all the other variables used that it alters and seriously biases the values obtained for the other parameters. We focus on the results of the second model.

Table 4 – Results of logit regressions
(reference: Non-5b canton)

	All variables		Selected conditioning variables	
	Parameter	Std. dev.	Parameter	Std. dev.
Number of observations	159		159	
Constant	17.76 **	8.460	-3.67	3.600
82-90 Migratory balance	-1.57 **	0.660	-2.39 ***	0.546
1990 Population density	-0.039 *	0.022	-0.053 ***	0.020
1990 Pop. > 65 years	0.189	0.116	0.370 ***	0.102
1988 SGM. per farm	-0.037 *	0.020	-0.060 ***	0.017
82-90 change in agric. empl.	-0.013	0.144	0.016	0.126
1990 share of. Agric. empl.	0.062	0.044	0.050	0.036
83-90 change in busin. tax base	-0.050	0.152		
1990 Business tax base/inhab.	0.108	0.079	0.084	0.068
1990 Rural population > 50 %	-0.299	1.037	-0.819	0.955
1990 Unemployment rate	-0.067	0.191	0.189	0.161
1994 Mean net tax. income	-2.4 E-4 ***	0.86 E-4		
82-90 Change in employment	0.4235	0.313	0.370 *	0.228
-2 LOG L	151.4		140.5	

*Significance levels: *** 1 %; ** 5 %; * 10 %*

It appears that, compared with the other cantons in "rural" Burgundy, the cantons eligible under the 5b program are mainly those with a low population density, less favourable population dynamics, an older population and lower standard gross margin of farms.

Conversely, the employment variable parameters are only rarely significant, and when they are it is not always with the expected sign. Thus, only the 1982-1990 change in total employment seems to have a positive effect (at the 10% level). That all things else being equal, the cantons eligible under the PDZR had a more favourable employment dynamic than the other "rural" cantons in Burgundy during the period before the program began. This may be because of the crisis that has long affected some industrial places in Burgundy, those concerned by the European Commission's Objective 2 programs.

But, while our findings suggest that this estimate is of good quality, they lead us to doubt the quality of the matching to which the estimate leads and on which our evaluation of the PDZR impact is based. This matching difficulty is illustrated by Table A.1 (reported in Appendix 1): it presents the probability that each Burgundy's canton will belong to 5b area in respect to its initial characteristics and compare this with its actual membership of the 5b area. Thus, of the 75 cantons that do not belong to the 5b area, only 11 have more than a 0.5 probability of belonging to the 5b area. Conversely, of the 84 cantons within the PDZR area, only seven have less than a 0.5 probability of belonging to it. Thus, while the 5b area clearly concerns cantons in bad situation, the gap between these and the remainder of "rural" Burgundy is so narrow that the use of matching methods does not allow a good correction of the selection bias.

5.2 Towards a measurement of the 5b programs impacts on local growth in Burgundy

Table 5 provides several estimators of the causal effect of 5b policy obtained using the five methods set out above for each of the selected economic development variables. It should be observed that the double-difference estimator could only be calculated for some of our variables, those for which the change during the period before the program was known and collected. These are data from the population censuses, taxable net income and local business tax base.

Table 5 – Estimators of 5b policy's causal effect in rural Burgundy on some performances variables (annual percentages and N=159 cantons)

