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Employment impacts of the Common Agricultural Policy in Eastern Germany – A regional panel data approach

Martin Petrick and Patrick Zier

Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO)
Theodor-Lieser-Strasse 2
06120 Halle (Saale)
Germany
Email: Petrick@iamo.de

Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009

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Abstract

Politicians and farm lobbyists frequently use the argument that agricultural policy is necessary to safeguard jobs in agriculture. We explore whether this is true by conducting an econometric ex-post evaluation of the European Union's Common Agricultural Policy in the three East German States Brandenburg, Saxony, and Saxony-Anhalt. Whereas previous studies have employed descriptive statistics or qualitative methods and have looked at single policy instruments in isolation, we apply a difference-in-difference estimator to analyse the employment effects of the entire portfolio of CAP measures simultaneously. Based on panel data at the county level, we find that direct payments for livestock, investment aid and transfers to less favoured areas had a zero marginal employment effect. Increases in direct area payments on average led to labour shedding, as simultaneous decoupling made transfer payments independent of factor allocation. Spending on modern technologies in processing and marketing also led to job losses in agriculture. Agro-environmental measures, on the other hand, kept labour intensive technologies in production or induced them. In light of the recent "health check" agreements on additional modulation, this analysis calls into question whether an expansion of existing second pillar measures is a reasonable way to use the modulated funds.

Keywords: Impact analysis, Agricultural employment, Common Agricultural Policy.

JEL codes: Q18, J43, R58.

1 Introduction

Many European citizens expect that the European Union's (EU) Common Agricultural Policy (CAP) safeguards or even creates jobs in rural areas (EC 2008: 7). In times of low economic growth and persistent unemployment in European regions, politicians and farm lobbyists extensively use this argument to justify towards the general public the enduring necessity of the CAP. But is it true?

It is commonly claimed that the financial support through direct payments, which has been occupying the lion's share of the CAP budget since their inception in the mid-1990s, is indispensable for keeping jobs in agriculture. Furthermore, it is argued that European agriculture has much potential, in addition to its conventional role of producing food and fibre, to also provide environmental services, contribute to quality of life in rural areas, and supply raw material for energy production. The more recent "second pillar" instruments of the CAP, such as investment aid, agro-environmental payments, and a broad range of rural development measures, are supposed to boost these additional functions. The European Commission insists that they focus on exactly the aim of maintaining existing or even creating new types of jobs in agriculture, despite their otherwise varying goals (EC 2006).

Such expectations are contrasting with a persistent decline in the agricultural labour force observed across most industrialized countries for decades (TRACY 1993). According to this trend, technological progress and rising off-farm wages have led to a process in which agricultural labour is increasingly substituted by capital. Given the envisioned new roles for farmers, the question thus arises whether the CAP can stop or even reverse this trend?

The existing evidence on this issue is inconclusive. European-wide studies are hampered by lack of relevant disaggregate data (SHUCKSMITH et al. 2005: 203). Furthermore, finding accurate employment indicators in agriculture is plagued by measurement problems, as many

farmers work partly off-farm. Research at national levels is often limited to case studies and plausibility arguments (see the overview in FASTERDING and RIXEN 2006). We go beyond this literature by conducting an econometric ex-post evaluation of the CAP in the three East German States (*Länder*) Brandenburg, Saxony, and Saxony-Anhalt. Our dataset includes information on agricultural employment, disaggregate policy expenses, and a set of controls on 69 counties (*Landkreise*) over 6 years. Whereas previous studies have usually employed descriptive statistics or qualitative methods and have looked at single policy instruments in isolation, we apply a difference-in-difference panel data estimator to analyse the employment effects of the entire portfolio of CAP measures simultaneously. The territorial approach allows us to include policies not directly related to individual farms, such as support to processing and marketing or rural development. Controlling for latent regional and time effects, we identify net policy impacts by exploiting the variation between regions and years. An advantage of the study region is that the bulk of agricultural labour is hired farm workers. We expect that this increases the accuracy of employment figures, as information about working hours of hired workers is formally recorded by employers.

