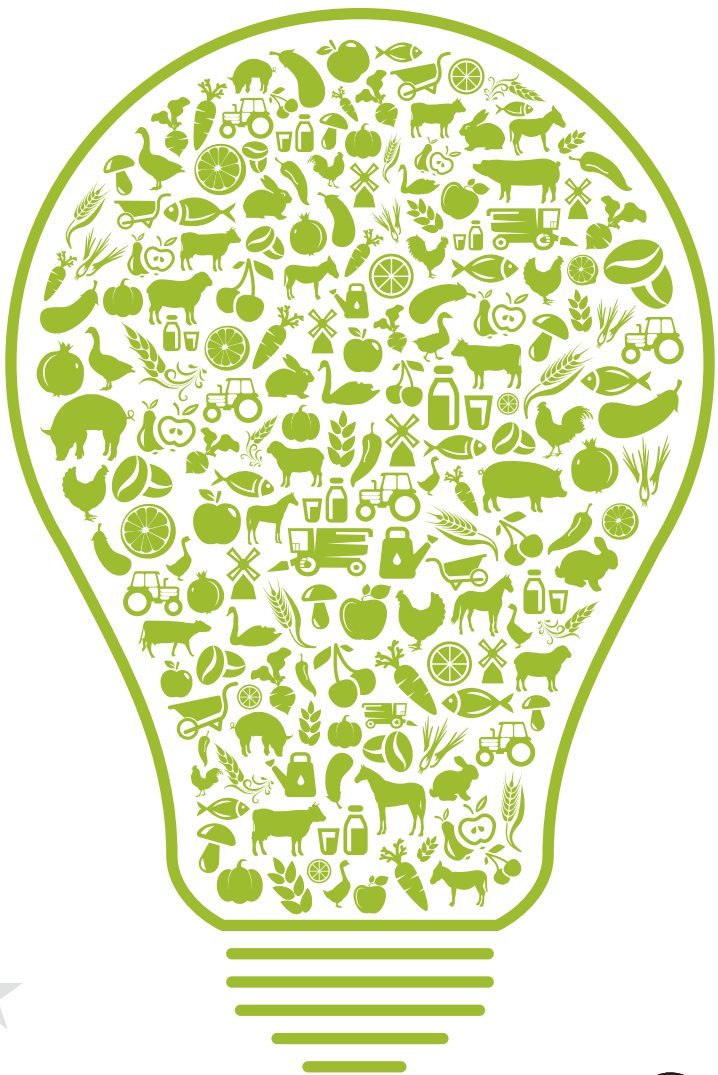
CONFERENCE EDITION

WORLD BANK REPORT
ON THE EUROPEAN UNION

Thinking CAP

Supporting Agricultural Jobs and Incomes in the EU



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Acronyms and Abbreviations

CAP	Common Agricultural Policy
CATS	Clearance Audit Trail System
CERD	Cambridge Econometrics Regional Database
DG AGRI	Directorate General for Agriculture and Rural Development (European Commission)
DG REGIO	Directorate General for Regional and Urban Policy (European Commission)
EAFRD	European Agricultural Fund for Rural Development
EAGGF	European Agricultural Guidance and Guarantee Fund
EC	European Commission
EFA	Ecological Focus Area
EU	European Union
EUR	Euro
FADN	Farm Accountancy Data Network
FFI	Farm Family Income
FWU	Family Work Unit
GDP	Gross Domestic Product
GVA	Gross Value Added
ILO	International Labour Organization
IT	Information Technology
LSDV	Least Square Dummy Variable
NMS	Newer Member States
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organization and Economic Co-operation and Development
OLS	Ordinary Least Square
OMS	Older Member States
PPP	Purchasing Power Parity
PPS	Purchasing Power Standard
RER	Regular Economic Report
SILC	Statistics on Income and Living Conditions
SST	Success Structural Transformers
USD	United States Dollars
VA	Value Added
WB	World Bank
WDI	World Development Indicators

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Overview

The Common Agricultural Policy is sometimes overlooked as an instrument to support inclusive growth. Why bother about agriculture? As a share of GDP, agriculture is small and declining. And agricultural employment is also declining, while the income gap with other sectors is significant (about 50 percent). This probably is as it should be: it reflects the normal process of structural transformation in which agriculture gives way to manufacturing, first, and services, later. However, international experience demonstrates that this process is not always easy, and shortcuts, which "skip" agriculture, are rare. How is structural transformation evolving in the EU and what role has the CAP played in it?

This report argues that the CAP was associated with the reduction of poverty and the creation of better jobs for farmers across the EU. Structural transformation is well underway and relatively successful: the gap between agricultural incomes and incomes in other sectors is closing and across the EU agricultural incomes are converging with each other. The successful transformers, about half of the Member States, have turned agriculture into a key sector for shared prosperity in rural areas: agriculture is no longer associated with poverty. The other half — the incomplete transformers — still have some way to go, which includes ensuring that the basic conditions for agriculture to thrive are in place.

The Common Agricultural Policy targets one of the few economic sectors for which the EU has a common policy[1]. It is also one of the oldest policies of the EU. The CAP budget consists of two pillars: direct payments and market support measures (Pillar I), comprising three-quarters of the budget, and the rural development policy (Pillar II), comprising one-quarter.

i. **Pillar I Direct payments** are annual, fully EU-funded payments to provide a basic income and help stabilize farm revenues by compensating for the risks farmers face, e.g. volatile market prices, unpredictable weather conditions and variable input costs. To benefit from these payments, farmers must respect rules and practices concerning environmental standards, animal welfare, food safety and traceability — this is known as "cross compliance".
ii. **Pillar II Rural development** is discrete EU co-financing for investment projects of farmers and agri-businesses in rural areas with economic, environmental or social objectives, primarily targeting farms and agri-businesses in rural areas. This includes payments to farmers for land management practices which support the environment and climate change mitigation.

The Pillar I direct payments are allocated between coupled and decoupled payments. Under Pillar I, payments linked to the production of a particular crop or keeping a particular type of livestock are called "coupled". The direct "decoupled" payments are annual "area-based" payments, based on how many hectares a farmer uses, not owns, and not on how much a farmer produces or intends to produce.[2] Most countries set a minimum farm size, below which a farm is not eligible

[1] The other one is fisheries.

[2] This description is a simplification. It is based on the Single Area Payment System in place in the NMS. In the OMS, the original system is based on entitlements, which are indirectly linked to area, as they must be activated by declaring an eligible hectare for each entitlement. This system is the Basic Payment System, based on the former Single Farm Payment system.

for these subsidies. Some countries set a maximum subsidy amount. Direct payments made up an average of 46 percent of farm income in the EU between 2005 and 2013.[3] They represent an important support for, and smoothing of, farmers' incomes.

Pillar II finances rural development projects. A wide variety of projects can be supported: subsidies for on-farm and off-farm investments which benefit an individual farmer (e.g. for processing of farm products, infrastructural development of farm holdings, business start-up aid for young farmers and non-farm business operations in rural areas), but also subsidies for environmentally-friendly land management. Most of the subsidies go directly to individual farmers and rural businesses, and not to, say, groups of farmers. However, the financing of investments in rural communities, e.g. nurseries, rural roads, is also possible. The subsidy usually covers a percentage of the total project cost (e.g. 40, 50, or 60 percent), with the applicant financing the remainder[4].

Does agriculture and the CAP matter for the creation of good jobs and poverty reduction in the EU? Agricultural production in the EU provides work to about one tenth of the workforce. Most of the workforce in agriculture is family labor, since farming in the EU is dominated by family farmers. But are the (family) jobs created in agriculture good jobs? And do they contribute to the eradication of poverty, given the substantial challenge described above? This report argues that agriculture and the CAP are indeed playing this role, but that this role differs depending on where the country finds itself along the process of structural transformation.

Box 1. Structural transformation: the role of agriculture

Successful structural transformation starts by ensuring that the basic conditions for profitable agriculture are in place. At the start of the process, at relatively low income levels, farmers need to be able to raise their incomes so that they can invest in their farms and in their family. For this to happen, the basic conditions for agriculture to thrive need to be in place. These are well known. Roads, to bring their product to market at a reasonable cost. Secure property rights, so they have strong incentives to invest in their farm. Extension services (and in today's world, the internet) so that they can adopt techniques which raise their productivity. Access to health and education services, so that they and their children can acquire the basic skills necessary for the jobs relevant to the next phases of structural transformation, either within or outside agriculture. If these basic conditions are not met, farmers will stay poor and the rural areas in which they live will stay poor, as agriculture is usually the main source of local economic growth. However, if these basic conditions are met and benefit a farm sector based on a multitude of family farms, the increase in on-farm investment and the resulting farm income growth will have substantial ripple effects on the local area via agriculture's strong production and consumption linkages. In this way, agricultural income growth raises rural household incomes area-wide.

Shortcuts are rare. First, growth originating in agriculture is more pro-poor than any other sector. Conversely, a lagging agricultural sector will be a drag on overall poverty reduction, unless the urban areas can expand low-skilled job creation at record rates, while successfully absorbing large numbers of the poor. In addition, the political tensions arising from a growing income gap between rural and urban areas will be difficult to manage. Second, the next phase of structural transformation requires labor to move from agriculture to manufacturing. For this, different skills are needed — households need to acquire them and this is neither automatic nor easy. A thriving agricultural sector will provide households with the financial resources to invest in the acquisition of these skills. These factors explain why it is so difficult to find shortcuts to the process of structural transformation by "skipping" agriculture.

[3] EC (2015d).

[4] In some cases, the national government can also finance the remainder.

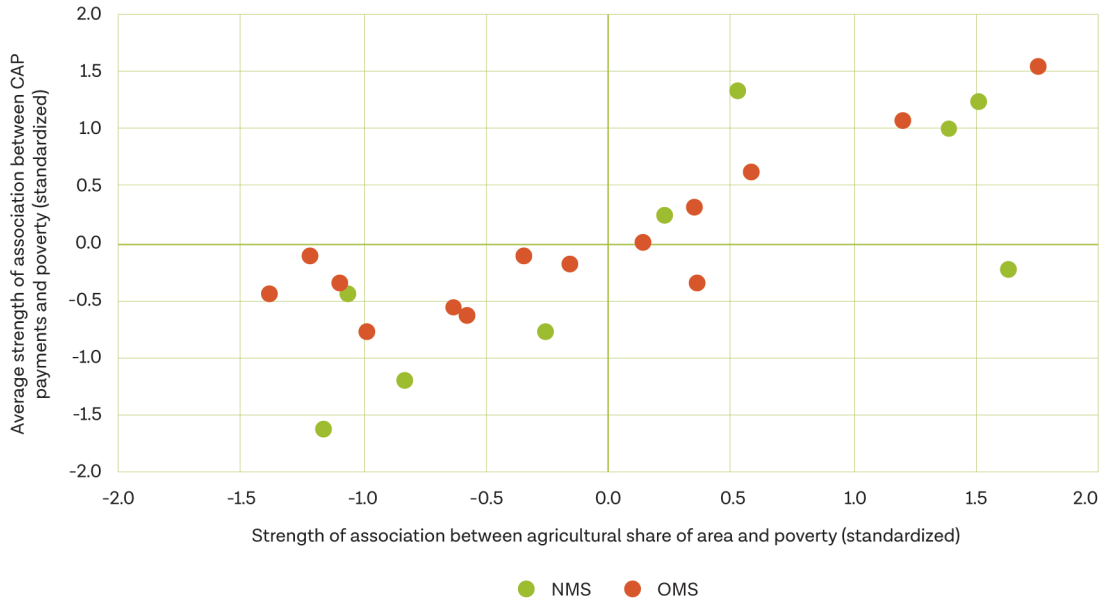
In the EU, growth, employment and income trends suggest that the process of structural transformation is on track. As a share of GDP, agriculture value added is small and declining. Agricultural employment is also declining, providing work for about one tenth of the labor force. And while the income gap with other sectors is still large (about 50 percent), this gap is closing, while farm incomes across the EU are converging. In other words, the structural transformation process is well-advanced. However, countries differ on where they are in the process of structural transformation.