	Naive estimator	Weighted estimator (†)	Regression estimators (†) (1)	(2)	(3)	Double-difference estimator (‡)
90-99 Change in population	-0.59 ***	-0.36 *	-0.045	0.006	0.017	0.54 ***
	(0.91)	*(2.26)*	*(0.129)*	*(0.175)*	*(0.175)*	*(0.11)*
90-99 Migratory balance	-0.07	0.05	-0.100	-0.095	-0.098	0.44 ***
	(0.89)	*(2.01)*	*(0.105)*	*(0.180)*	*(0.180)*	*(0.11)*
94-97 Change in net taxable income	-0.73 ***	0.008	-0.712 **	-0.642 *	-0.661 *	-0.935 **
	(1.93)	*(13.9)*	*(0.295)*	*(0.387)*	*(0.387)*	*(0.42)*
90-99 Change in total employment	-0.81 ***	0.11	0.022	0.145	0.156	0.003
	(2.09)	*(7.06)*	*(0.343)*	*(0.405)*	*(0.407)*	*(0.34)*
95-98 Change in employees (DADS) #	-0.98	-1.21	-0.996	-0.991	-0.990	-
	(7.98)	*(11.91)*	*(1.359)*	*(1.615)*	*(1.621)*	
95-98 Change in manufactured sector employees #	-0.64	-3.41	-2.779	-4.710	-4.697	-
	(15.45)	*(35.92)*	*(2.614)*	*(3.072)*	*(3.086)*	
95-98 Change in market services employees #	-0.92	-0.69	-1.095	-0.831	-0.857	-
	(11.18)	*(15.52)*	*(1.974)*	*(2.276)*	*(2.285)*	
90-99 Change in unemployment rate	0.34 *	1.57	-0.318	-0.299	-0.299	-
	(2.29)	*(17.77)*	*(0.360)*	*(0.460)*	*(0.462)*	
88-00 Change in number of farms	0.017	0.287	0.404	0.236	0.236	-
	(2.159)	*(6.717)*	*(0.273)*	*(0.432)*	*(0.433)*	
95-98 Change in number of plants (DADS) #	0.73 *	1.48	-0.106	-0.077	-0.162	-
	(4.96)	*(17.00)*	*(0.809)*	*(1.001)*	*(0.994)*	
95-98 Change in number of manufactured plants #	0.65	0.29	-0.300	-0.609	-0.653	-
	(9.20)	*(19.44)*	*(1.596)*	*(1.861)*	*(1.868)*	
95-98 Change in number of market services plants #	0.95 *	1.93	-0.190	-0.064	-0.156	-
	(6.32)	*(18.06)*	*(1.054)*	*(1.278)*	*(1.273)*	
88-00 Change in standard gross margin	0.14	1.65	0.204	0.543 *	0.561 *	-
	(1.61)	*(12.73)*	*(0.257)*	*(0.314)*	*(0.314)*	
90-97 Change in business tax base (%/year)	-0.42	1.06	-0.079	0.013	-0.054	0.112
	(3.60)	*(20.22)*	*(0.582)*	*(0.721)*	*(0.715)*	*(0.642)*
95-98 Change in total gross wages ##	-1.22	-1.46	-1.903	-2.284	-2.273	-
	(8.86)	*(20.18)*	*(1.522)*	*(1.793)*	*(1.800)*	
95-98 Change in manuf. gross wages ##	-1.63	-5.76	-5.694	-9.113 **	-9.016 **	-
	(21.44)	*(63.36)*	*(3.588)*	*(4.194)*	*(4.203)*	
95-98 Change in market services wages ##	-0.79	-1.36	-2.164	-2.585	-2.636	-
	(13.35)	*(-20.88)*	*(2.353)*	*(2.718)*	*(2.728)*	

Significance levels: *** 1 % ; ** 5 % ; * 10 % - standard deviation in brackets.

Sources: *INSEE (1982, 1990 & 1999 Pop. Censuses, 1995 & 1998 DADS, 1994 & 1997 Income tax); SCEES (1988 & 2000 Agr. Censuses); DGI (Centres Départementaux d'Assiette).*

The DADS database covers employees in plants with at least 1 employee in manufactured sectors and market services from which the following sectors have been removed: Utilities (water, gas, electricity) (G2A-G2B), Building (H01-H02), Post Office and Telecommunications (N10), Financial Intermediaries (L01), and Manpower Recruitment (N32). Farming and "Administered services" are not concerned.

The figures used here are for the total of all wages paid in the area as reported in the DADS 1995 and 1998.

(†) Conditioning variables used are as for second logistic regression (table 2).

