Jobs and Agricultural Policy : Impact of the Common Agricultural Policy on EU Agricultural Employment

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Abstract:

This paper investigates the relationship between agricultural subsidies and the outflow of labor from agriculture. We use new and more representative subsidy indicators than have been used before and panel data from 215 EU regions over the period 2004-2014. The data allow to correct better for sample selection bias than previous empirical studies. We find that, on average, CAP subsidies reduce the outflow of labor from agriculture, but the effect is entirely due to decoupled payments and rural development payments. Coupled payments have no impact on reducing labor outflow from agriculture, i.e. on preserving farm employment.

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*Keywords***:** *Agricultural employment, off-farm migration, panel data analysis*

*JEL classifications***:** Q12, Q18, O13, J21, J43, J60

1. Introduction

It is well know that the decline in agricultural employment is a key aspect of structural adjustments that occur when an economy develops. In addition, it is well known that government support increases as economies grow (Anderson et al., 2013). Agricultural subsidies have been criticized for distorting agricultural markets and labor allocation in the economy by constraining or preventing structural change that is essential for economic growth (e.g. Johnson, 1973; OECD, 2008). At the same time, proponents of agricultural subsidies have argued that such policies are crucial to support incomes of farmers and to sustaining rural communities by sustaining jobs and preventing out-migration from rural areas (e.g. European Commission, 2010). Adverse economic conditions caused by the global economic crisis have reinforced the arguments for job creation. For example, the European Commission's recent "Communication on the future of the Common Agricultural Policy (CAP)" identified fostering jobs in rural areas and attracting new people into the agricultural sector as key policy priorities (European Commission, 2017).

Interestingly, while the arguments of opponents and supporters of agricultural subsidies are used to support different policy conclusions, they both use basic economic models of labor allocation that predict that agricultural employment is responsive to changes in returns to agricultural labor. In other words, agricultural subsidy programs are expected to have a positive impact on agricultural employment because they increase agricultural incomes.

However, empirical evidence on this assumption is actually quite mixed. Some studies do indeed find a positive impact of subsidies on agricultural employment (e.g. Breustedt and Glauben, 2007; Olper et al., 2014), but others find no or mixed impacts (e.g. Barkley, 1990; Petrick and Zier, 2012) and yet others find a negative impact (e.g. Petrick and Zier, 2012; Berlinschi et al., 2014).

The different empirical findings may be due to various reasons. Conceptual studies have pointed out that the simple logic behind the subsidy-employment relationship is too simplistic because subsidies may affect employment through other channels effects than income, and cause indirect effects because of interaction with capital or land markets.[1] Subsidies may cause, for example, capital–labor substitution effects (Goetz and Debertin, 1996) or lead to a reduction in credit-constraints, thus allowing farmers to purchase other farmers' land, inducing those to leave agriculture (Goetz and Debertin, 2001). Hence, (an increase in) subsidies may have an indirect negative impact on agricultural employment because of capital or land substitution, which can (depending on the country and/or time period) dominate the direct positive impact (the direct income effect). Berlinschi et al. (2014) propose a related explanation based on education and longer-term adjustments. By increasing farmers' income, subsidies allow credit constrained farmers to invest more in their children's education and thereby their employment choices in the next generation. If children with higher educational levels have access to more attractive job opportunities in non-agricultural sectors, then in the long term a subsidy-induced increase in farm income may result in a reduction of agricultural employment, instead of an increase. Their empirical analysis is consistent with these hypotheses.

Another reason for the different findings may be empirical, i.e. differences in geographic and regional coverage, problems with data and/or with the empirical models used. In this paper we attempt to contribute to the literature by using more detailed and more complete data and a broader coverage of regions than have been used before in this literature, for analysis on the EU.

[1] Labor reallocation from agriculture to other sectors, or vice versa, can also be caused by institutional reforms and farm restructuring (see e.g. Dries and Swinnen, 2004; Swinnen et al., 2005).

More specifically, our analysis extends and improves previous analyses of the impact of agricultural subsidies on agricultural employment in the EU (such as e.g. Olper et al., 2014) in three ways. First, we use data for the 215 regions from the entire EU-27 (compared to EU-15). This allows to disentangle the effect for sub-groups of countries and in particular whether there are differences between old member states (OMS) and new member states (NMS).[2] Second, we cover the post-NMS accession period (2004-2014) which has not yet been covered in previous studies. Third, and arguably most importantly, we are the first to use the Clearance Audit Trail System (CATS) data set from the European Commission as indicators of subsidies. The CATS data are very detailed, covering all payments made to all farmers for each individual budget component of the CAP funds. Using this CATS data set represents a fundamental improvement. Previous studies used data from the Farm Accountancy Data Network (FADN) to construct EU agricultural subsidy indicators. FADN covers only agricultural holdings whose size exceeds a minimum threshold, which unavoidably creates sample selection bias.