The EU's successful structural transformers have delinked agriculture from poverty. If farmers are successful in profiting from agriculture and raise its productivity, poverty will be reduced. And because of the strong local multipliers of agriculture, poverty in the area will be reduced. At some point in the process, poverty will be eradicated, but agricultural labor productivity will continue to rise to levels comparable to other sectors in the economy, to reduce the agricultural income gap. At this point, the correlation between agriculture and poverty turns negative: structural transformation is completed and successful. This has happened in about half of the countries in the EU. These countries saw significant migration from rural to urban areas, but at the same time agricultural labor productivity increased, so that those who remained could benefit from better, more remunerative, jobs in agriculture. In these countries, agriculture today is no longer associated with poverty, has modernized and is a source of growth and good jobs.

Incomplete transformers still show a link between agriculture and poverty. Here, the process has not yet completed. Local poverty is associated with agriculture. The agricultural sector, for various reasons, has not (yet) transformed itself into the fully modernized sector of a successful transformer. An incomplete transformer can simply be a country which is in the first phase of the transformation process. However, it can also be a country which is in some way "stuck". Or it can point to strong dualism within the agricultural sector between successful and less successful farming.

This report uses the link between agriculture and poverty to define where it finds itself in the structural transformation process. If successful, the correlation between agriculture and poverty should be negative. If still incomplete, the correlation should be positive. The agriculture and poverty indicators used at the sub-national level are the share of the area devoted to agriculture and the poverty rate in the area. The intensity of this correlation is then used to place the countries along the X-axis in Figure 1 below. Countries to the left of the origin are successful, and countries to the right are incomplete structural transformers. In both directions, there is a mix of Older Member States (OMS) and Newer Member States (NMS).

Figure 1. Country plot of the association between poverty rate, agriculture, and CAP payments



Note: CAP data for the program period 2008–2013

What has been the role of the Common Agricultural Policy (CAP) in this process? Did the CAP reduce poverty and support better jobs? This report uses new and more detailed data on the key economic variables and the CAP payments. These were merged into two unique EU-wide panel data sets. Controlling for a range of other variables, we estimate the dynamic associations between the CAP and the variables of interest. However, we cannot say that the CAP "causes" the changes in these variables, in the absence of randomized controlled or natural policy experiments. This is why we consistently refer to "associations" and "correlations".

Improvements in agricultural productivity and employment go hand in hand, supported by the CAP. Agricultural productivity, defined as growth in agricultural value added per worker, is positively associated with the CAP, particularly in the NMS. The decoupled payments of Pillar I and the Pillar II payments have a positive impact on agricultural productivity growth, but not the coupled payments. The hypothesis is that because farmers no longer received subsidies coupled to the production of low value-added crops, they switched to higher value added crops. This hypothesis is further supported by the fact that decoupled payments are also associated with a reduction in the outflow of labor: higher productivity sustains better jobs in agriculture. This report therefore argues that there may not be a trade-off between agricultural employment and supporting increases in agricultural productivity. The CAP seems to be effective in increasing farmers' investments in productivity by reducing farmers' incomes exposure to risk and relieving certain credit constraints. This should matter most in the NMS — a hypothesis supported by the data.

The CAP reaches the poorer regions within the EU member states. The Y-axis in Figure 1 above shows the relation between where CAP payments go and poverty. Above the origin, CAP payments and poverty have a positive correlation. Below the origin, the correlation turns negative. If a country is in the beginning of the process, and agriculture is very much associated with poverty, the CAP support, to be effective, should target the areas where agriculture and poverty combine.

In this way, the CAP support could help increase of agricultural productivity, which would ultimately result in the eradication of poverty and increases in farmer incomes to the levels of other sectors.

Overall, countries seem to target CAP support reasonably well, given where they are in the process of structural transformation. In the Figure 1, the intensity of the relation between poverty and agriculture on the X-axis is plotted against the degree of association between poverty the CAP payments on the Y-axis. The 45-degree line represents consistency between where the CAP payments reach and the particular phase of structural transformation. As incomes increase and structural transformation progresses, countries should move from the upper right quadrant to the lower left quadrant, ideally following a line with a 45-degree angle, if the CAP and the transformation process are aligned. Countries in the lower right quadrant show a certain inconsistency: poverty and agriculture are correlated, but the CAP funds go instead to areas which are relatively less poor. Similarly, countries in the upper left quadrant could review the coherence of their policy: poverty and agriculture are no longer correlated, but CAP funds target poorer areas. Most countries find themselves close to the 45-degree line. However, in a few countries, agriculture is still associated with poverty, but the CAP support reaches areas which are, relatively for that country, not so poor.

The CAP is associated with poverty reduction and a decrease in inequality at the regional (subnational) levels. The channel through which poverty could have fallen in relation to the CAP would be through the creation of better jobs in agriculture for the workers who remained behind in agriculture. This hypothesis is supported by the combined results of the statistical analysis on productivity, jobs and poverty.

However, the CAP components, in particular the Pillar I decoupled and Pillar II payments, show a different link to poverty reduction over time:

i. For the successful structural transformers, Pillar II is the only payment associated with regions in which poverty declined.
ii. For the incomplete transformers, both Pillar I decoupled as well as Pillar II payments are associated with regions which achieve higher poverty reduction.
iii. However, in the incomplete transformers, the magnitude of the correlation for Pillar II is considerably lower than in the successful transformers, pointing to the need to improve the basic conditions which would improve the returns on the investments made.

Policy implications for the incomplete transformers:

i. To make Pillar I support more effective, continue the shift from coupled to decoupled payments, while targeting these to the relatively poorer agricultural areas. This reduces income risk and thereby supports farmers' own investments by making them less dependent on the vagaries of the weather and the market.
ii. To make Pillar II support more effective, improve the probability of higher returns of the Pillar II investments by a better sequencing of basic public service provision and the individual investment projects. This implies more effective coordination between programs targeting other sectors, both at the EU and the member state levels.
iii. In the NMS, policy priority should be given to getting the basic conditions right for agriculture to thrive (roads, social services, markets, extension services, and support to farmers' organizations). The Pillar I payments should be decoupled and targeted towards the poorer areas to incentivize agricultural investment. Care should be taken that the Pillar II support is accompanied by improvements in the basic conditions, in order to improve the return on these investments.

iv. In the OMS, it seems likely that the infrastructure and social sector conditions are already in place, but that the institutional links between stakeholders (farmers, agri-business, educational institutions, including for advisory services) need strengthening. This could be most effectively supported by the Pillar II payments. The Pillar I payments should be of lesser importance here than in the NMS. Based on the statistical evidence in this report, the rationale for coupled payments is weak.

Policy implications for the successful transformers:

i. Continue to shift from coupled payments to decoupled payments (in Pillar I) and to rural development (in Pillar II) to support agricultural productivity and employment, in support of the continued sustainable modernization of agriculture.
ii. In the NMS, decoupled Pillar I payments would provide income-smoothing support for poor or emerging farmers to enable increased on-farm investment. However, these payments should no longer be necessary for the more successful farmers. A shift of support to Pillar II would be important to further increase investments, both on and off-farm.
iii. In the OMS, Pillar I decoupled payments seem unnecessary, given already high income levels. However, Pillar II support can provide important investments, both of a private and a collective nature.

Box 2. "Capping the CAP"

"Capping the CAP" by making the Pillar I decoupled area-based payments regressive and agreeing on appropriate levels and thresholds by country makes sense from an equity perspective. Since the decoupled payments are based on area used, they, ceteris paribus, drive up land prices.[5] Strongly increasing land prices, without a clear link to investments in land, also attract investors more interested in the prospect of capital gains than in farming. High land prices make it more difficult for young farmers and poorer segments of the population to get access to land, and it makes farm expansion and consolidation more difficult for efficient farmers seeking to expand. There is a case to be made to reduce this impact by agreeing on "capping the CAP" and making the payments regressive. This would allow, on the one hand, small farmers to benefit from the area-based payments as a buffer against shocks and distress sales, while the price of their farm would not go down. On the other hand, larger, successful farmers would find it easier to expand as they would face less competition from speculators for land. However, more analysis, using more recent data, is needed to substantiate the exact impact of capping the CAP on land prices and on different farms' access to land. And much will depend on how exactly the capping of the CAP would be implemented to ensure that both equity and efficiency goals are achieved. There are also likely to be important differences among regions and member states as the farms affected by capping are regionally concentrated in the EU.

Finally, CAP objectives should be more clearly defined in terms of results targeted. CAP regulations can be confusing, difficult to access or hard to understand. And there is often a bias towards measuring inputs, rather than results. More clearly defining the objectives is a prerequisite for a more results-based CAP. These results would include a better "greening" of the CAP. In this regard, the potential of new digital technologies to simplify the process of collecting, inputting and analyzing information with respect to actual results achieved on the ground is substantial,

[5] The most recent estimates suggest that in NMS, an additional one Euro of area-based payments increases land rental rates by 70 cents: the capitalization rate is over 70 percent. On average, across the EU, decoupled payments are capitalized at a rate of 47 percent. An estimated 25 percent of payments benefit non-farming landowners and investors, instead of the farmers they are supposed to benefit.

but remains largely untapped. Enhanced efforts by Eurostat and the EU Member States to increase the availability and frequency of comparable agriculture and social indicators at the more granular sub-national levels would simplify such future monitoring of the CAP results. The task at hand is to combine the CAP's monitoring system, continuous remote sensing data to track land use and other agro-environmental variables, and the key social-economic variables at the NUTS3[6] or below. This may also require creating the legal framework for the use of these data, which sometimes implies "re-purposing" data use: using data created for one purpose for another one.

In conclusion, the CAP reaches far and wide, and can be a powerful instrument of structural transformation. Around 40 million transactions are financed, and monitored, every year. And even though some countries set certain thresholds to farm size, below which households are not eligible for payments, in most member states most farmers participate in the program. The sheer reach of the program means that even marginal improvements will have far-reaching effects on shared prosperity and poverty reduction in the EU. Supported by the CAP, the successful transformers have turned agriculture into a key sector for good jobs in rural areas. And the incomplete transformers can use a well-targeted and coordinated CAP to reduce poverty and start creating better jobs for farmers. The statistical analysis conducted for this report did not find a trade-off between agricultural employment and supporting increases in agricultural productivity. As labor moved out of agriculture, the CAP supported the creation of reasonably remunerative jobs for the workers who remained behind in agriculture, while poverty in agricultural areas was reduced. It is in this sense that agriculture and the CAP mattered for inclusive growth in the EU. Further reform, along the lines outlined above, is likely to increase this impact even more.

[6] The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU for the purpose of the collection, development and harmonization of European regional statistics. Three levels exist: NUTS 1: major socio-economic regions, with a population between 3 and 7 million; NUTS 2: basic regions for the application of regional policies (population between 800,000 and 3 million); and NUTS 3: small regions for specific diagnoses (between 150,000 and 300,000).