(‡) Control variables used for double-difference regression are limited to: difference in migratory balance (90/82 – 82/75); difference in population density (99 – 90); difference in unemployment rate (90 – 82); difference in share of agricultural employment in total employment (90 – 82); difference in change in agricultural employment (90/82 – 82/75); difference in change in total employment (90/82 – 82/75).

(1) Conditioning variables are introduced as explanatory variables of regression.

(2) Only the value estimated from the logit regression on the conditioning variables (score) is introduced as control variable.

(3) The logit score and its square are introduced as control variables in the regression

Estimation results show the low impact of 5b policy in Burgundy. The causal estimators obtained are rarely significant and, even when they are significant, they are not always positive and converge only slightly. However, this result must be discussed in view of the limitations of the methods used. We have already pointed out that the differences between supported cantons and unsupported rural cantons is so weak that it allows only poor matching between both types of cantons. It makes the methods used here for correcting selection bias less effective. The fact that the comparison is restricted to Burgundy's cantons is probably responsible for this poor matching. Furthermore it is worth remembering that many actions targeted by the program is concealed here by the lack of information about the commerce, the self-employment plants and the tourism activities. Only the change in total employment from 1990 to 1999 includes these sectors, but any changes may be masked by the constant decline in agricultural employment.

In addition to these shortcomings with the methods, it is worth noting that with our indicators we can record only some effects in short run. But, some actions conducted under these programs can act only in the long run. Finally, we should wonder whether the policy conducted in the 5b area is really different as this conducted in other areas of Burgundy under the state-regional authority planning agreements (*Contrats de plan État-Région*) or under other national government, local authority and European Union policies (especially Objective 2).

Even if the methodological issues may be predominating in the seemingly low impact of the PDZR, some estimators reveal significant effects of the program. This is the case, first of all, of the variables reflecting demographic changes: although they do not bring out any positive significant effect through the weighted or regression estimators, they do show a significant and positive program effect with the double-difference estimator. This tends to show that while the programs could not reduce the gap in terms of population attraction, they positively and significantly modified the trend of the demographic pattern between the period before the programs and the period during which the two PDZR programs were in work. This demographic change would seem to be related to an effect of the programs on migratory dynamics, allowing a reversal of population flows over the period 1990-1999. This apparently leads to the conclusion that the program made the 5b area more attractive and that it contributed to attract new population despite the lack of direct intervention under the program in this field. This may be seen as an indirect effect of the investments made in public facilities for population and of the efforts made under the PDZR to renew shops and services to population. These factors promote residential migration to rural areas by retired people or by those who work outside the area. A more detailed analysis of the structure of the migrant population would be required to identify the process at work and its consequences for the local dynamics. On one hand, the improvement of public facilities and of services in 5b areas with little productive capacity but benefiting from comparative advantages in terms of amenities has made it possible to sustain the arrival of seasonal population (second-home owners) or permanent residents (retired people). On the other hand, other areas probably benefit from geographical advantages (proximity to urban centres, motorway access), which combined with the development of industrial and tourist dynamics supported by the PDZR induce residential migration.

It is more difficult to interpret the impact of the programs on economic development because the estimators obtained from the indicators used are often not significant and in some instances are contradictory. These results suggest that the program had no significant impact on devebpment and local economic growth, but some results need additional explanations. Although the estimates for the local business tax base fail to reveal any effect exerted by the program, significant and negative effects are observed for the change in total gross wages paid by local industries between 1995 and 1998. This disturbing result may be due to the short duration of the selected period and to the low reliability of data when this database is used in time series. It may also be interpreted as the effect of a program that mainly acted on the productivity gains of local firms without acting any decisive role in increasing their production capacity and their market size. First, individual support for investment in the production tool was the main intervention under the PDZR and benefited the economic agents already in place: 25% of the local industrial firms benefited, allowing them to make substantial investments to

modernise their production tools. These investments apparently go along with an increase in turnover and employment by the recipient firms, although this cannot be attributed for certain to the program. Firms that benefited under the program were, generally, firms that were expanding. By using conventional tools of economic intervention, the PDZR did not have significant effects on local economic growth. Second, because the PDZR did not have any stated objectives to promote the creation of new business, it essentially helped the passing-on of existing firms in small plants, shops and farms. It is probably in tourism-related services that a few activities were developed. Third, the input of these programs into training was focused primarily on improving the skill levels of the workforce in employment and of the unemployed. By improving the match on the labour markets, the PDZR improved labour productivity in the dominant sectors of the area.