2. Data, Econometric Model and Hypotheses

Our dataset covers 27 EU member states and 215 regions over the period 2004-2014. The data were aggregated based on the Nomenclature of Territorial Units for Statistics (NUTS)[3] at NUTS2 level with the exception of Germany and the United Kingdom, for which NUTS1 level of aggregation was applied.[4] We dropped some regions or regional observations due to the lack of data for some variables employed in our econometric analysis. This resulted

[2] The distinction between old and new member states is based on the date of accession to the EU. OMS are 15 old member states, while NMS are 13 new member states that joined the EU after 2004.

[3] The Nomenclature of Territorial Units for Statistics (NUTS) is a geographical nomenclature subdividing the economic territory of EU into regions at three different levels: NUTS 1, 2 and 3 respectively, moving from larger to smaller territorial units. (Eurostat, 2013).

[4] The choice of employing NUTS1 level of analysis for Germany and the UK is due to the fact that have adopted a regional approach to the implementation of both CAP and Structural Fund (SF) policies at NUTS1 level. Moreover, this choice is imposed by the necessity to match data from different sources for the construction of our variables. In particular data, coming from FADN regional dataset, are classified at NUTS1 level for these two countries.

in a final sample consisting of 215 regions and 1,792 observations. The choice of the period of analysis (2004-2014) is due to data availability. The subsidy (CATS) data were available only from 2004; and the employment (CERD) database was available only until 2014.

We estimate the following model:

$$m_{i,t} = \beta_0 + \beta_2 s_{i,t-1} + \beta_3\ conv_{i,t} + \beta_n X_{i,t-1}\ + + \alpha_i + \gamma_t + \varepsilon_{it,} \qquad (1)$$

where $m_{i,t}$ is the outflow of labor from agriculture, $s_{i,t-1}$ is the amount of agricultural subsidies at time t-1 and βs are the parameters to be estimated. X is a vector including all control variables such as relative income, relative labor, population density, family farm work, and unemployment rates. $Conv_{i,t}$ is the dummy variable taking value 1 for EU Structural Funds (SF)[5] Objective1 regions and 0 otherwise. The subsidy variables as well as the other covariates enter the equation as lagged by 1 year. This reflects the assumption that farmers need time to adjust to a new situation, e.g. a farmer's choice to leave at time t is affected by the level of CAP payments at time t-1. To control for potential endogeneity bias due to omitted variables, we include regional level and time fixed effects, α_i and γ_t, respectively.[6]

2.1 Agricultural employment (Dependent variable)

To measure the change in agricultural employment, we used regional data coming from the Cambridge Econometrics Regional Database (CERD). In particular, we use regional

[5] The SF Objective 1 measures are designed to promote economic growth in those regions whose GDP per capita is less than 75% of the EU average, and they therefore aim to improve economic cohesion across the EU space.

[6] The application of fixed-effects controls for (time invariant) observable and unobservable differences in the unit of analysis, that can influence the farmer's decision to migrate, but that change quite slowly over time. These include for example the stock of human capital, the age structure of the farm population, or the share of land under property (Olper et al., 2014)

agricultural employment, corrected for the growth rate of the total labor force, following Larson and Mundlak (1997), and define the outflow of labor from agriculture as:

$$m_{i,t} = \left[L^A_{i,t-1}\frac{L^T_{i,t}}{L^T_{i,t-1}} - L^A_{i,t}\right] / L^A_{i,t-1} \qquad (2)$$

where $L^A_{i,t}$ is the labor force employed in the agricultural sector of region *i* at time *t* and $L^T_{i,t}$ is the total labor force in the region's economy at time *t*.

2.2 Agricultural subsidies (Independent variable)

The key variable in the regression equation, $s_{i,t-1}$, is the amount of agricultural subsidies, and is calculated with data from the CATS database[7] aggregated at NUTS2 regional level. The CATS database includes information on payments of each individual budget component of the CAP funds to all farms that receive payments.