Introduction

This report assesses the impact of the Common Agricultural Policy (CAP) on inclusive growth — past and present. The CAP constitutes nearly 40 percent of the EU budget — it is its biggest budget item. Its central aim is to increase the individual earnings of persons engaged in agriculture. What has been the impact of the CAP on inclusive growth? On increasing productivity, creating more and better jobs; and reducing poverty and inequality? What lessons can we draw from the past to inform the future of the CAP? Are there differences between regions in the EU? What has been the impact of the CAP in the "older" Member States — the OMS or the EU-15?[7] What has been its impact on the "newer" Member States — the NMS or the EU-13?[8]

Why now? In 2017, the mid-term review of the last CAP reform 2013 is being carried out. The review will influence the strategic thinking for a post-2020 CAP. Going forward, the CAP's goal should be to encourage a vibrant rural economy to maximize its contribution to the EU's jobs and growth agenda.[9, 10] In this context, the EC conducted consultations with the public and private stakeholders. This report is part of these consultations. The EC's final recommendations from the mid-term CAP review will be presented by the end of 2017.

The main methodology used for the analysis in the special section is based on two new and unique panel data sets prepared for this report, compiled from five EU-wide data sets. They are complemented by inputs from four background country studies (Romania, Croatia, Bulgaria and Poland), a literature review[11] and results of earlier work undertaken by the World Bank.[12]

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[7] The OMS/EU-15 are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

[8] The NMS/EU-13 are the countries that joined since 2004: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia.

[9] Alan Mathews: "The CAP and agricultural employment", 2017.
http://capreform.eu/the-cap-and-agricultural-employment/

[10] The CAP is also urged to maximize its contribution to the Sustainable Development Goals and the Paris Agreement on Climate Change. And the CAP has the secondary objective to promote social inclusion, poverty reduction and economic development, by facilitating job creation, promoting local development and improving access to information and communication technologies.
http://www.europarl.europa.eu/atyourservice/en/displayFtu.html?ftuId=FTU_5.2.6.html

[11] This includes the results of earlier reviews, such as the 2016 review done for the Directorate-General for Internal Policies of the European Parliament on "The role of the EU's Common Agricultural Policy in creating rural jobs." (European Commission, 2016); and the most recent overall assessment of the territorial distribution of CAP expenditures and trends in rural employment, growth and innovation from 2010 (European Commission, 2010). The latter used a combination of trend analysis, an analysis of 13 rural clusters, and 15 regional case studies. The study mapped the allocation of CAP funding by pillar to the various regions (and sub-regions).

[12] These include: Romania: "Medium- and long-term Vision for the ARD sector" (2014), "Functional Review" (2012) and "PER" (2009); Bulgaria: "Hydro-melioration Strategy" (2015), "SCD" inputs (2015) and "PER" (2008); Croatia: Pre-accession TA on Rural Development (2014); Cyprus: "Functional Review" (2014) for the ROC, and "Agriculture Policy Note", "Functional Review" and "PER" (all 2016) for the TCC; Latvia: PER; Slovakia: PER; and Poland: SCD.

Agriculture matters for shared prosperity

Agriculture functioned as a shock absorber during the 2008 crisis. Of the sectors, agricultural growth was least affected by the crisis. In several countries, there was a temporary decline in the secular outflow of labor from agriculture. This was apparent even in high-income countries like Greece. Overall, agricultural incomes are now 33 percent higher than in the crisis year. However, agricultural incomes in the NMS recovered much faster than in the OMS after the crisis: from 2005 to 2015, agricultural incomes in the NMS rose by 70 percent, as compared to 6 percent in the OMS.[13] In this way, the agriculture sector fulfilled the role of shock absorber, in particular in the NMS, where social protection institutions are less developed. And while the share of agriculture in GDP is declining, as it should if structural transformation is successful, agriculture matters for jobs. Agricultural production in the EU still provides work to about one tenth, while the wider food sector provides work for about one fifth of the workforce.[14] So agriculture matters much more than just as a shock absorber in lieu of social protection. Agriculture matters for shared prosperity.

As Part of a Successful Structural Transformation

Agriculture can boost inclusive growth and shared prosperity. How does agricultural growth do this? In countries where most farms are owner-operated family farms and most labor is family labor, the increase in the value of agricultural production is often largely appropriated by the farming family. In this way, if there is growth in agriculture, it directly raises farming families' incomes. And since at the beginning of the process known as "structural transformation" (explained below) the majority of these households is usually in the bottom 40 percent of the population in terms of income, this boosts shared prosperity through a direct channel. This boost in income allows the family to invest in its health and education, and in the farm.

Agricultural growth can have strong local ripple effects. Agricultural growth can also indirectly boost shared prosperity. It can increase non-farm profits and labor incomes via relatively high production multipliers.[15] And local consumption multipliers of agriculture incomes are even larger than production linkages: this is because family farmers typically spend a large share of their income locally, spurring local business growth. In this way, agricultural growth is often able to

[13] European Commission, 2016.

[14] European Commission, 2016.

[15] The combined impact of agricultural production and consumption multipliers is often much larger than assumed given the usually small share in overall production (Haggblade, Hazel, and Brown 1989). Unfortunately, we are not aware of more recent estimates.

raise the incomes of rural, not just agricultural, households**.** Finally, agricultural growth also has important economy-wide effects by causing lower prices of non-tradable foods, which makes the consumption basket of low-income families cheaper. This could reduce the pressure for higher nominal wages, which is important for the competitiveness of non-agricultural sectors. When all these elements combine, agricultural growth can be a powerful reducer of poverty and boost inclusive growth.[16]

Agricultural growth also plays a key role in a successful structural transformation, even in relatively advanced economies. The key challenge is to establish a positive interplay between agriculture and other sectors. A stylized story of structural transformation would involve a productive and labor-intensive agricultural sector that reduces poverty, a fast-growing manufacturing sector that absorbs excess labor from agriculture and uses new skills and technology, and a services sector that provides good jobs when rising wages start to make labor-intensive manufacturing uncompetitive. The beginning would involve urban manufacturing growth which leads to higher wages that trigger labor migration from rural agricultural areas to urban areas. The resulting urban population growth makes food prices rise, making agriculture more profitable for the remaining rural workers. Higher farm profits then lead to increased farm and non-farm investments, which makes agricultural productivity grow, and, given the strong multiplier and linkage effects of agricultural growth, rural investments lead to improvements in rural livelihoods. The combined effect is an optimal allocation of resources across sectors, resulting in sustained overall growth and the reduction of poverty everywhere, including in agriculture. Note that in this transformation process, the sectors that grow the fastest (manufacturing first and later services) are not the sectors that reduce poverty: agriculture does, at least in the first phase.

It is difficult to get this process right — there are no shortcuts. Successful transformation hinges on rural incomes continuing to rise, so that the more enterprising households or household members can acquire the necessary basic education to make the transition to non-farm sectors, particularly urban manufacturing, while those that stay behind can invest in their farms and raise agricultural productivity in response to higher prices, ultimately fully modernizing their operations. Simultaneously, manufacturing needs to serve as a major source of growth, generating employment, but also skills and industrial capacity, and to sustain aggregate demand. Appropriately managing the political economy of the transformation process also matters, avoiding inefficient policy responses to the initially widening and politically sensitive gap between the rural and urban sector, such as untargeted agricultural subsidies or supporting uncompetitive practices. This can result in rent-seeking, which undermines long-term productivity growth. Finally, for labor to move from agriculture to, say, manufacturing, different skills are needed — households need to acquire them and this is neither automatic nor easy. A thriving agricultural sector will provide households with the financial resources to invest in the acquisition of these skills. These factors explain why it is so difficult to find shortcuts to the start of the process of structural transformation by "skipping" agriculture.[17]

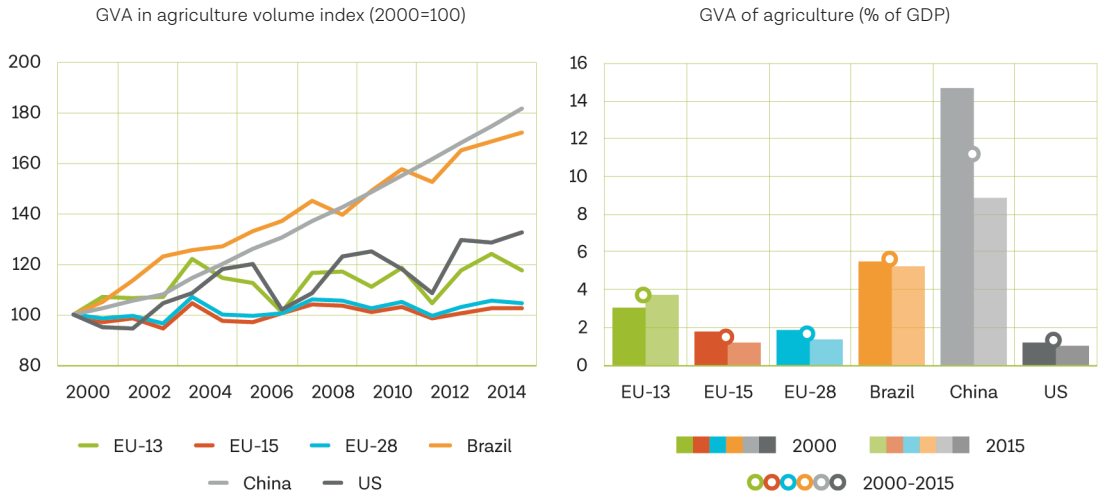
Where is the EU's agriculture on structural transformation? First, the share of agriculture in the EU's GDP is decreasing, as the economy shifts towards faster-growing sectors such as manufacturing and services, but it remains slightly above that of the US. However, compared to other major

[16] World Development Report (2008); Hazell (2010); De Janvry and Sadoulet (2010).

[17] This stylized narrative is based on a vast literature, including Lipton and Ravallion (1993); Timmer and Akkus (2008), Timmer (2010), and Lin (2012).

agricultural producers, such as China, the US and Brazil, overall agricultural growth in the EU has been stagnating. There are significant intra-EU differences: reflecting a lag in the transformation process, the NMS's agricultural share of GDP is twice as high as that of the OMS's (Figure 2). However, the agricultural sectors of the NMS have been growing faster than those of the OMS. Overall, the EU conforms to the stylized story of successful structural transformation.