Farming seems to be an exception to the claim that the programs had no economic impact. Two of the three regression estimators relating to change in the standard gross margin of agriculture between 1988 and 2000 reveal a significantly positive effect of the 5b program in Burgundy. It is as though belonging to the 5b area and obtaining aid under these programs allowed the local agricultural sector to improve its relative performances and to narrow the gap in gross margin compared with farms that did not benefit under the program. The 5b program has seemingly helped to consolidate the competitiveness of local farms, especially by supporting investment and reducing production costs. The large proportion of program spending attributed to farms compared with the weight of the sector in the active population [9] means that a large proportion of farmers located in the 5b area were involved and so formed a "critical mass" allowing the appearance of a scale effect in the area. A second explanatory factor lies in the nature of the interventions in the agricultural sector: two-thirds of the support was assigned to modernising farms and to making technical improvements with a view to increasing productivity. While our evaluation cannot determine the individual effect of the programs on farms, the rise in agricultural added value may be indicative of the effectiveness of such interventions. The appearance of an overall effect in the sector is probably intensified by the fact that the programs mainly benefited those farms with the lowest standard gross margins.

Ultimately, these initial statistical results raise questions about the levers of public intervention in rural development programs. The positive results for demographic data (that may be related in part to the quality of public investment) and those concerning the standard gross margins of farms (related in part to investment in equipment) suggest that there are two main types of lever activated by the PDZR. The programs provided support for public infrastructures for the area and they encouraged individual strategies.

6. Concluding remarks

The objective of this paper was to measure whether the two European rural development programs (objective 5b) implemented in Burgundy in 1991-1993 and 1994-1999 had exerted any positive effect on the local economic development, in narrowing the gap in development between these declining rural areas and the others. First we built a large array of indicators of economic activity and of local growth. A preliminary analysis based on these indicators reveals a substantial "lag in development" of the 5b area and shows that this gap has persisted without narrowing despite the existence of the two programs. However it seems from the indicators for which information is available over a longer period that the gap in development between the 5b area and the rest of rural Burgundy was narrower in the period when the programs were operating than in the preceding period.

We then used matching and double-difference methods to attempt to measure the actual impact of the program, that is, to measure the difference in change in our indicators between supported and unsupported cantons, correcting for endogenous selection bias that is inherent in this kind of comparison. In this way, we sought to evaluate the causal effect of 5b programs on local economic growth. We showed the very weak impact of the program on the economic development of the

[9] Public spending per worker in agriculture under the second program was about three times that of spending on workers in industry, artisanal activities and commerce.

supported areas. Only the demographic pattern and the standard gross margins of local farms seem to have been improved by the programs, while the program's effects on industrial and market tertiary services seem to have been negligible. Although these results are related in part to technical problems, they raise questions about the program's overall short run effects. The absence of such effects does not mean that these subsidies had no positive effect on individual recipient firms, but that the programs did more in the way of improving firms' productivity than of generating economic development. The low level of discrimination between the actions undertaken as part of the PDZR compared with regional (or other) policies conducted in other areas of Burgundy, especially in terms of economic development, seem to go some way to explaining this observation. One of the limitations of this evaluation is the little scope given by our indicators for self-employment plants, commerce and tourism, and for non-market services.