Previous studies used FADN data set for subsidy measures. This limits the coverage to commercial larger agricultural holdings only and hence introduces a potentially serious sample selection bias. Unlike the FADN data set, the CATS data set covers all transfers paid to all EU farmers, also those includes in the FADN sample. Table 1 and Figure 1 compares the CATS indicators and the FADN indicators.[8] These comparisons confirm that FADN-based subsidy indicators are higher compared to those constructed from the CATS data because of the bias towards larger farms.

[7] CATS was created to assist the European Commission in implementing audits on agricultural expenditures. It collects the digitalized files that each year Member State forwards to the European Commission concerning details of all individual payments (in Euro) made to CAP recipients.

[8] The CATS CAP expenditure are divided variables by regional value added line with previous studies (see e.g. Barkley, 1990; D'Antoni and Mishra, 2010; Olper et al., 2014). The policy variables coming from the FADN data set are associated to the amount of payments received by the 'average farm' for every region of interest and normalized by the average farm income net value added (inclusive of subsidies) as in Olper et al. (2014).

A key assumption of our identification strategy is that the CAP variables subsidies $s_{i,t}$ are predetermined variables with respect to the outflow of agricultural labor. For Pillar I payments, this assumption is justified on the ground that these policy instruments are decided by EU authorities rather than regional authorities.[9] The assumption of exogeneity of Pillar II payments might be more open to critique as they are under the responsibility of regional institutions. However, Olper et al. (2014) argue that the regional allocation is the result of negotiations between EU and national authorities and can thus be considered as exogenous. To further control for this, the CAP variables are lagged by 1 year, which would reduce a potential bias caused by a spurious correlation due to shocks simultaneously affecting CAP payments and farmers' exit.

2.3 Different types of agricultural subsidies

The CATS database allows to disentangle total CAP payments into several components. It allows to distinguish between Pillar I and Pillar II payments and within Pillar I support between decoupled and coupled payments. Within Pillar II payments in five classes following the categorization of Boulanger and Philippidis (2015). Coupled Pillar I subsidies, such as tariffs and price support, were the main form of EU agricultural subsidies in the 1970s and 1980s. These subsidies have been reformed and most of the Pillar I payments are now decoupled from production. The impact of the subsidies is likely to differ between CAP payments.

Coupled payments distort markets and the allocation of labor and are likely to keep labor employed in less productive activities (which are more likely to receive subsidies).[10]

[9] More specifically, the CAP is financed by two funds: the EAGF (European Agricultural Guarantee Fund) and EAFRD (European Agricultural Fund for Rural Development), and up until financial year 2006 the EAGGF (European Agricultural Guarantee and Guidance Fund).

[10] Political economy studies show that support to agriculture and to specific sectors is inversely related to these sectors' comparative advantage (Anderson et al 2013; Swinnen 2018).

Therefore coupled subsidies may be correlated with more, rather than less, labor outflow because they tend to go to sectors where the difference in labor returns are relatively large – or at least the revenue-increasing effect will be offset by the (endogenous) large difference in income with other sectors.

Decoupled payments suffer less from this problem. They are not coupled to specific farming activities and give farmers more options in choosing for more productive farming activities. Hence, one would expect decoupled direct payment to have a more positive effect on agricultural employment (Dewbre and Mishra, 2007; Hennessy and Rehaman, 2008). This argument is supported by empirical evidence showing that agricultural productivity on farms in the EU increased with the shift from “coupled” to “decoupled” subsidies, allowing farmers to increase specialization in higher valued added farming activities (Kazukauskas et al., 2014; Rizov et al., 2013).

Pillar II payments include various measures, which target different activities and hence may have different effects on employment. Following Boulanger and Philippidis (2015) we focus on five categories of Pillar II payments: (a) investment in human capital; (b) investment in physical capital; (c) agri-environmental payments; (d) least favored areas (LFA); and (e) wider rural development (RD) instruments.[11] Investments in physical and human capital are expected to be productivity-enhancing and thus cost reducing (Dudu and Kristkova, 2017). This may increase or reduce agricultural demand depending on whether it enhances agricultural labor productivity more or less than other activities; and to what extent it may create complementary opportunities which can be combined with farm work. For example, investments in human capital is likely to enhance farm productivity but at the same time may enhance farmers’ opportunities in being hired for better paying off-farm jobs. Agri-

[11] The wider rural development measures include diversification into non-agricultural activities; encouragement of rural tourism; village renewal and development, etc.

environmental payments are linked to specific production activities, which are often more labor-intensive than the traditional ones, so they can increase the demand of labor (Petrick and Zier, 2012). LFA payments are linked to land and may thus have an ambiguous effect similar to that of coupled payments (Olper et al., 2014). Finally, wider rural development payments are generally assumed to have no effects on agricultural sector as such, but to support of other sectors such as construction or tourism. In this sense, these payments may be effective in creating new rural jobs, which can lead to a loss or continuation of agricultural employment depending on whether they are substitutes or complements (Schuh et al., 2016; Boulanger and Philippidis, 2015; Dudu and Kristkova, 2017).