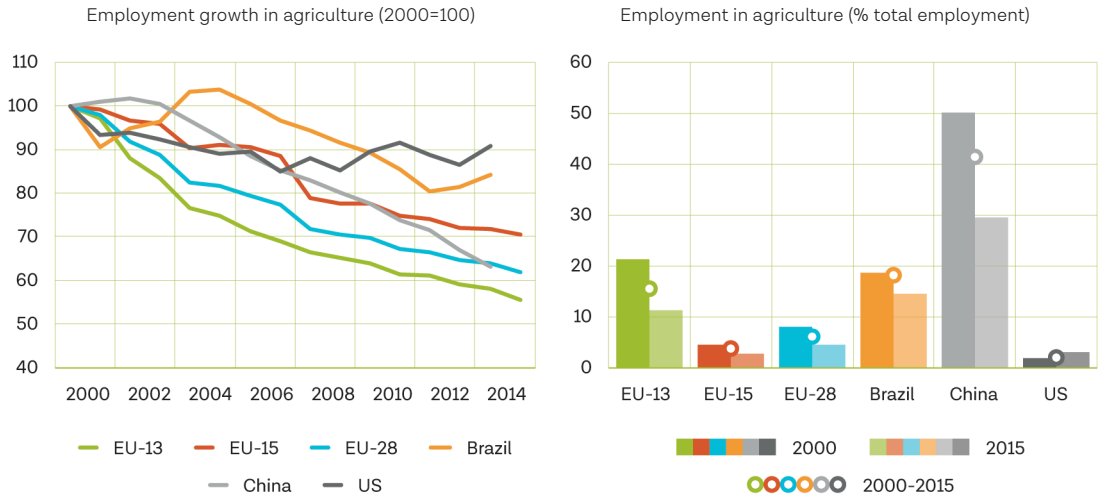
Figure 2. Agricultural sector growth and share in GDP across the world



Source: Eurostat, WDI and staff calculations

How is employment in EU agriculture doing? Employment in agriculture in the EU has been declining faster than for other major agricultural producers. Nonetheless, in the EU agricultural employment as a share of total employment is higher than in the US. As expected, while agricultural employment is lower in OMS compared to NMS, agricultural employment in NMS is declining at a higher pace than in OMS (Figure 3). Again, structural transformation in the EU is following a path consistent with the stylized story.

Figure 3. Employment in agriculture in the EU



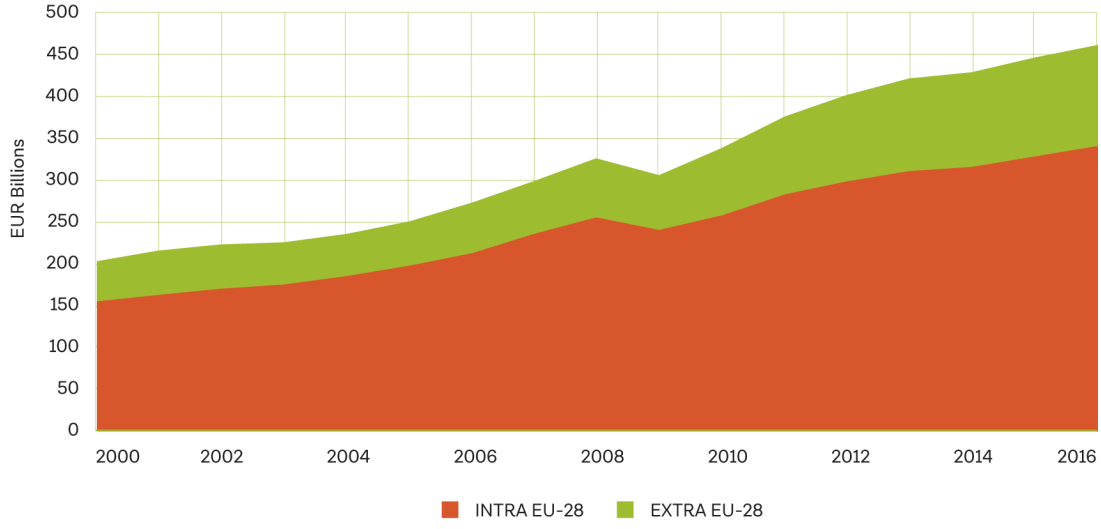
Source: Eurostat, ILO, WDI and staff calculations

Agriculture matters for trade: the EU is the world's largest importer and exporter of agri-food. The agri-food sector represents 7.5 percent of goods exports and 6.6 percent of exports. The EU's agricultural exports are fourth in importance after machinery, chemical products and pharmaceuticals. The EU is the world's largest importer of agricultural and food products, followed by the United States and China. Given the preferential trade agreements in place with more than 50 countries, including important producers such as Central American countries, South Africa, Chile, Colombia, Peru, and Mexico, trade of agricultural and food products from these countries to the EU more than doubled in the last fifteen years.

The EU's internal market is booming. Trade within the EU is significantly more important for the Member States than external trade, with around three quarters of all agricultural exports going to other EU Member States (Figure 4). And between 2000 and 2016, exports among EU Member more than doubled, reaching EUR 350 billion. The NMS conduct around a fifth of this trade.

Figure 4. Significance of agricultural trade for the EU's external trade

Exports of Agri-food products



Source: Eurostat, staff calculation

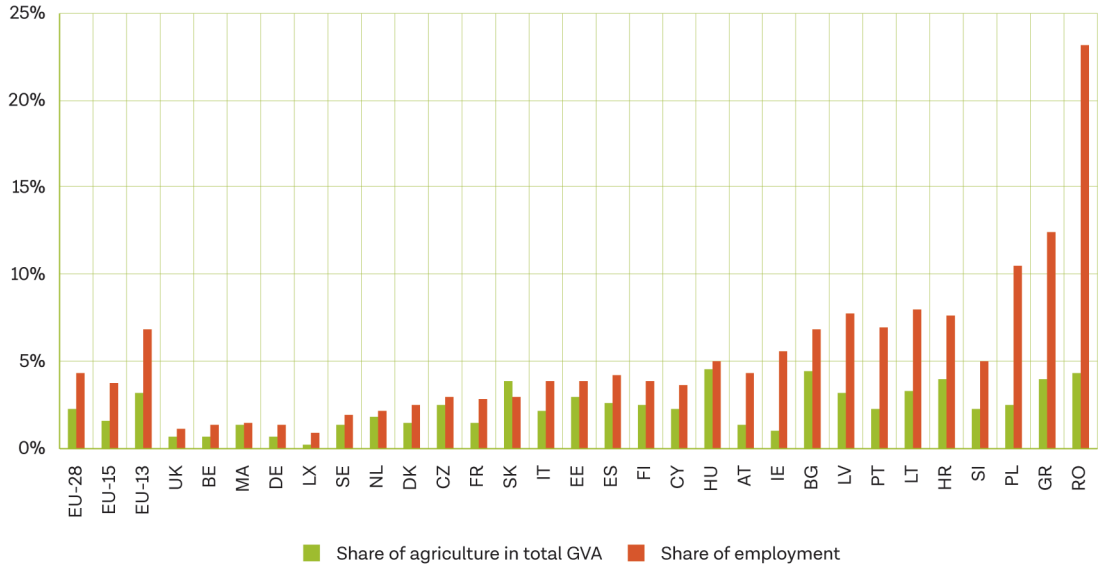
Agriculture matters for jobs. While the agricultural sector, narrowly defined to include primary production, accounts for only 1.4 percent of GDP, it provides a significant share of the workforce with work. About one tenth of the EU workforce works regularly on farms, even if not full-time. Most of the jobs in agriculture represent the livelihoods of family farmers — by far the majority of agricultural producers in the EU.

In 2010, 97 percent of all holdings were family farms, while only 16 percent of total agricultural labor was performed by non-family workers.[18] More than two-thirds of all farms are less than 5 ha (about seven soccer fields) and provide the bulk of the livelihoods in agriculture. Many of the jobs on these family farms are not full-time jobs. But the actual time spent working on the farm by the

[18] European Commission, 2013.

family farmers themselves, the other family members working on the farm, full-time commercial farmers, permanent workers and temporary workers can be converted into their full-time equivalents. Added up in this way, agricultural production provides around 9 million full-time equivalent jobs or 4 percent of total EU employment[19]. And in the NMS this rises to around 7 percent. Romania, tops the agricultural employment share at over 28 percent in 2016 (Figure 5). If we do not convert the time spent into full-time equivalents, but count everybody who regularly works on the around 11 million farms in the EU, we come to 22 to 25 million people or 10 to 11 percent of total EU employment (Farm Structure Survey, 2013).

Figure 5. GVA and labor force employed in agriculture by member state (EU-28)



Source: Eurostat, June 2017

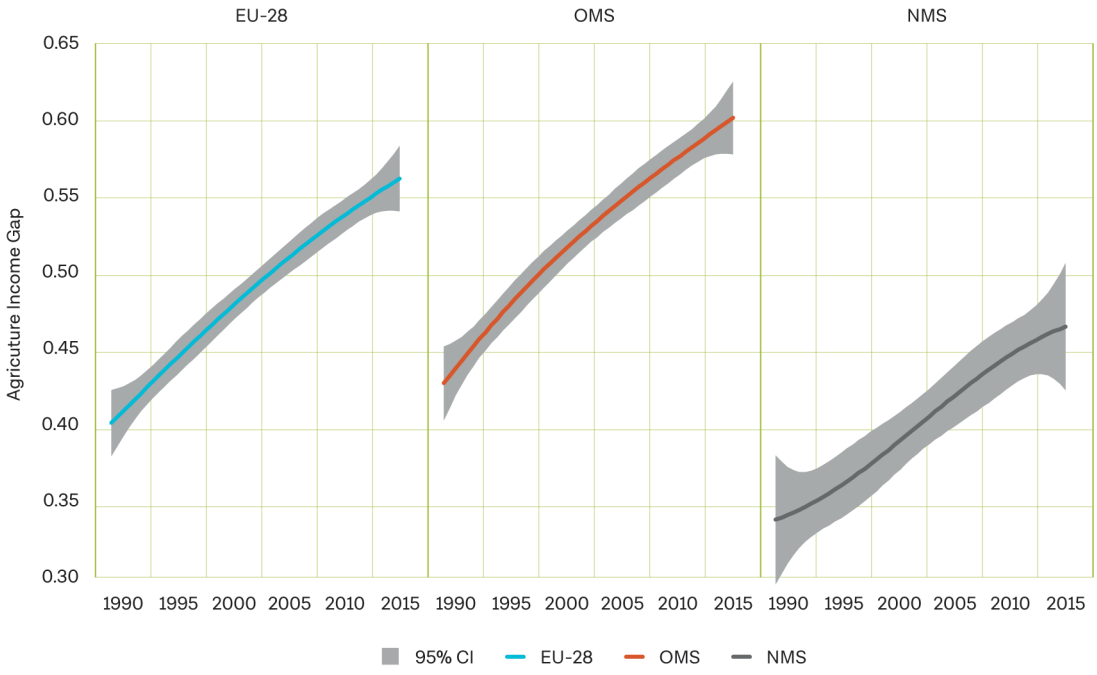
The wider food sector provides work for a substantial share of the workforce: about one fifth. If we include the jobs indirectly created by the typically high multipliers of agriculture, the sector becomes even more important for employment. If we widen the net to include food processing, food retail and food services and include the more than 15 million businesses involved, the sector's contribution to GDP quadruples to 6 percent. This broader sector provides work to almost 44 million persons, which is about a fifth of the EU workforce[20]. And if we would add the consumption multipliers, the total number of jobs linked to agriculture in the EU, directly and indirectly, is even more substantial.

[19] Measuring employment in agriculture is different than in most other sectors. Labor inputs are mostly family members, who work at different intensities and time periods during the year. The definition of jobs therefore needs to capture the time and effort that members of the household contribute to farm activities, even if it is part time. These contributions need to be included in the jobs count. In addition, temporary workers will be hired during peak seasons. All these inputs need to be consistently measured, added up and converted into full-time equivalents for the year. The 4 percent number given here is consistent with the separate estimates coming from the Economic Accounts for Agriculture, the Farm Structure Survey, and the Labor Survey.

[20] European Parliament resolution of 27 October 2016.