From a methodological standpoint, the application of selection bias correction methods to regional policies is limited by the very close overlap of eligible areas and recipient areas. Matching methods are more effective where the proportion of eligible but non-recipient individuals is high (which is usually the case when analysing policy instruments aimed at a target category of individuals as in employment policy). There are two ways to improve this result. The first is to widen the comparison area to include a set of unsupported cantons lying outside the boundaries of Burgundy so as to increase the probability of including in the analysis cantons that are in comparable economic straits to the cantons receiving aid in Burgundy. The second is to supplement the overall analysis by an analysis of the specific effects of the program on individual recipients of public-sector aid. The problem is the availability of individual data with which to compare recipients and non-recipients, as program monitoring has not yet been designed along these lines.

Finally, the approach proposed here is restricted to a statistical procedure directed mainly at correcting the measurement of short run effects. However these methodological issues must not overshadow the economic approach, that is, the analysis of the mechanisms by which public aids produce effects (both positive and negative) on local economic growth and the way they combine with other economic determinants of local growth. To do this, it seems essential to integrate this type of procedure in approaches that model local economic growth (Freshwater *et al.*, 1997). This might make it possible to move from the short run effects approach to long run effects and to identify more clearly those factors directly related to the policy and those factors related to other regional policies that are running concomitantly.

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Appendix 1 – Probability of belonging to 5b area given the Burgundy's cantons initial (evaluated from the logit regression) compared to the real belonging (excluding urban cantons)

Canton	Canton ∈ 5b area	Proba. ∈ 5b area (logit)	Canton	Canton ∈ 5b area	Proba. ∈ 5b area (logit)	Canton	Canton ∈ 5b area	Proba. ∈ 5b area (logit)
2101	1	0.887	5818	0	0.281	7142	1	0.962
2102	1	0.999	5819	1	0.985	7143	0	0.057
2103	0	0.104	5820	1	0.951	7144	1	0.981
2104	1	0.947	5821	1	0.483	7145	0	0.018
2105	0	0.169	5822	1	0.878	7146	1	0.996
2106	0	0.002	5823	1	0.997	7147	0	0.109
2107	1	0.981	5824	1	0.996	7148	0	0.892
2108	1	0.314	5825	1	0.955	7149	1	0.722
2109	0	0.000	5826	0	0.044	7150	1	0.895
2110	0	0.000	5827	0	0.671	7151	1	0.643
2113	0	0.681	5829	0	0.002	7152	0	0.002
2114	0	0.000	5830	0	0.000	7153	0	0.062
2115	0	0.006	5831	0	0.065	8901	0	0.283
2116	1	0.754	5832	0	0.149	8902	1	0.746
2117	0	0.056	7101	1	0.455	8903	0	0.000
2118	1	0.991	7102	1	0.946	8905	1	0.493
2119	1	0.999	7103	1	0.984	8906	1	0.968
2120	0	0.048	7104	0	0.078	8907	0	0.502
2121	1	0.689	7105	0	0.001	8908	0	0.450
2122	1	0.921	7107	0	0.000	8909	0	0.006
2123	0	0.214	7108	0	0.000	8910	1	0.843
2124	0	0.001	7109	1	0.973	8911	0	0.019
2125	0	0.205	7110	1	0.802	8912	0	0.072
2126	1	0.976	7111	1	0.971	8913	1	0.861
2127	1	0.971	7112	0	0.701	8914	1	0.822
2128	1	0.966	7113	0	0.133	8915	1	0.954
2129	0	0.177	7114	0	0.000	8916	1	0.198
2130	0	0.704	7115	1	0.635	8917	1	0.951
2131	1	0.997	7116	1	0.704	8918	1	0.518
2132	0	0.679	7117	1	0.501	8919	0	0.068
2133	1	0.652	7118	1	0.837	8920	0	0.000
2134	0	0.206	7119	0	0.001	8921	1	0.927
2135	0	0.116	7120	1	0.847	8922	0	0.000
2136	1	0.820	7121	1	0.954	8923	1	0.984
2137	1	0.965	7122	1	0.998	8924	1	0.973
2139	0	0.000	7123	1	0.775	8925	0	0.001
2143	0	0.000	7124	1	0.958	8926	0	0.728
5801	1	0.999	7125	0	0.008	8927	1	0.989
5802	0	0.560	7126	0	0.000	8928	0	0.008
5803	1	0.994	7127	0	0.006	8929	0	0.001
5804	1	0.997	7128	1	0.995	8930	0	0.000
5805	1	0.672	7129	1	0.998	8931	0	0.037
5806	1	0.995	7130	1	0.996	8932	1	0.019
5807	0	0.047	7132	0	0.372	8933	1	0.108
5808	0	0.780	7133	0	0.007	8934	0	0.354
5809	1	0.994	7134	1	0.981	8935	1	0.945
5810	1	0.921	7135	1	0.897	8936	0	0.129
5811	1	0.990	7136	0	0.843	8937	0	0.414
5812	1	0.998	7137	1	0.759	8938	0	0.000
5813	1	0.999	7138	1	0.521	8939	0	0.000
5814	1	0.999	7139	1	0.995	8940	0	0.000
5815	1	0.999	7140	1	0.995	8941	0	0.009
5817	0	0.001	7141	1	0.981	8995	0	0.000