2.4 Control variables

We use a dummy variable taking value 1 for EU SF Objective1 regions and 0 otherwise to control for additional EU regional support, a key goal of which is to promote development in poor regions and ultimately stimulate regional employment growth.[12] To construct this dummy variable we used the SF payments at the NUTS2 level of regional aggregation under the three programming periods 2000-2006 and 2007-2013 and 2014-2020 covered in our analysis. These data were retrieved from the DG REGIO website[13] and cover the regional transfers of the European Regional Development Fund (ERDF).[14]

Other control variables include relative income, population density, unemployment rate, the share of family labor involved in farm work, and relative labor. Data for these variables stem from several sources, such as CERD, Eurostat and FADN. To account for inter-sectoral income differential we compute relative income. We also add relative labor, which denotes the

[12]The SF Objective 1 policy measures are designed to promote economic growth in those regions whose GDP per capita is less than 75% of the EU average, and they therefore aim to improve economic cohesion across the EU space.
[13] http://ec.europa.eu/regional_policy/en/policy/evaluations/data-for-research/.
[14]The ERDF contributes to 60% of the total SF under both programming periods.

absorption of non-agricultural sectors as well as indicates the regional structural change in terms of potential migration flow from agriculture. Both variables are defined as the ratio of non-agricultural income (labor) to agricultural income (labor).[15]

To control for search costs and the probability of finding a job in the non-agricultural sector, we include the overall rate of unemployment, and a measure of population density, calculated as the total population over regional area in km^2. This variable accounts for several market conditions, in particular product and land markets (Glauben et al., 2006). Furthermore, it represents a rough approximation of the average 'distance' from urban areas. We also include a variable that measures the amount of farm family workers. The underlying idea is that a high number of family members working on the farm lowers the exit rate (Breustedt and Glauben, 2007).

3. Results

Table 2 summarizes the regression results for the EU-27 (total EU). We find that total CAP payments have a negative and significant effect on the outflow of labor from agriculture (Column 1 of table 2). Hence, on average, CAP subsidies maintain employment in EU agriculture. Columns 2 to 4 of Table 2 disentangle total CAP spending into Pillar I and Pillar II subsidies; and the Pillar I subsidies into "coupled Pillar I subsidies" and "decoupled Pillar I subsidies". The regression coefficients for both Pillar I and Pillar II are still significant and negative (meaning they reduce the outflow of labor from agriculture), but for Pillar I, the significant effects are exclusively related to the decoupled payments (with a strongly

[15] Olper et al. (2014) correct their relative income variable for potential double counting induced by the CAP transfers, because it can potentially bias the estimates downward. Our analysis covers the period 2005-2014 were coupled subsidies, which are included in the computation of the GVA, accounting for a small share of total CAP expenditures, hence the issue related to double counting is small.

significant negative coefficient). There is no significant association of coupled Pillar I payments with agricultural employment (column 3).

Tables 3 and 4 present results for OMS and NMS separately. On the one hand, in the OMS (Table 3) the overall CAP impact is still negative (meaning a reduction of labor outflow from agriculture) but only weakly significant. Only non-distortionary transfers (decoupled Pillar I payments and Pillar II payments) maintain jobs in agriculture. As for the EU-27 as a whole, coupled payments has no significant effect on agricultural employment. On the other hand, the results for the NMS (Table 4) show that only Pillar I decoupled payments reduce the outflow of labor from agriculture. The Pillar II subsidies and total CAP payments have on average no significant impact for NMS.

The estimated impacts of the different components of Pillar II are summarized in Columns 5 of tables 2 to 4. The estimated Pillar II component impacts are heterogeneous. Investment in human capital has a significant positive effect, consistent with the argument that while higher human capital increases farm productivity, it also enhances off-farm labor opportunities, and apparently the second effect is stronger.