Agriculture matters to reduce the gap between agriculture and non-agriculture incomes. This agricultural income gap, if measured as the ratio between agricultural value added per-worker to non-agricultural value added per-worker, was about 50 percent in the EU28. Fortunately, over the 1990–2015 period, the growth rate of agricultural income outpaced the growth of the non-agricultural income. As a result, the income gap shrank substantially in both OMS and NMS, as shown in Figure 6. The assumption that growth in value added per-worker in agriculture translates into overall agricultural income growth seems reasonable.[21] Most farming is family farming using mainly family labor, which should be able to appropriate most of the growth in value added, ceteris paribus. And independently collected household panel data on incomes confirm the same trend: agricultural income growth is converging faster than non-agricultural income growth (Table 1). This suggest that, on average, the agricultural income gap and possibly even the rural-urban income gap, is declining. However, the agricultural sectors in the OMS are catching up faster with the non-agricultural income level than those in the NMS. While the smaller gap in the OMS points to a successful process of structural transformation, the lagging pace in the NMS points to the need to accelerate improvements in the basic conditions which support agricul-

Figure 6. The agricultural income gap with non-agriculture is closing



Notes: The figures show the evolution of the (smoothed) average agricultural income gap measured as the ratio between agricultural value added per worker and non-agricultural value added per worker.
The 95% confidence interval (computed using Stata's command for local polynomial smooth plots with confidence interval).

Source: Eurostat and Cambridge Econometrics

[21] However, the typical agricultural household is "pluri-active" and obtains income from a variety of sources. This is an important risk-reduction strategy, observed all over the world. But there is currently no working system for agricultural household income statistics in the EU (Directorate-General for Internal Policies, 2015) and existing laws of confidentiality make it difficult to identify respondents within the existing survey systems, such as the EU-SILC.

ture. These trends need to be confirmed by better empirical estimates, however, because the data on farm and non-farm average income are notoriously incomplete, and the definitions may vary by country.[22]

Table 1. Speed of convergence for different incomes between OMS and NMS

		OLS			LSDV		
		EU27	**OMS**	**NMS**	**EU27**	**OMS**	**NMS**
Mean total household income	Speed of Convergence, β	0.04%	0.00%	0.05%	0.21%	0.21%	0.24%
	Half-life of convergence	1863	175913	1340	334	338	290
Mean agricultural income	Speed of Convergence, β	0.13%	0.13%	0.08%	0.72%	0.76%	0.65%
	Half-life of convergence	550	525	903	97	91	107

Notes: (1) Speed of Convergence is calculated using the coefficients of respective variables of interests; (2) Half-life of convergence is calculated as 0.6931/speed of convergence; (3) OLS columns report results using OLS regressions, while LSDV columns results using fixed effect models; (4) OMS are 14 old member states, while NMS are 13 new member states that joined the EU after 2004; (5) Data Source: EU-SILC, Eurostat (2005–2014)

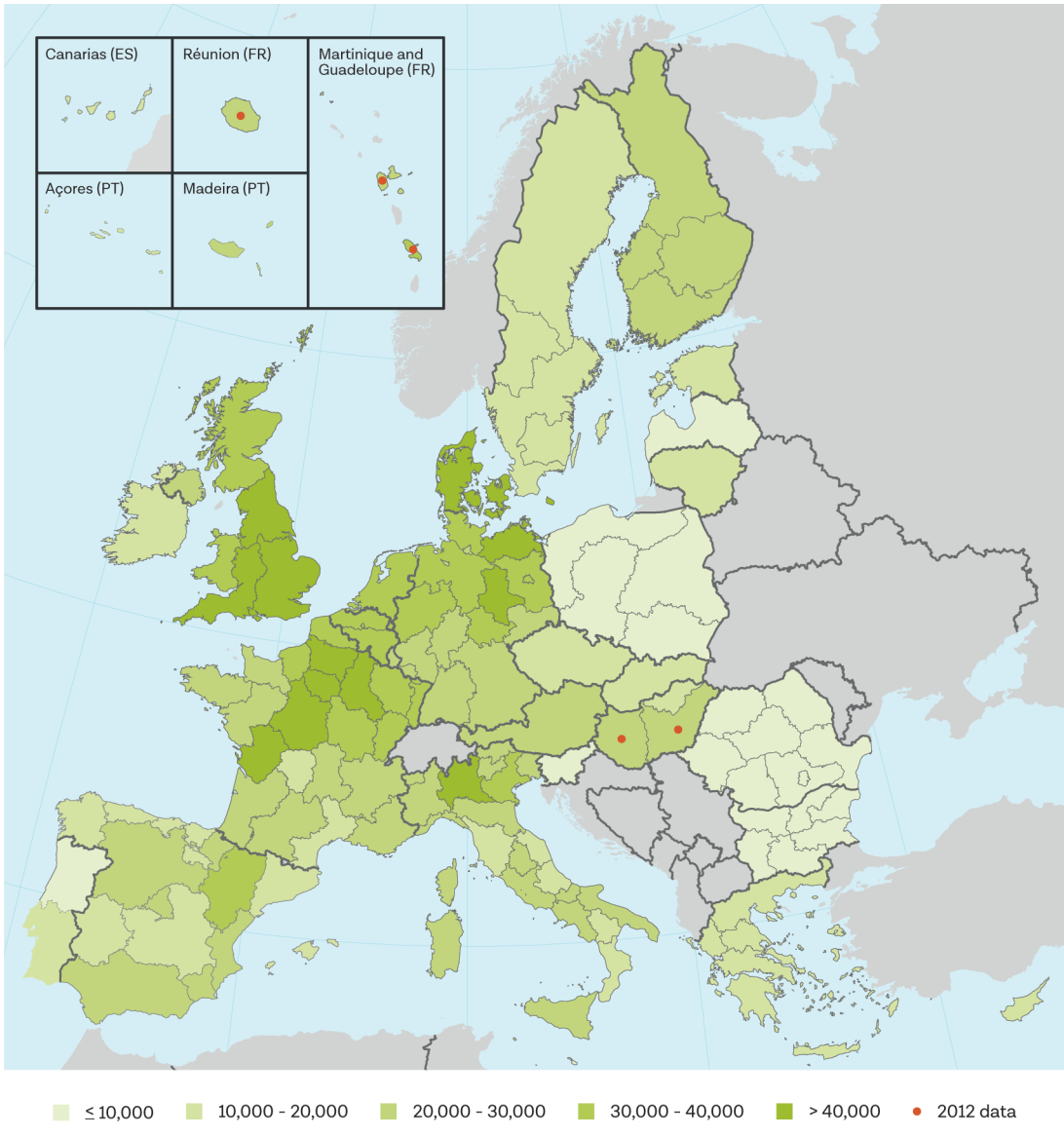
Agriculture matters to reduce the differences in farm incomes between Member States. These differences are large. While farm incomes are notoriously difficult to measure, the estimated differences are too large to ascribe to measurement error.[23, 24] North-Western Europe has significantly higher farm incomes than Eastern Europe. In Denmark, the Netherlands and Sweden earnings average more than €15 per hour, while in Bulgaria, Greece, Latvia, Lithuania, Poland and Romania the average is €3 or less (Figure 7). As a result, farm workers migrate, often only for the season, from low to high wage regions. For instance, Romanians work on farms in Italy, Bulgarian workers help out in Portugal, while Portuguese farm workers in turn go to France. In addition, seasonal workers from outside the EU contribute labor on a temporary basis, say, for three month periods.

[22] See Hill (2012).

[23] A recent report by the EU's Court of Auditors concludes that "No representative data are available on the disposable income of farm households, which would facilitate assessing the achievement of the treaty objective of ensuring a fair standard of living for farmers. Furthermore, there is no reliable system to allow comparisons to be made between agricultural incomes and those in other sectors of the economy, which could justify EU income support for farmers."

[24] From the Court of Auditors: "The FADN is designed to estimate the income of commercial agricultural holdings as a business unit, whose production value, measured in standard output, exceeds a certain threshold of what is considered to cover the largest possible share of agricultural output, agricultural area and agricultural labor of those holdings run with a market orientation. Currently, national liaison agencies (public or private bodies) collect data from more than 80,000 agricultural holdings across all Member States. Participation in the survey is voluntary. A holding is not identical to a farm household and it is possible that one farmer manages several agricultural holdings."

Figure 7. Farm Family Income (FFI) in euro per Family Work Unit (FWU)



Source: Eurostat

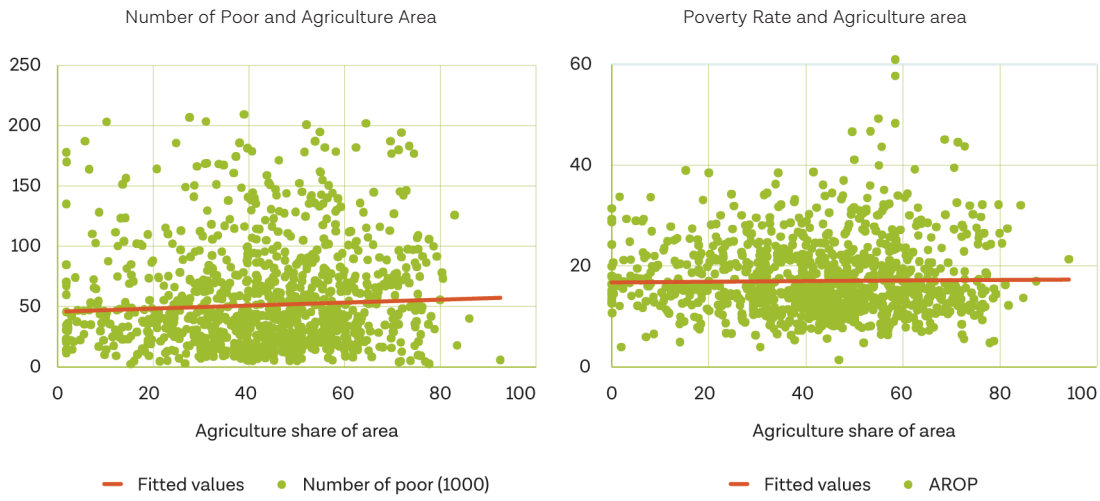
These differences are shrinking. Agricultural value added per worker is converging across the EU. This report finds that convergence within agriculture is indeed happening: regions with a lower level of agricultural value added per worker, on average, grew faster than other regions. The results show the presence of absolute convergence in the EU28 regions. And on average, the NMS (EU13) are converging at a faster rate than the OMS (EU15) regions, while disparities are shrinking (Annex 5).

Growth, employment and income trends suggest that the process of structural transformation in the EU is on track, on average. The share of agriculture in GDP is declining, while the gap with the other sectors is closing and agricultural incomes are converging. However, the gap with other

sectors is closing faster in the OMS, while within agriculture EU-wide, agricultural incomes are catching up faster in the NMS.

But what is the relation between agriculture and poverty in regions in Member States? Is poverty being reduced, as structural transformation progresses? For instance, is the stylized story that simply links agriculture to poverty true? Are the regions which have large areas are devoted to farming poor? Figure 8 shows the simple correlation between agriculture and poverty. It turns out that there is no correlation. How can this be? This report argues that whether agriculture is linked to poverty depends on the particular phase or the quality of the structural transformation process.