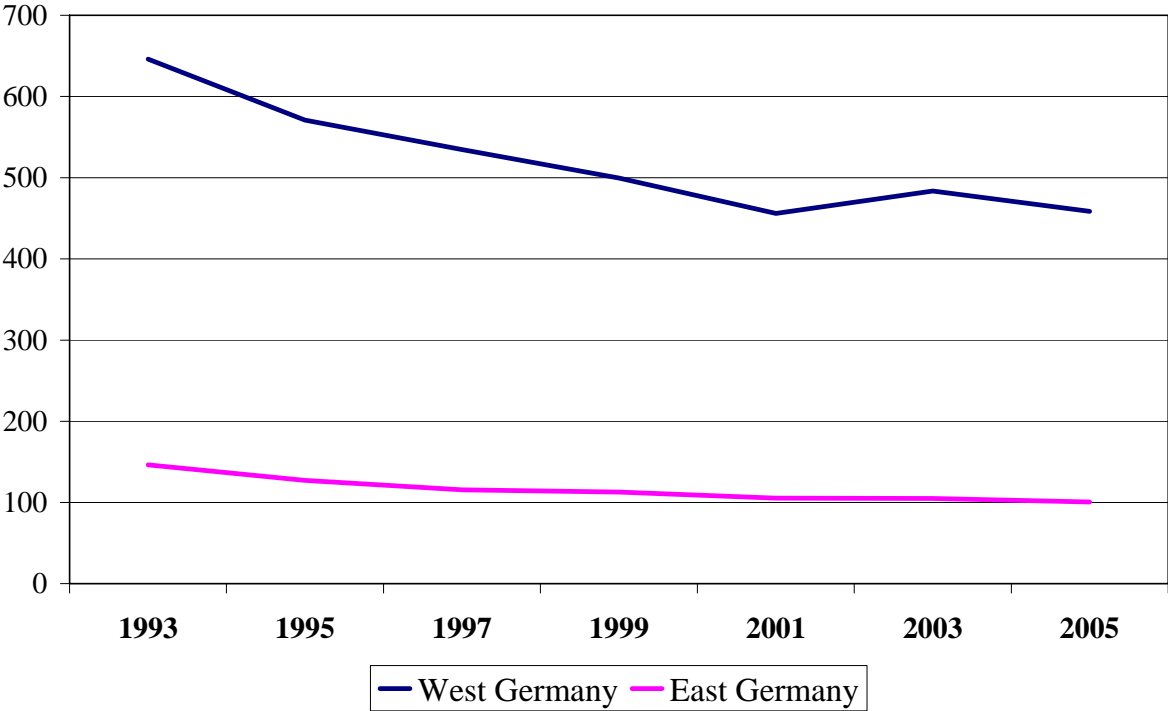
The following section explains the current state of agricultural employment in Eastern Germany and which agricultural policy measures have been employed. Section 3 summarises the recent literature. Section 4 gives an overview of the methodological issues involved in impact assessment and explains the approach used in this study. Section 5 specifies the model and the data, section 6 presents the results, while section 7 concludes.

2 Employment in East German agriculture and the regional CAP portfolio

Situated on the territory of the former German Democratic Republic, the five East German Länder Mecklenburg-West Pomerania, Brandenburg, Saxony-Anhalt, Saxony, and Thuringia are characterized by large scale agricultural structures primarily based on hired labour. Many

of the former collective farms were transformed into agricultural cooperatives or other corporate business entities (FORSTNER and ISERMAYER 2000). Agriculture in Eastern Germany thus resembles structures in those New Member States of the EU which predominantly kept their large scale farms, such as the Czech and Slovak Republics, Hungary, or parts of Poland. While the immediate shock of transition had led to widespread labour shedding (KOESTER and BROOKS 1997), recent downward adjustments of agricultural employment were more modest and followed the patterns of the family farm model in West Germany (Figure 1).

Figure 1 Labour force in German agriculture (1000 standardised labour units)