LFA and agri-environmental payments reduce labor outflow but only in the OMS, not in the NMS. Wider rural development spending has a weakly significant negative coefficient for the EU as whole, but not for the regressions for NMS or OMS separately, suggesting that they may be have some effect in reducing off-farm migration but not strongly – in fact the different sub-effects of rural development initiatives may offset one another (see above).

The estimated coefficients of the control variables (such as relative income, relative labor, unemployment rate, population density and farm family work, which might affect migration costs) are consistent with our expectations. As expected: (1) in all specifications (Tables 2-4) relative income between agriculture and non-agricultural sector has a strong positive and significant effect on off-farm migration; (2) the outflow of hired labor is higher than that of family labor; (3) unemployment rates and (4) population density have the expected (and significant) sign.

4. Conclusion

Following the global financial crisis, job creation is at top of the political agenda in numerous countries. The relationship between agricultural employment and government support has gained increasing attention both in academic and policy circles. While policy arguments that agricultural subsidies increase farm profits and, as a consequence, jobs are used commonly, empirical evidence for this argument is much weaker than assumed and argued.

There are good conceptual arguments why this relationship is more complex than often assumed. There are also problems in measuring the effect empirically. In this paper we contribute to the literature by estimating the relationship by using more complete data and a broader coverage than in earlier empirical studies.

We use an EU-wide panel data set of 215 regions, a more recent period (2004–2014), and our analysis is the first to use detailed CATS data with detailed payments for each farm. With these improved data, we find that EU subsidies, as a whole, reduce the outflow of labor from agriculture. The entire effect comes from non-distortionary payments, i.e. Pillar I decoupled payments and Pillar II payments. Within Pillar II, LFA and agri-environmental payments especially reduce labor in OMS, while investment in human capital stimulate the outflow of labor, especially in NMS.

These findings have important policy implications. They indicate that non-distortionary payments, decoupled Pillar I payments and rural development (Pillar II) support, sustain agricultural employment. The CAP reduced the reduction in farm employment by increasing agricultural productivity through decoupled payments. This is in line with previous research documenting a higher efficiency loss associated with coupled payments (e.g. Kazukauskas et al., 2014; Rizov et al., 2013)

References

Anderson, K. (2009). *Distortions to Agricultural Incentives: A Global Perspective, 1955–2007*. London; Washington DC: Palgrave Macmillan; World Bank.

Anderson, K., & Hayami, Y. (1986). *The Political Economy of Agricultural Protection: East Asia in International Perspective*. Boston, USA: Allen & Unwin.

Anderson, K., Rausser, G., & Swinnen, J. (2013). Political Economy of Public Policies: Insights from Distortions to Agricultural and Food Markets. *Journal of Economic Literature*, *51*(2), 423-477.

Barkley, A. (1990). The Determinants of the Migration of Labor out of Agriculture in the United States, 1940–85. *American Journal of Agricultural Economics*, 72 (3), 567–73.

Berlinschi, R., Swinnen, J., & Van Herck, K. (2014). Trapped in Agriculture? Credit Constraints, Investments in Education and Agricultural Employment. *The European Journal of Development Research*, 26(4), 490–508.

Blomquist, J., & Nordin, M. (2017). Do the CAP Subsidies Increase Employment in Sweden? Estimating the Effects of Government Transfers Using an Exogenous Change in the CAP. *Regional Science and Urban Economics*, 63, 13–24.

Borjas, G.J. (1987). Self-Selection and the Earnings of Immigrants. *The American Economic Review*, 77(4), 531–53.

Boulanger, P., & Philippidis, G. (2015). The EU Budget Battle: Assessing the Trade and Welfare Impacts of CAP Budgetary Reform. *Food Policy*, 51, 119–30.

Breustedt, G., & Glauben, T. (2007). Driving Forces behind Exiting from Farming in Western Europe. *Journal of Agricultural Economics*, 58(1), 115–27.

Cattaneo, C., & Peri, G. (2016). The Migration Response to Increasing Temperatures. *Journal of Development Economics*, 122, 127–46.

D'Antoni, J.M., & Mishra, A.K. (2010). Agricultural Policy and Its Impact on Labor Migration from Agriculture. In *2010 Annual Meeting, February 6-9, 2010, Orlando, Florida* (No. 56426). Southern Agricultural Economics Association.

Dewbre, J., & Mishra, A.K. (2007). Impact of Program Payments on Time Allocation and Farm Household Income. *Journal of Agricultural and Applied Economics*, 39(3), 489–505.