Figure 8. Share of agriculture area and regional poverty are not correlated



Note: (1) Data source: EU 2011 Poverty Map (DG-REGIO and World Bank) and 2010 Farm Structure Survey; (2) The graph on the left (Number of poor and agriculture share of area) is zoomed to below 95th percentile of number of poor in the database

In the early phase of structural transformation, agriculture is significantly less productive than other sectors of the economy in the country. The relative poverty rate of the areas dominated by agriculture will be high. Farming is extensive, not very profitable and the jobs created are not good. Consequently, larger farms in these areas are not associated with lower poverty in these areas. However, during the process of transformation, broad-based agricultural growth lifts the incomes of farming households and, through the strong local area multipliers, reduces poverty area-wide. After a successful transformation, agriculture is relatively productive and provides good jobs: within the country, the agricultural areas are no longer the poorest. The basic conditions for farming are good and many farmers are looking to expand their farms in order to increase their incomes.

Ranking of Member States. Table 2 ranks the EU's Member States along these two indicators (share of agriculture in the region's area and average size of the holdings in the region). A positive sign suggests that an increase in the variable is associated with higher area poverty. Conversely, a negative sign suggests that the variables are associated with lower area poverty. This report uses the score on the first indicator to describe a country as "successful transformer" or "incomplete transformer".

Table 2. Association between area poverty rate and selected agriculture indicators[25]

Country	Agriculture share of area	Average holding size (hectare)
NMS 1	+	+
NMS 2	+	+
OMS 1	+	+
NMS 3	+	+
OMS 2	+	+
NMS 4	+	+
NMS 5	+	–
OMS 3	+	–
NMS 6	+	0
OMS 4	+	–
OMS 5	+	–
OMS 6	+	–
OMS 7	–	–
OMS 8	–	–
OMS 9	–	–
OMS 10	–	–
OMS 11	–	–
NMS 7	–	–
OMS 12	–	–
OMS 13	–	–
NMS 8	–	–
OMS 14	–	–
OMS 15	–	–
NMS 9	–	–

The Common Agricultural Policy

Does the CAP reduce poverty and create better jobs? The CAP aims "to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture."[26, 27] This aim is supported in three ways. First, by supporting viable food

[25] This analysis is based on how each agriculture indicator is correlated with spatial distribution poverty and the number of poor by each member state. The sign indicates the direction of a statistically significant association found between the poverty rate and the specific indicator referred to in each column, while controlling for factors such as population and GDP. A zero indicates that no significant association was found.

[26] Directorate-General for Internal Policies, 2015, p. 11.

[27] The CAP also aligns with Europe's 2020 strategy on smart, sustainable and inclusive growth: smart growth is about fostering knowledge, innovation, education and the digital society; sustainable growth is about making EU production greener and more resource efficient, while boosting competitiveness; and inclusive growth is about enhancing labor market participation, skills acquisition, and the fight against poverty.

production through income support for farmers. Second, by promoting sustainable management of agricultural land, including through boosting biodiversity and reducing greenhouse gas emissions. Third, by balanced territorial development focused on maintaining agriculture across the entire European Union, boosting employment and growth, and tackling poverty in rural areas. The 2013 CAP reform shifted the emphasis to agricultural income, in the context of the objective of viable food production, and ensuring a fair standard of living for farmers. The multiplicity of objectives has resulted in a program which reaches far and wide, and means many things to many people. However, this report only focuses on one aspect, the incomes and jobs objective. The report does not investigate any other aspects, neither does it attempt to assess the overall impact of the CAP.

The focus on jobs, in particular, is relatively recent: it was not an original objective of the CAP. Neither was the CAP set up as a poverty reduction program. In fact, several other EU programs target these "inclusive growth" objectives more explicitly. This report therefore also does not hold the CAP accountable for past trends on jobs and poverty. Rather, the assessment attempts to learn lessons from past trends to inform the reform agenda going forward.

The CAP's implementation differs country by country. The heterogeneity which exists — in local conditions and how and when the CAP is implemented — is both a blessing and a curse. On the one hand, these differences provide opportunities to learn. On the other, attribution and causality are difficult to establish, given the lack of uniformity and the absence of randomized controlled experiments. To interpret the correlation patterns, stakeholder and local knowledge is required. This report presents a first attempt at interpretation, to be validated further. The next subsection describes the CAP — its evolution and its basic design — the pillars and the policy.

Box 3. Evolution of the CAP

The Common Agricultural Policy (CAP) is the largest budget item in the EU budget, but largely substitutes for national spending on agriculture, unlike any other sector. At nearly 40 percent of the EU budget, it is the largest single line item and translates to about €50 billion a year, or a resource transfer of 0.4 percent of GDP in support of the agricultural sector.[28, 29, 30] While the budget share looks large, support for agriculture in the EU Member States is largely done through the CAP budget. In addition, national budgets are estimated to combine for another €18 billion per year through top-ups to the CAP and other support for agriculture. Other sectors, such as education, transport, defense, pensions and healthcare are either not included in the EU budget, or take a much smaller share, because they are paid for — fully or partially — out of national budgets.

Over time, the CAP moved away from price to income support for farmers across the EU. As one of the EU's oldest common policies, the CAP has been reformed several times during its 55-year existence. It shifted emphasis from food security in the 1960's, to market support in the 1970s and 1980s, and to income support in the 1990's, before moving to "greening" in the 2010s. Today's CAP has moved a long way from the "coupled" support (support targeting the production of a particular commodity), which produced the proverbial butter "mountains" and wine "lakes" in the 1980s and early 1990s to the "decoupled" support farmers receive today.[31] This shift explains to a large extent why, while the CAP spending amounts to about one-tenth of global agricultural subsidies, world market and EU prices have now mostly converged.

[28] In the EU's 2014–20 Multiannual Financial Framework, the CAP constitutes nearly 40 percent. In the 80's, the CAP constituted an even larger share: more than three quarters of the EU's total budget.

[29] Overall, the seven year 2014–20 financial framework is set at EUR1 trillion or around 1 percent of EU28 GNI.

[30] European Commission, 2015.

[31] Decoupled refers to the support not being based on how much is produced or intended to be produced.

Quality standards: barriers or catalysts? Some observers argue that the tariffs and coupled subsidies have in fact been replaced by the EU's high quality standards which function as non-tariff trade barriers. Others argue that the EU standards can also be catalysts to trade, once necessary investments are made. And while public agricultural and food standards tightened considerably over the past 15 years, private standards introduced by food processors and retailers in the EU are often more demanding and more requiring than public standards[32]. Most observers would agree that, driven by public and private standards, food safety in the EU is high by international standards, while arguing about the global costs and benefits of these standards.

The Twin Pillars of the CAP

The twin pillars of the CAP. The CAP budget consists of two pillars: direct payments and market support measures (Pillar I), comprising three-quarters of the budget, and the rural development policy (Pillar II), comprising one-quarter.

i. **Pillar I Direct payments:** annual, fully EU-funded payments to provide a basic income and help stabilize farm revenues by compensating for the risks farmers face, e.g. volatile market prices, unpredictable weather conditions and variable input costs. To benefit from these payments, farmers must respect rules and practices concerning environmental standards, animal welfare, food safety and traceability — this is known as "cross compliance".
ii. **Pillar II Rural development:** discrete EU co-financing for investment projects of farmers and agri-businesses in rural areas with economic, environmental or social objectives. This includes payments to farmers for land management practices which support the environment and climate change mitigation.

Pillar I: coupled and decoupled payments. Under Pillar I, payments linked to the production of a particular crop or keeping a particular type of livestock are referred to as "coupled". The direct "decoupled" payments are annual payments, based on how many hectares a farmer uses, not owns, and not on how much a farmer produces or intends to produce.[33] Most countries set a minimum farm size, below which a farm is not eligible for these subsidies. Some countries also set a maximum subsidy amount. The "basic" payments can be topped up if the land is, for instance, in remote areas with natural constraints or if the farmer is a young farmer. Direct payments made up an average of 46 percent of farm income in the EU between 2005 and 2013.[34] There has been a shift away from "coupled" towards "decoupled" payments and support for individual investment projects (Figure 9).

Pillar II: most of the payments for rural development are to finance private investments, including land management. A wide variety of projects can be supported: subsidies for on-farm and off-farm investments which benefit an individual farmer (e.g. for processing of farm products, infra-structural development of farm holdings, business start-up aid for young farmers and non-farm business operations in rural areas). Most of the subsidies go directly to individual farmers and rural

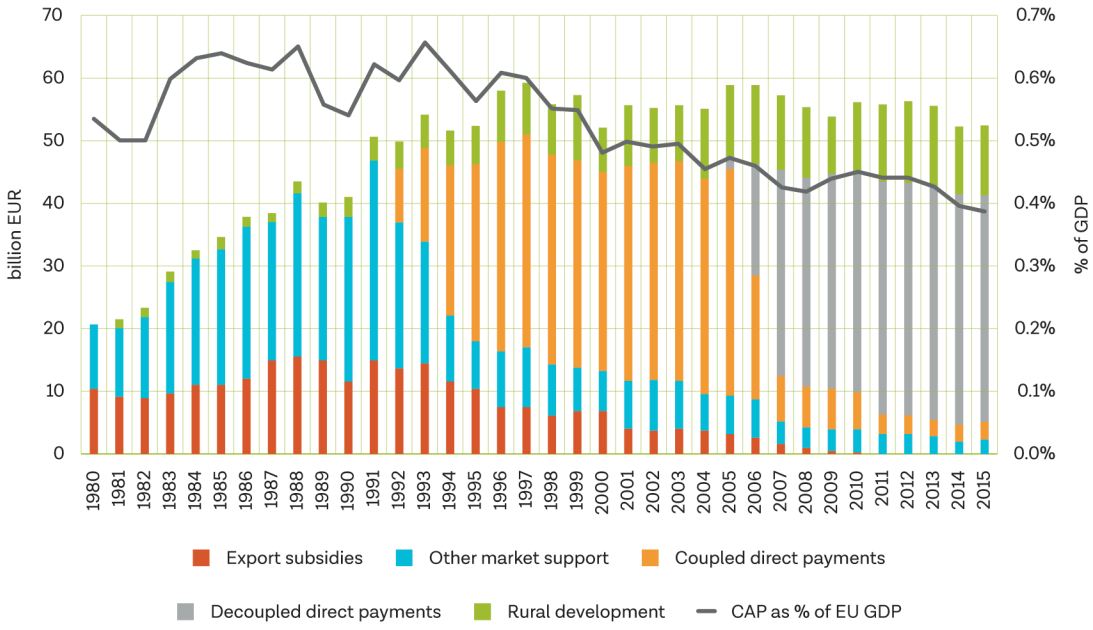
[32] Beghin et al 2015; Bureau and Swinnen, 2017.

[33] This description is a simplification. It is based on the Single Area Payment System in place in the NMS. In the OMS, the original system is based on entitlements, which are indirectly linked to area, as they must be activated by declaring an eligible hectare for each entitlement. This system is the BPS system, based on the former SFP system.

[34] EC (2015d).

businesses, and not to, say, groups of farmers. Member States can allocate subsidies for young farmers, small agricultural holdings, mountainous and other less-favored regions, short supply chains, women in rural areas, mitigating climate change and adapting to it, and biodiversity. Payments can be made as a lump sum, with the projects monitored over the investment horizon specified in the proposal, or in installments, depending on the phasing of the investment. The subsidy usually covers a percentage of the total project cost (e.g. 40, 50, or 60 percent), with the applicant financing the remainder. However, young farmers' projects, for instance, can be subsidized at even higher levels up to 90 percent. Pillar II payments are also used to encourage private investment into public goods, e.g. environmentally sound farming practices ("agri-environment-climate measures"), organic farming; areas facing natural or other specific constraints; and animal welfare payments.