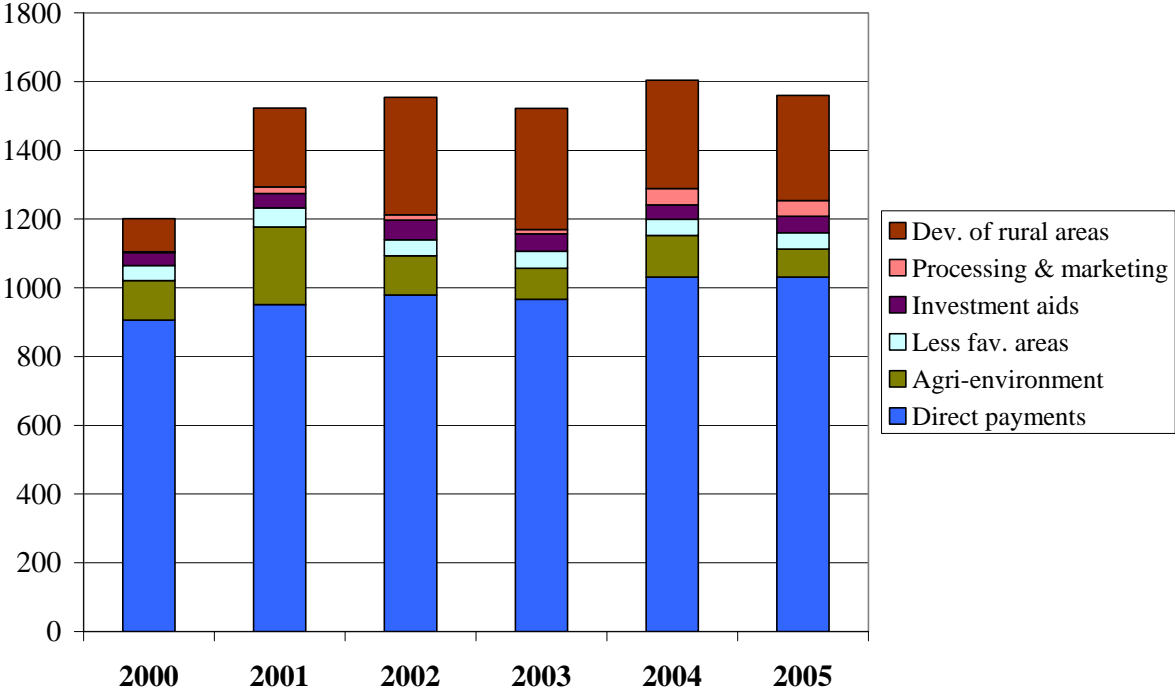
Note: Biannual figures. The annual reporting period for farmers was extended from one to twelve months in 2003.

Source: BMELV (2007).

As a result of Agenda 2000 and Mid-term review reforms of the CAP, East German Länder have been spending substantial amounts of direct payments, of which 75 percent are co-

financed by the EU. Essentially, these reforms meant a stepwise transformation of price- and product-related support measures to area-based farm payments that are decoupled from most factor allocation decisions. Figure 2 shows that, in the three States studied here, about two thirds of the CAP budget is allocated to direct payments. Single farms receiving more than 300 thousand euro of direct payments annually are no exception.¹

Figure 2 Aggregate annual CAP expenses in Brandenburg, Saxony, and Saxony-Anhalt according to main policy instruments (mln euro)



Source: Authors’ calculations based on unpublished data of State paying agencies.

East German States also implemented a region-specific mix of second pillar measures. The emphasis is on instruments under the umbrella of “development of rural areas”. These are mostly related to infrastructure investments, such as road construction and improvement, and

¹ This is the threshold above which farms are subject to additional modulation after the “health check” reforms of November 2008.

are usually disbursed to local municipalities. The second largest portion of the second pillar measures goes to agro-environmental measures, which include payments for the maintenance of extensive grassland and the conversion to organic farming. In addition, some ten to twenty million euro are spent on compensatory allowances for less favoured areas (LFA), as well as on investment aids and processing and marketing support. While the former represents support for regions with below average soil conditions, the latter two are credit subsidies for a wide range of capital investments on farms and in the downstream sector.

The various measures reflect the partly incompatible policy goals described in the introduction. While direct payments and less favoured area transfers are primarily of a compensatory nature, they alleviate adjustment pressure and should thus lead to less pronounced labour shedding on farms. To the extent that they promote labour intensive technologies, such as organic farming, agro-environmental measures will also have a positive effect on employment. To the contrary, capital subsidies will commonly increase the capital intensity in the production process and thus substitute labour. The effects of “development of rural areas” are hard to predict, as these infrastructure measures only indirectly affect allocation decisions in the agricultural sector. They may increase the profitability of farms, but may also make off-farm employment more attractive, for example by allowing rural inhabitants to commute to urban centres more easily.

A sound evaluation of the employment effects of the CAP must therefore allow different impacts of the various instruments. At the same time, their effects should be analysed jointly to avoid that unexpected effects are driven by left-out instruments.

3 What we know about employment effects of the CAP

FASTERDING and RIXEN (2006) provide a review of policy impacts on agricultural employment in Germany. While they stress the inherent tendency of agriculture to shed

labour in the process of economic development, they also assess the potential impact of individual measures or policy areas. Based on a number of primarily descriptive studies and case studies as well as plausibility arguments they suggest that organic farming may often display a higher labour intensity than conventional farming. Land consolidation and farm investment aid, on the other hand, lead to an increase in labour productivity, and thus, have a negative employment effect. The authors argue that the support of production diversification is a reasonable way to develop additional jobs in agriculture.