Dries, L., & Swinnen, J.F. (2004). Foreign direct investment, vertical integration, and local suppliers: Evidence from the Polish dairy sector. *World development*, *32*(9), 1525–1544.

Dudu, H., & Smeets Kristkova, Z. (2017). Impact of CAP Pillar II Payments on Agricultural Productivity. JRC Technical Report No. 106591.

European Commission. (2010). Communication on the CAP towards 2020: Meeting the Food, Natural Resources and Territorial Challenges of the Future. COM 672. Brussels.

———. (2017). The Future of Food and Farming. COM 713. Brussels.

Goetz, S.J., & Debertin, D. (1996). Rural Population Decline in the 1980s: Impacts of Farm Structure and Federal Farm Programs. *American Journal of Agricultural Economics*, 78(3), 517–29.

Goetz, S.J., & Debertin, D.L. (2001). Why Farmers Quit: A County-Level Analysis. *American Journal of Agricultural Economics*, 83(4), 1010–23.

Gollin, D., Lagakos, D., & Waugh., M.E. (2014). Agricultural Productivity Differences across Countries. *American Economic Review*, 104(5), 165–70.

Harris, J.R., & Todaro, M.P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, 60(1), 126–42.

Hennessy, T.C., & Rehaman, T. (2008). Assessing the Impact of the 'Decoupling' Reform of the Common Agricultural Policy on Irish Farmers' Off-Farm Labour Market Participation Decisions. Journal of Agricultural Economics, 59(1), 41–56.

Kazukauskas, A., Newman, C., & Sauer, J. (2014). The Impact of Decoupled Subsidies on Productivity in Agriculture: A Cross-Country Analysis Using Microdata. *Agricultural Economics*, 45(3), 327–36.

Larson, D., & Mundlak, Y. (1997). On the Intersectoral Migration of Agricultural Labor. *Economic Development and Cultural Change*, 45(2), 295–319.

Matthews, A., Salvatici, L., & Scoppola, M. (2016). Trade Impacts of Agricultural Support in the EU. Commissioned Paper No. 19. IATRC Publications.

Michalek, J., Ciaian, P., Kancs, D. A., & Gomez y Paloma, S. (2011). Distributional Effects of CAP Subsidies: Micro Evidence from the EU. 2011 Annual Meeting, July 24-26, 2011, Pittsburgh, Pennsylvania (No. 102978). Agricultural and Applied Economics Association.

Mundlak, Y. (1979). *Intersectoral Factor Mobility and Agricultural Growth* (No. 6). Washington : International Food Policy Research Institute.

OECD. (2017). Agricultural Policy Monitoring and Evaluation 2017. Paris: OECD Publishing.

Olper, A., Raimondi, V., Cavicchioli, D., & Vigani, M. (2014). Do CAP Payments Reduce Farm Labour Migration? A Panel Data Analysis across EU Regions. *European Review of Agricultural Economics*, 41(5), 843–73.

Petrick, M., & Zier, P. (2011). Regional Employment Impacts of Common Agricultural Policy Measures in Eastern Germany: A Difference-in-Differences Approach. *Agricultural Economics*, 42(2), 183–93.

———. (2012). Common Agricultural Policy Effects on Dynamic Labour Use in Agriculture. *Food Policy*, 37(6), 671–78.

Rizov, M., Pokrivcak, J., & Ciaian, P. (2013). CAP Subsidies and Productivity of the EU Farms. *Journal of Agricultural Economics*, 64(3), 537–57.

Roy, A.D. (1951). Some Thoughts on the Distribution of Earnings. *Oxford Economic Papers*, 3(2), 135–46.

Schuh, B., Powell, J.R., Vigani, M., Hawketts, E., Gorny, H., Kaucic, J., & Kirchmayr-Novak, S. (2016). The Role of the EU's Common Agricultural Policy in Creating Rural Jobs. Monograph. April 30, 2016.

Swinnen, J.F., Dries, L., & Macours, K. (2005). Transition and agricultural labor. *Agricultural Economics*, *32*(1), 15–34.