Appendix 2 – "Naive" comparison between the 5b area cantons and other cantons in Burgundy (excluding urban centres)

	5b cantons	Non-5b rural cantons	All rural cantons
Number of cantons	84	75	159
90-99 Change in population	-0.19	0.40	0.09
	(0.69)	*(0.60)*	*(0.71)*
90-99 Migratory balance	0.31	0.38	0.34
	(0.66)	*(0.60)*	*(0.63)*
94-97 Change in net taxable income	3.28	4.02	3.63
	(1.25)	*(1.48)*	*(1.41)*
90-99 Change in total employment	-0.54	0.28	-0.15
	(1.22)	*(1.70)*	*(1.51)*
95-98 Change in employees (DADS)*	1.53	2.52	1.99
	(6.19)	*(5.04)*	*(5.68)*
95-98 Change in manufactured sector employees *	2.15	2.79	2.45
	(10.40)	*(11.43)*	*(10.87)*
95-98 Change in market services employees *	2.90	3.81	3.33
	(9.52)	*(5.87)*	*(7.99)*
90-99 Change in unemployment rate	1.45	1.10	1.28
	(1.80)	*(1.42)*	*(1.64)*
88-00 Change in number of farms	-3.85	-3.86	-3.85
	(1.43)	*(1.61)*	*(1.52)*
95-98 Change in number of plants (DADS) *	2.67	1.94	2.33
	(3.90)	*(3.08)*	*(3.54)*
95-98 Change in number of manufactured plants *	1.82	1.17	1.52
	(7.43)	*(5.43)*	*(6.55)*
95-98 Change in number of market services plants *	3.17	2.28	2.72
	(5.10)	*(3.74)*	*(4.52)*
88-00 Change in standard gross margin	0.16	0.02	0.09
	(0.73)	*(1.43)*	*(1.11)*
90-97 Change in business tax base (%/year)	3.99	4.42	4.19
	(2.45)	*(2.64)*	*(2.54)*
95-98 Change in total gross wages **	3.48	4.71	4.06
	(7.12)	*(5.28)*	*(6.32)*
95-98 Change in manuf. gross wages **	4.20	5.83	4.97
	(10.96)	*(18.42)*	*(14.93)*
95-98 Change in market services wages **	5.34	6.12	4.71
	(11.70)	*(6.41)*	*(9.56)*

Sources: INSEE (1982, 1990 & 1999 Pop. Censuses, 1995 & 1998 DADS, 1994 & 1997 Income tax); SCEES (1988 & 2000 Agr. Censuses); DGI (Centres Départementaux d'Assiette).

* The DADS database covers employees in plants with at least 1 employee in manufactured sectors and market services from which the following sectors have been removed: Utilities (water, gas, electricity) (G2A-G2B), Building (H01-H02), Post Office and Telecommunications (N10), Financial Intermediaries (L01), and Manpower Recruitment (N32). Farming and "Administered services" are not concerned.

** The figures used here are for the total of all wages paid in the area as reported in the DADS 1995 and 1998.

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