Other recent studies make more systematic use of panel data sets, although only some of them look at agricultural employment. SCHMITT et al. (2004) present a regression analysis of the EU objective 5b program, based on French regional data. They find positive employment effects in the service sector, while agriculture and manufacturing are negatively affected. ESPOSTI (2007) investigates the impact of the CAP as well as the EU objective 1 program at the NUTS-2 level by estimating a conditional growth convergence model. He confirms a positive growth impact of the objective 1 program, but does not refer explicitly to employment issues. PUFAHL and WEISS (2007) apply non-parametric difference-in-difference propensity score matching to evaluate the effects of agri-environmental payments and support to less favoured areas in Germany. Based on accountancy panel data, they find that farms participating in agri-environmental measures significantly use more on-farm labour. Compensatory payments for LFA did not have an impact on employment. HENNING and MICHALEK (2008) also implement a matching approach to investigate the impact of the EU pre-accession aid SAPARD in Slovakia. They find that the investment aid scheme for agricultural farms has a positive effect on farm employment, but negatively influences labour productivity. Both papers argue that a naïve mean value comparison overestimates the policy impact and conclude that considering this fact is crucial for an appropriate policy evaluation.

Overall, the literature on employment effects is rather incomplete as many important measures – such as direct payments or measures for the development of rural areas – have not been analysed at all. The evidence on other measures is inconclusive and suffers from the shortcoming that only single policies were analysed in isolation.

4 Methods to evaluate policy measures at the regional level

The easiest way to evaluate the impact of policies is to compare the average value of the policy target figure (outcome) between a group of observations that has been given the treatment (policy group) and a group without treatment (control group). Such a mean comparison test requires observations from both groups. However, the assumption that no other variable influences the outcome is crucial for isolating the policy effect, which is quite implausible outside of controlled experiments. It is therefore common to use multiple regression models to control for other covariates than the policy treatment, such as in the following treatment effect model (GREENE 2008: 889):

$$y_i = x_i' \beta + \delta d_i + \varepsilon_i. \quad (1)$$

y_i is the outcome variable observed for a sample of $i = 1 \dots n$ regions. x_i is a vector of control variables, β the vector of coefficients that is to be estimated, d_i a binary or metric variable that indicates policy treatment in region i , and ε_i is an identically and independently distributed error term (i.i.d.). δ then estimates the ‘treatment effect’, i.e. the marginal impact of the policy measure on the outcome.

In the standard treatment effect model, (1) is estimated for a pooled sample of regions with different policy treatments. In this case the identification of the marginal policy effect δ is based on the assumption that both groups differ only in observable variables. Any latent

selection bias is neglected, hence this has been labelled ‘selection on observables’ (SMITH 2004: 297).

As an extension, the following panel data treatment effect model also allows selection on unobservables, as it includes a potentially latent, regional fixed effect α_i that may be correlated with elements out of x (SMITH 2004: 304):

$$y_{it} = x_{it}'\beta + \delta d_{it} + \alpha_i + \mu_t + \varepsilon_{it} \quad (2)$$

Furthermore, μ_t denotes an unobservable macro or time effect that affects all regions at time t in the same way. Differencing leads to:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)'\beta + \delta(d_{it} - \bar{d}_i) + (\mu_t - \bar{\mu}) + \varepsilon_{it} - \bar{\varepsilon}_i, \quad (3)$$

which shows that the influence of latent characteristics of regions, as far as they are time invariant, as well as any other linear separable selection bias is ‘swept out’ of the equation.

In this model, δ denotes a ‘difference-in-difference’ estimator of the policy impact, which can efficiently and consistently be estimated by including region- and time-specific dummy variables into a least squares dummy variable (LSDV) regression (HSIAO 2003: 30).

Given appropriate data, this estimator can be considered a state-of-the-art approach to identify net-policy effects (SMITH 2004: 305). Even so, a frequently used alternative method for policy evaluation is propensity score matching, in which individual outcomes from a treated and a non-treated population are compared by using some distance metric (SMITH 2004: 299). This metric is often based on a regression model for programme participation. As a semi-parametric method, matching abandons the linearity assumption inherent to the regression model. On the other hand, the reliability of the method depends on having sufficiently similar observations in the treated and the untreated population. Furthermore, datasets must be suitably rich to include the relevant characteristics on which observations are matched. Conventional matching methods do not take into account the effect of latent characteristics, as

observations are matched on observables.² As matching requires the formation of two subsamples based on participation or non-participation in a policy treatment, there is no natural way to study the effects of several policy measures simultaneously. Moreover, metric policy variables cannot be handled by this method. We therefore implement a LSDV approach in the following.