Table 1: Descriptive Statistics

Variables - (SOURCE)	Description	EU-27		OMS		NMS	
		Obs.	Mean	Obs.	Mean	Obs.	Mean
Total CAP payments (t-1) – (CATS)	Share over regional agricultural value added	1,792	0.334	1,398	0.328	394	0.355
CAP Pillar I payments (t-1) – (CATS)		1,792	0.259	1,398	0.274	394	0.205
CAP Pillar I coupled payments (t-1) - (CATS)		1,783	0.090	1,389	0.110	394	0.020
CAP Pillar I decoupled payments (t-1) – (CATS)		1,783	0.167	1,389	0.162	394	0.186
CAP Pillar II payments (t-1) – (CATS)		1,789	0.075	1,395	0.054	394	0.149
Pillar II human capital (t-1) – (CATS)		1,621	0.008	1,230	0.004	391	0.018
Pillar II physical capital (t-1) – (CATS)		1,621	0.012	1,230	0.007	391	0.029
Pillar II agri-environment (t-1) – (CATS)		1,621	0.025	1,230	0.023	391	0.031
Pillar II LFA (t-1) – (CATS)		1,621	0.015	1,230	0.013	391	0.022
Pillar II RD (t-1) – (CATS)		1,621	0.014	1,230	0.009	391	0.032
Off-farm migration rate	Growth rate	1,792	0.015	1,398	0.011	394	0.027
Relative Income (t-1)	Log ratio	1,792	0.709	1,398	0.629	394	0.995
Relative Labor (diff)	Difference ratio	1,792	0.746	1,398	0.841	394	0.409
Population density (t-1)	1,000 person/km2	1,792	0.220	1,398	0.227	394	0.192
Unemployment rate (diff)	Difference percentage	1,792	0.169	1,398	0.344	394	-0.455
Family farm labor force (t-1)	Annual work unit	1,792	1.265	1,398	1.266	394	1.262
Convergence regions	Dummy	1,792	0.342	1,398	0.180	394	0.916
Total CAP payments (t-1) – (FADN)	Share of average farm net valued added	1,792	0.509	1,398	0.481	394	0.609
CAP Pillar I payments (t-1) - (FADN)		1,792	0.355	1,398	0.349	394	0.378
CAP Pillar I coupled payments (t-1) - (FADN)		1,744	0.114	1,350	0.119	394	0.095
CAP Pillar I decoupled payments (t-1) - (FADN)		1,783	0.245	1,389	0.234	394	0.283
CAP Pillar II payments (t-1) – (FADN)		1,789	0.154	1,395	0.132	394	0.231

Source: CATS database provided by the European Commission, CERD, DG REGIO, FADN, Eurostat.

Table 2: Off-farm migration regressions for EU-27 regions (215 regions)

Dependent variable: *Off-farm migration*	(1) LSVD	(2) LSVD	(3) LSVD	(4) LSVD	(5) LSVD
Total payments (t-1)	-0.034**				
	(2.15)				
Pillar I (t-1)		-0.037*			
		(1.88)			
Pillar I coupled (t-1)			-0.013		
			(0.76)		
Pillar I decoupled (t-1)			-0.074***		
			(3.38)		
Pillar II (t-1)				-0.073*	
				(1.95)	
Pillar II human capital (t-1)					0.553***
					(2.62)
Pillar II physical capital (t-1)					0.024
					(0.46)
Pillar II agro-environmental (t-1)					-0.330***
					(3.28)
Pillar II LFA (t-1)					-0.392*
					(1.67)
Pillar II RD (t-1)					-0.120*
					(1.81)
Relative income (t-1)	0.065***	0.064***	0.077***	0.059***	0.067***
	(4.43)	(4.33)	(5.01)	(3.72)	(4.40)
Relative labor (diff)	0.004***	0.004***	0.004***	0.004***	0.005***
	(5.32)	(5.32)	(5.26)	(5.39)	(5.35)
Population density (t-1)	0.508**	0.478**	0.398	0.586***	0.707***
	(2.27)	(2.01)	(1.63)	(2.67)	(2.71)
Unemployment (diff)	-0.003***	-0.003***	-0.003***	-0.004***	-0.003***
	(3.44)	(3.50)	(3.52)	(3.65)	(3.06)
Family work	-0.038***	-0.036***	-0.036***	-0.044***	-0.057***
	(3.01)	(2.90)	(2.94)	(3.29)	(4.19)
Convergence regions	0.020**	0.020**	0.021**	0.017*	0.019**
	(2.01)	(2.02)	(2.17)	(1.78)	(2.03)
Observations	1,792	1,792	1,783	1,789	1,621
R-squared	0.434	0.433	0.440	0.424	0.458
Number of Regions	215	215	215	215	215
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: each Least Square Dummy Variable (LSDV) regression includes both region and time fixed effects. T-statistics based on standard errors clustered by region are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 3: Off-farm migration regressions for OMS regions (159 regions)