Figure 9. CAP expenditures and policy reforms

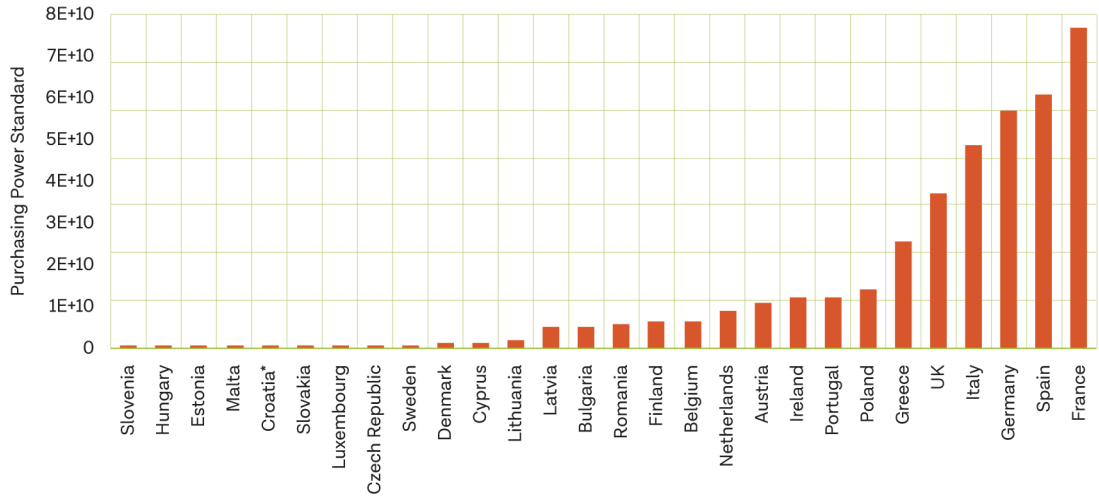


Source: EC, staff calculation

Level and composition of CAP payments varies across the EU. Total CAP payments differ widely by country (Figure 10). In addition, countries have some freedom over the allocation of these funds between Pillar I (direct payments) and Pillar II (rural development). Most countries and regions prefer to spend CAP funds on Pillar I. The majority of direct payments are area-based, and 30 percent are linked to farmers with land use that can be defined as "greening". Nevertheless, there is clear heterogeneity on allocations of CAP funds within and across countries (Figure 11).

Figure 10. Levels of CAP funds received by different member states are drastically different

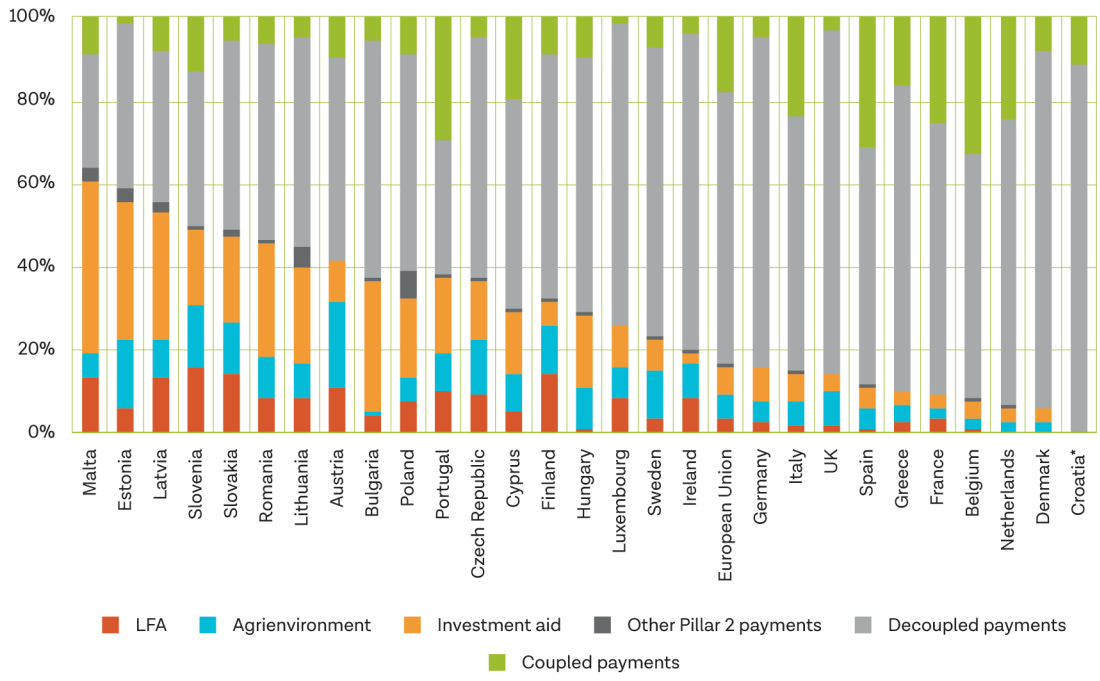
Total CAP Payments (2008–2013)



Source: DG AGRI (2017) Clearance Audit Trail System (CATS) database provided by the European Commission

Figure 11. CAP funds composition by country

Composition share of CAP payment by country (2008–2013)



Source: DG AGRI (2017) Clearance Audit Trail System (CATS) database provided by the European Commission

Implementation of the CAP increasingly allows for flexibility, but within limits. In particular, the 2013 reform greatly increased the flexibility given to Member States regarding how they could implement the direct payments regime.[35] Member States had the option to introduce a number of voluntary schemes and to choose, within limits, how much they wanted to spend on them. They also had the possibility to transfer funding between Pillar I and II in either direction, again within limits. They had additional flexibility to define the beneficiaries of direct payments, to decide on the allocation of entitlements, and to choose among different implementation models for the basic payment and the greening payment.[36]

Monitoring of the CAP is extensive. To become eligible for these payments, and as a means to monitor the payments, a farm registry needs to be established, which is updated at least once a year.[37] In total, the number of payments made each year and monitored at the national and EU level reaches 40 million transactions. In addition, the Court of Auditors employs a risk-based auditing system to conduct ex-post audits.

Data and Methodology

The CAP has been extensively studied from a variety of angles. Before and after the introduction of policy changes, the European Commission conducts assessments, most of which are conducted in-house. Several methodologies are used, based on a mix of literature reviews, public consultations and quantitative analyses. The latter include *ex ante* quantitative analyses,[38] as well as *ex post* quantitative analyses, which use existing farm survey and administrative data, often conducted as case studies.[39] However, these assessments of the CAP have not yielded a clear set of general policy conclusions. The difficulty to obtain clear policy conclusions can be traced back, first, to the existence of considerable variability in implementation modalities and local conditions. Second, to the range of households and businesses that benefit from the CAP, each with different motives, incentives and production structures.

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[35] However, in some of the Member States some of the changes only came into effect in 2016: the impact may not yet be apparent.

[36] For instance, from January 2015, the Single Payment Scheme (SPS) introduced in 2005 was replaced by the "2013 reform", which introduced the Basic Payment Scheme (BPS), a greening payment top-up and various targeted measures for young farmers, small farmers, and farmers in areas of natural constraints. And the Single Area Payment Scheme (SAPS) was extended to 2020 for those Member States that wished to continue to use it. Some of these payments are voluntary for Member States, while others are mandatory.

[37] This is the IACS (Integrated Agricultural Control System) has information on areas and animal numbers and payments: https://ec.europa.eu/agriculture/direct-support/iacs_en

[38] These often use partial equilibrium models, such as the CAPRI (Common Agricultural Policy Regionalized Impact) model. It is a tool for *ex-ante* impact assessment of agricultural and international trade policies. It is a partial comparative static equilibrium model, with two interlinked modules: about 250 regional aggregate programming models covering the EU27, Norway and Western Balkans at the NUTS 2 level, and a global spatial multi-commodity model for agricultural commodities. A spatial downscaling component allows impact assessment at the 1x1 km grid level for EU27. CAPRI is maintained by a network of different European research institutions and coordinated by a team at the Institute for Food and Resource Economics at the University of Bonn. Source: Wikipedia.

[39] Colen, L., Gomez y Paloma, S., Latacz-Lohmann, U., Lefebvre, M., Préget, R. and Thoyer, S. (2016), Economic Experiments as a Tool for Agricultural Policy Evaluation: Insights from the European CAP. Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 64: 667–694. doi:10.1111/cjag.12107

This report assesses the CAP with respect to its association over time with trends in jobs and poverty reduction. The method used for this report's statistical analysis can best be described as an approach in which the CAP is considered as a "treatment" on the agricultural sector in the countries and regions, which is then associates with changes in growth, jobs and poverty reduction, controlling for a range of other variables which might explain the association. The report benefits from new, more detailed and audited CAP data and it is also the first empirical analysis which measures the correlation of the CAP with poverty at the EU level as a whole. It was made possible by the creation of poverty maps at more geographic detail (NUTS3) than before and the improved administrative records from the CAP's monitoring system.

The CAP data were extracted from the Clearance Audit Trail System (CATS) database provided by the European Commission (DG AGRI). The CATS database compiles detailed annual data of all payments paid to the recipients under the CAP. The CAP payments were broken up into several components, distinguishing within Pillar I support between decoupled and coupled payments, and Pillar II. In addition, two panel data sets were created:

i. For the growth and jobs analysis, the panel dataset covered 28 countries and 220 regions at NUTS2[40] level over the period 2004–2014. The analysis looked at the rate of regional GDP growth per worker deflated at 2005 constant prices ("regional growth"), the agricultural labor productivity growth, measured as the change in regional agricultural value added per worker ("agricultural productivity growth") and the out-farm migration, measured as the change in regional agricultural employment ("jobs").
ii. For the incomes and poverty analysis, the panel data set was based on the EU Statistics on Income and Living Conditions (EU-SILC). It collects cross sectional and longitudinal multi-dimensional microdata on income and poverty. These are used to create an EU Poverty Map, which contains area estimates of poverty at the NUTS3 level. The EU Poverty Map allowed us to investigate the spatial correlation of CAP funds with poverty and incomes at NUTS3 level between 2002 and 2014. The panel of subnational poverty rates from 2004 to 2014 and administrative records from the CAP program with geocoded information made it possible to assess the relationship between the CAP and poverty over time.

However, causality cannot be inferred. This report, nor any other reports on the impact of the CAP, cannot build on the results of randomized controlled or natural experiments. This is why the report consistently refers to "associations", "correlations" or "links". However, the statistical results obtained are based on a large number of observations, EU-wide, over time and space. They are not derived from projections, models, before-after comparisons, or simple cross-sectional analysis, as are many of the studies in the existing literature on the CAP. In addition, the statistical analysis attempts to rule out as many other factors, which could cause the correlations, as possible.

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

Growth

In the subsections below, "elasticities" are used to assess the economic magnitude of the statistical estimates. Elasticities are indicators that measure the percentage change in one variable associated with a change of one percent in another variable.[41] We use elasticities to get an idea of economic significance, because sometimes results that are highly significant statistically may be of little economic significance. The Annex 6 shows the elasticities of these variables with respect to a change in CAP expenditures.

The CAP's decoupled payments are associated with increases in agricultural productivity per worker, in particular in the NMS. Growth in agricultural value added per worker is positively associated with the CAP, particularly in the NMS. The productivity elasticity of total CAP spending is 2.2 for the EU-28. This means that a 10 percent increase in overall CAP spending would increase agricultural labor productivity growth in the EU-28 from 1.3 percent per year to 1.6 percent per year. The elasticity is particularly high in the NMS where it is 5.1. There, agricultural labor productivity growth would increase from 3.1 percent to 4.7 percent with a 10 percent increase spending. The positive effect comes almost exclusively from decoupled Pillar I and Pillar II subsidies. The elasticities for both decoupled Pillar I and Pillar II spending are statistically significant for the EU-28 and for the NMS and OMS separately, while the elasticity of the coupled Pillar I subsidies is insignificant.