5 Model specification and data

Data on CAP payments was collected from paying agencies of the Ministry of Rural Development, Environment and Consumer Protection in Brandenburg, the Saxon State Ministry of Environment and Agriculture as well as the Ministry of Agriculture and Environment in Saxony-Anhalt. We distinguish area and livestock direct payments of the CAP's first pillar.³ The second pillar instruments were aggregated according to the Rural Development Plans of the *Bundesländer* in the range of Guarantee and the respective Operational Programmes regarding the Guidance measures. We distinguish the single farm investment aid scheme, the support of processing and marketing of agricultural produce as well as measures for the adoption and development of rural areas, following regulation (EC) 1257/1999. Guarantee funds are aggregated as agri-environmental measures and the compensatory allowance for less favoured areas.

Our dependent variable is number of employees in agriculture, forestry and fishery, taken from the regional database of the German Federal Statistical Office (SÄBL 2008). From the

² However, difference-in-difference matching has been developed to address this shortcoming (PUFAHL and WEISS 2007).

³ In 2005, Germany implemented the single farm payment according to the EU CAP reform of 2003. Respective funds were distinguished by the average distribution of the years 2000 to 2002, following the adoption of the CAP reform in Germany (BMVEL 2005).

same source we use regional population density and average yearly wages per employee as additional control variables. While population density measures changes in demographic structure that are regionally varying over time, the wage level is an indicator of the opportunity costs of labour. Table 1 displays some descriptive statistics.

Table 1 Descriptive statistics of the data

		<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>Std. Dev.</i>
Employees 1st sector	n	110	4962	1764	981
Direct livestock payments	€	15,579	11,024,801	1,560,682	1,753,468
Direct area payments	€	21,630	43,117,802	12,608,171	9,173,143
Agri-environmental scheme	€	0	11,885,841	1,805,298	1,974,176
Compensatory allowance	€	0	3,351,418	702,441	844,748
Investment aid scheme	€	0	4,095,862	669,595	712,527
Processing and marketing	€	-779,338 ^a	24,298,035	343,530	1,684,849
Rural development measures	€	0	23,529,590	3,964,416	3,332,525
Population density	n/km ²	42	1,861	288	380
Average yearly wages	€	21,209	29,884	25,399	1,492

Note: ^a There is occasional overpayment in some regions, which leads to negative expenses in subsequent years.

N=414.

Source: Authors' calculations.

The estimation of the impact of the CAP on the employment in the agricultural sector is based on three approaches: a “naïve” regression model using pooled data (equation (1)), a LSDV model which only includes regional effects, and the full panel data treatment effect model (equation (2)).

According to model (2), y_{it} depicts the number of employees in agriculture, forestry and fishery. Policy variables include: d_{1it} direct payments related to livestock farming (mln. €), d_{2it} direct area payments (mln. €), d_{3it} payments of the agri-environmental scheme (mln. €), d_{4it} compensatory allowance for LFA (mln. €), d_{5it} payments of the investment aid scheme (mln. €), d_{6it} support in processing and marketing of agricultural produce (mln. €), and d_{7it}

payments for the adoption and development of rural areas (mln. €). Control variables x_{1it} and x_{2it} characterize the population density (inhabitants/km²) as well as the average yearly wages per employee (€) in the respective region and year. The latent effects are captured by α_i for each *Landkreis* and μ_t for each year.

6 Estimation results

For illustrative purposes, we start with an analysis of the “naïve”, pooled OLS model without fixed effects. In this model, coefficients are highly significant and positive for direct area payments, agri-environmental measures, compensatory allowance, and single farm investment aid (Table 2). Rural development measures reveal a slightly significant, negative impact. These results show that payments under the CAP mostly go into regions where many people are employed in agriculture, except for the measures on development of rural areas. However, these results are not useful for analysing policy impacts, as variables controlling for regional size and structure of the agricultural sector are not included in the model.

Moving to model (B) which includes regional fixed effects and thus accommodates regional differences in size and structure, the picture changes completely. The coefficients of direct area payments and support of processing and marketing change into highly significant, negative effects. The impacts of compensatory allowance, investment aid, and rural development measures disappear. However, the coefficient of the agri-environmental measures remain positive. We find an expected negative sign on the general wage level. At the same time, we observe that the adjusted R² increases notably. The latter demonstrates the additional explanatory power of the fixed effects. There is little change in results if we also include annual macro effects, as in model (C), except that increasing population density now leads to employment losses in agriculture.