Dependent variable: *Off-farm migration*	(1) LSVD	(2) LSVD	(3) LSVD	(4) LSVD	(5) LSVD
Total payments (t-1)	-0.030*				
	(1.70)				
Pillar I (t-1)		-0.028			
		(1.61)			
Pillar I coupled (t-1)			-0.004		
			(0.27)		
Pillar I decoupled (t-1)			-0.066***		
			(2.90)		
Pillar II (t-1)				-0.108*	
				(1.71)	
Pillar II human capital (t-1)					-0.521
					(1.06)
Pillar II physical capital (t-1)					0.163
					(1.17)
Pillar II agro-environmental (t-1)					-0.445***
					(2.99)
Pillar II LFA (t-1)					-0.567***
					(2.74)
Pillar II RD (t-1)					-0.103
					(1.36)
Relative income (t-1)	0.040***	0.038***	0.053***	0.035***	0.049***
	(3.09)	(2.96)	(3.53)	(2.70)	(3.44)
Relative labor (diff)	0.004***	0.004***	0.004***	0.004***	0.005***
	(4.29)	(4.29)	(4.16)	(4.33)	(5.06)
Population density (t-1)	0.278***	0.235***	0.145	0.415***	0.494**
	(3.24)	(2.76)	(1.50)	(3.09)	(2.20)
Unemployment (diff)	-0.003***	-0.003***	-0.003***	-0.004***	-0.003***
	(3.22)	(3.18)	(3.11)	(3.59)	(2.95)
Family work	-0.045***	-0.045**	-0.043**	-0.057***	-0.067***
	(2.64)	(2.58)	(2.53)	(3.13)	(3.82)
Convergence regions	0.027***	0.028***	0.030***	0.024***	0.026***
	(2.86)	(2.88)	(3.17)	(2.65)	(2.93)
Observations	1,398	1,398	1,389	1,395	1,230
R-squared	0.443	0.442	0.450	0.433	0.489
Number of Regions	159	159	159	159	159
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: each Least Square Dummy Variable (LSDV) regression includes both region and time fixed effects. T-statistics based on standard errors clustered by region are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 4: Off-farm migration regressions for NMS regions (56 regions)

Dependent variable: Off-farm migration	(1) LSVD	(2) LSVD	(3) LSVD	(4) LSVD	(5) LSVD
Total payments (t-1)	-0.044				
	(1.07)				
Pillar I (t-1)		-0.146**			
		(2.48)			
Pillar I coupled (t-1)			-0.022		
			(0.24)		
Pillar I decoupled (t-1)			-0.188**		
			(2.31)		
Pillar II (t-1)				0.014	
				(0.21)	
Pillar II human capital (t-1)					0.695***
					(2.79)
Pillar II physical capital (t-1)					-0.047
					(1.36)
Pillar II agro-environmental (t-1)					-0.292
					(1.35)
Pillar II LFA (t-1)					-0.203
					(0.79)
Pillar II RD (t-1)					-0.104
					(0.91)
Relative income (t-1)	0.144***	0.155***	0.160***	0.133***	0.140***
	(4.89)	(4.99)	(5.10)	(4.86)	(4.82)
Relative labor (diff)	0.004***	0.004***	0.004***	0.004***	0.004***
	(3.80)	(3.81)	(3.78)	(3.85)	(4.03)
Population density (t-1)	0.684	0.544	0.506	0.780	0.818
	(0.89)	(0.72)	(0.65)	(1.08)	(1.25)
Unemployment (diff)	-0.003*	-0.004*	-0.004**	-0.004*	-0.005**
	(1.74)	(1.95)	(2.06)	(1.78)	(2.04)
Family work	-0.044**	-0.031	-0.031	-0.048**	-0.048*
	(2.11)	(1.51)	(1.44)	(2.18)	(1.99)
Convergence regions	-0.031	-0.031	-0.030	-0.031	-0.031
	(1.45)	(1.43)	(1.39)	(1.57)	(1.39)
Observations	394	394	394	394	391
R-squared	0.485	0.490	0.491	0.483	0.501
Number of Regions	56	56	56	56	56
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: each Least Square Dummy Variable (LSDV) regression includes both region and time fixed effects. T-statistics based on standard errors clustered by region are in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Figure 1: Evolution of CAP protection by regional specification