Table 2 Regression estimates: policy impacts on employment in agriculture

<i>Explanatory variable</i>	<i>Pooled OLS model (A)</i>		<i>OLS with regional effects (B)</i>		<i>OLS with regional and year effects (difference in difference) (C)</i>	
	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>
Direct livestock payments	22.7	0.395	-0.9	0.953	-13.0	0.466
Direct area payments	52.7 ***	0.001	-57.9 ***	0.001	-32.7 ***	0.007
Agri-environmental scheme	67.4 ***	0.001	12.8 **	0.028	12.0 *	0.054
Compensatory allowance	299.9 ***	0.001	-8.8	0.854	4.2	0.929
Investment aid	290.3 ***	0.001	4.1	0.837	9.3	0.638
Processing & marketing support	2.5	0.861	-14.1 ***	0.009	-12.7 **	0.018
Rural development measures	-17.1 *	0.082	1.4	0.755	4.2	0.397
Population density	0.1	0.671	-0.9	0.162	-1.7 **	0.015
Average yearly wages	-0.1	0.339	-0.1 ***	0.001	-0.1 ***	0.001
Adjusted R ²	0.756		0.977		0.978	

Notes: All models include a fixed intercept. Model (B) includes 68 regional dummies. Model (C) includes 68 regional dummies plus five year dummies. *** (**, *):

significant at the 1% (5%, 10%) level. N=414.

Source: Authors' calculations.

To check for statistical power of the regional and time effects, F-tests were applied. The null hypothesis is that the additional parameters of the more complex model can be set to zero. In our estimation the null hypothesis was rejected in both cases, thus, regional and time effects have a significant impact on the model. Hausman-Tests were utilized to check for orthogonality of the common regional and time effects and the regressors. Under the hypothesis of no correlation, the ordinary least squares (OLS) models with fixed regional and time effects as well as the generalized least squares (GLS) models with random effects are consistent, but OLS models are inefficient. The hypothesis of random effects was rejected. The two-way model (C) is thus consistent and efficient.

A closer investigation of the data shed additional light on the parameter estimates. Focusing on model (C), we found that the negative sign on direct area payments was driven by a couple of regions dominated by crop production. In these regions, we observe a systematic drop in agricultural employment after the implementation of decoupling in the framework of the mid-term review. While decoupling led to higher area payments, our results suggest that it also induced shedding of excess labour in crop production, as payments were made increasingly independent of the level of production decisions. Farms could thus reduce labour input without risking the loss of transfer payments.

Agro-environmental payments in the region under study were particularly increasing in the support of conversion to organic farming. Our positive coefficient is consistent with the view that labour intensity increased in regions where payments stimulated organic farming, a result that is also in line with the findings of PUF AHL and WEISS (2007). According to our estimates, transfers of on average 83,000 € annually are necessary to create one full time job by agro-environmental support. The share of this measure in the total CAP budget of the region varies between 5 and 15 percent.

To the contrary, subsidies on processing and marketing primarily increased the capital intensity in the downstream sector, for example by supporting investment in egg and fruit handling and processing. It seems plausible that these investments were mainly made in labour saving technologies and thus led to employment losses.

7 Conclusions

Our regression analysis of CAP payments in three German States reveals that there were few desirable effects on job maintenance or job creation in agriculture. Based on a difference-in-difference treatment effect model implemented at the county level, we found that direct payments for livestock, investment aid and transfers to less favoured areas had no marginal employment effect at all. Increases in direct area payments on average led to labour shedding, as simultaneous decoupling made transfer payments independent of factor allocation. Spending on modern technologies in processing and marketing also led to job losses in the first sector. Agro-environmental measures, on the other hand, kept labour intensive technologies in production or induced them.

We therefore conclude that, in the three East German States, the CAP mostly misses its target of safeguarding jobs. It seems likely that further decoupling steps will lead to more job losses. Existing bundles of measures on rural development have partly contradictory effects on employment. In light of the recent “health check” agreements on additional modulation, this analysis calls into question whether an expansion of second pillar measures is a reasonable way to use the modulated funds.

The analysis here has focused on the goal of job creation in agriculture. With regard to other goals that may have been achieved by the CAP, such as environmental stewardship or the social goal of income redistribution, we can only conclude that their potential achievement at least has not made jobs in agriculture safer.

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