The CAP seems to be effective in increasing farmers' investments in agricultural productivity. In theory, CAP payments could reduce farmers' credit constraints, allowing them to invest more. This should matter most in the NMS. In addition, CAP support would reduce farmers' exposure to income risk, which, again, would lead them to invest more. The statistical results are consistent with this theory.

The shift from "coupled" towards "decoupled" payments and Pillar II is associated with higher agricultural productivity growth. In theory, the coupled CAP payments could lead to a distortion of farmers' resource allocation, which over time would reduce productivity growth.[42] A shift away from these coupled payments would have the opposite effect. This is what the statistical analysis finds. It is consistent with findings of several other studies that agricultural productivity in the EU benefited from the shift from "coupled" to "decoupled" subsidies.[43]

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[41] The elasticities are computed at the sample mean using the following formula:

$$\varepsilon_{y/s} = \frac{dy/y}{ds/s} = \frac{d\ln(y)}{d\ln(s)} = \beta\frac{\bar{s}}{\bar{y}}$$

where $\bar{s}$ refers to the estimated sample mean of each specific CAP payment ratio, which is computed by dividing the specific CAP payment by the regional value added in agriculture; $\bar{y}$ refers to the estimated sample mean of our dependent variables (i.e. regional GDP growth per worker, agricultural labor productivity growth and the rate of out-farm migration) (see table 1 in Annex 5); β is the estimated marginal effect of the CAP payments on our dependent variables (see table of the regression results in Annex 5).

[42] Some earlier studies also find that the higher the share of subsidies in total farm income, the more negative the impact, e.g. Zhu and Lansink (2010); Bojnec and Latruffe (2013); and Zhu et al. (2012).

[43] Rizov et al. (2013); Minviel and Latruffe (2016); and Latruffe et al. (2016).

This report finds, on average, no statistically and economically significant association over time between total CAP support and regional GDP growth per worker.[44] The overall effect of CAP subsidies is not significant.[45] While decoupled payments had a positive association with agricultural labor productivity growth, this effect seems not strong enough to overcome the productivity gap with other sectors, so the association of a region's share of agricultural employment with regional growth was negative.[46, 47] Earlier studies, using various simulation methods and/or partial equilibrium modeling, revealed a mixed impact. Studies based on survey data found little impact.[48] This report comes to a similar conclusion. In summary, the CAP is associated with increases in agricultural labor productivity growth, in particular in the NMS, but not with general economic growth in the regions of the EU. This is consistent with the stylized story of structural transformation told above.

Jobs

Decoupled payments have a positive impact on agricultural employment, but the effect is small. There is a significant positive association between agricultural employment and the decoupled Pillar I and Pillar II payments. No such association was found for the coupled payments. The elasticity estimate[49] implies that a 10 percent increase in CAP subsidies reduces the average annual outflow of labor from agriculture by about 1.5 percent. However, the effect is relatively small. Earlier studies provided contradictory findings with respect to the CAP's impact on agricultural employment: some studies found that the outflow of labor from agriculture was highest in countries which supported agriculture the most;[50] some found the opposite;[51] and others found mixed effects.[52]

The results suggest that there may not be a trade-off between employing people in agriculture and supporting increases in agricultural productivity. Such a trade-off was suggested by other studies.[53] Decoupled, non-distortionary payments stimulate higher productivity agriculture. They also have a positive association with agricultural employment. In this way productivity growth and employment can go hand in hand.

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44 In this report, we present findings which measure "gross effects" — we do not take into account the negative effects of taxation for financing of these expenditures, and we do not assess the opportunity costs of expenditures on the CAP.

45 The statistical results show a slightly significant positive effect of Pillar I coupled subsidies, but the 0.2 elasticity means that an increase of 1 percent in Pillar I spending would increase average regional growth by 0.01 percentage point, i.e. from 0.568 percent to 0.569 percent, which in economic terms is not significant.

46 These results are at odds with earlier studies. An earlier study found a positive effect of CAP expenditures on regional growth in the OMS for the period 1989–2000 (Esposti, 2007); and our own analysis with FADN data also found this (for the EU-28 and for OMS or NMS separately) over the 1989–2010 period. However, our new regressions using CATS data find no significant effect (for the EU-28 and for OMS or NMS separately).

47 Consistent with the predictions of a standard neo-classical model with an initial technological gap between the agricultural and non-agricultural sectors (Esposti, 2007).

48 Boulanger and Philippidis (2015); Nowicki et al (2009); Esposti (2007); and Crescenzi and Guia (2016).

49 The elasticity is -0.3. A negative sign of these elasticities means that CAP payments reduced the outflow of labor from agriculture — and thus had a positive impact on agricultural labor (jobs).

50 Berlinschi et al. (2011); Schuh et al. (2016).

51 Peerligs et al. (2014); Olper et al. (2014).

52 Kristkova and Ratinger (2012); Petrick and Zier (2011).

53 Helming and Tabeau (2017).

Regional Poverty and Inequality

The CAP is reaching the poorer regions within EU Member States. Total CAP payments show a positive and significant association with poverty.[54] This means that CAP support reaches the poorer areas. Between the pillars, Pillar II has a higher correlation with poor regions than Pillar I (Table 3). But within Pillar I, the decoupled payments are the ones primarily allocated to poor areas. Thus, Pillar II payments and the decoupled payments within Pillar I are the most important in terms of outreach to poor areas.

Table 3. Correlation between poverty rate and share of the country poor to different measurements and different groups of CAP support

LABELS	Poverty Rate
Payment (Total)	+
Payment per capita (Total)	+
Payment (Pillar I)	+
Payment per capita (Pillar I)	+
Payment share (Pillar I)	0
Payment (Pillar II)	+
Payment per capita (Pillar II)	+
Payment share (Pillar II)	0
Payment (Pillar I coupled)	0
Payment per capita (Pillar I coupled)	0
Payment share (Pillar I coupled)	0
Payment (Pillar I decoupled)	+
Payment per capita (Pillar I decoupled)	+
Payment share (Pillar I decoupled)	0
GDP per capita (PPS)	Y
Population density	Y
Country fixed effects	Y

Note: (1) Data source: EU 2011 Poverty Map (DG-REGIO and World Bank), 2010 Farm Structure Survey (Eurostat), and EU National Statistic Institutes (Eurostat); (2) Symbols: + positively significant, - negatively significant, 0 not significant at 10% level; (3) Missing observations in CAP data are treated as zero; (4) Luxembourg and Cyprus Republic are not being analyzed here; (5) CAP data is missing for 21 regions in Croatia and 2 regions in Spain (with 1 more region missing for Pillar II data); (6) Standard errors are clustered at country level

Over time, the CAP is associated with poverty reduction. Larger total per capita CAP payments are associated with a reduction in poverty at the regional level (NUTS1 and NUTS2 levels) (Table 4). Within the CAP, Pillar II is more significant in its contribution to poverty reduction than Pillar I. And again, within Pillar I, the association between per capita decoupled payments and poverty reduction is particularly strong[55].

[54] Caveat: the analysis in this report is spatial and focused on household income. The analysis cannot, and does not, claim that CAP resources are reaching out the poorest families in the poorest regions, although any positive externality or spillover effect of the CAP is more likely to take place in areas with a higher intensity of poverty.

[55] These results differ from the existing literature, in particular the work of Shucksmith et al (2005) which showed that CAP funds contributed little toward territorial cohesion. However, the methodologies differ: the current report uses a dynamic panel analysis vis-à-vis the cross-sectional used by Shuksmith et al (2005) and includes poverty as an indicator for social cohesion.

Table 4. Per capita CAP payments are linked to regions with higher poverty reduction

	Poverty rate											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Total payments (per capita)	-0.294*	-0.185+	-0.244*									
Payments to pillar1 (per capita)				-0.352*	-0.173	-0.270+				-0.251	-0.0519	-0.171
Payments to pillar2 (per capita)							-0.618*	-0.517*	-0.549*	-0.393+	-0.476*	-0.412+
Share of individuals in agricultural households		0.314+	0.235		0.300*	0.216		0.344*	0.251+		0.339*	0.246
Share of inhabitants with secondary education		0.00214	0.126		0.0166	0.137+		0.0148	0.175+		0.00786	0.135+
Share of inhabitants with tertiary education		-0.137	-0.104		-0.131	-0.0995		-0.130	-0.0838		-0.133	-0.100
Unemployment rate		0.420*			0.429*			0.470*			0.454**	
GDP per inhabitant		-2.791	-4.405		-2.760	-4.288		-3.186	-5.179		-3.090	-4.649
Dependency ratio		-0.0620	-0.152+		-0.0443	-0.136		-0.0601	-0.152*		-0.0650	-0.158+
Population density		0.00495*	0.00307		0.00617**	0.00433*		0.00445*	0.00302+		0.00428*	0.00260
R-Squared:												
Within	0.387	0.497	0.433	0.367	0.480	0.415	0.359	0.508	0.425	0.388	0.510	0.437
Between	0.0586	0.222	0.0453	0.0416	0.213	0.0435	0.0537	0.330	0.0964	0.0663	0.312	0.0588
Overall	0.00414	0.283	0.0866	0.00302	0.266	0.0789	0.0427	0.375	0.133	0.00611	0.363	0.103
Observations	959	959	959	959	959	959	959	959	959	959	959	959

Notes: (1) Panel Fixed Effects; All regressions include year fixed effects; (2) Anchored Relative Poverty line (60% of median at 2011); (3) Data Source: Farm Structure Survey, Eurostat; EU-SILC, Eurostat ; (4) Symbols: ** P<0.01, * P<0.05, + P<0.1

The CAP is also associated with a decrease in inequality at the subnational level. There is a significant association between the CAP program and the dynamics of inequality within regions in the EU (Annex 4). There is a significant negative effect of total per capita payments on inequality.[56] The effect is particularly strong for Pillar II.

The channel through which poverty could have fallen in relation to the CAP would be through the creation of better jobs in agriculture for the workers who remained in agriculture. This hypothesis is supported by the combined results on productivity, jobs and poverty obtained above. Note that these results were only made possible by the existence of a poverty map at the NUTS3 regional classification and much improved administrative records from the CAP monitoring system. Replicating this analysis at country level and NUTS1 or 2 levels results in weaker relationships between the CAP and poverty[57]. A second hypothesis would be that the workers who remained in agriculture are relatively unskilled. This is because overall inequality increased over time, which is likely caused by the out-migration of skilled workers from the rural economy — a pattern commonly found globally.

The relation between agriculture, poverty and the CAP differs depending on what phase of the structural transformation process a country is in. Ideally, if a country is in the beginning of

[56] Inequality is measured by the Gini index. The results described remain qualitatively similar when the Theil index is used as the measure for inequality. Individual pillars, such as coupled and decoupled payments, or specific sub-periods, such as after 2006, do not produce estimates which are statistically significant.

[57] This phenomenon is referred to in the social and medical sciences as the "amalgamation paradox".

the process, and agriculture is very much associated with poverty, the CAP support should target the areas where agriculture and poverty combine. In this way, the CAP support could the increase of agricultural productivity, which would ultimately result in the eradication of poverty and increases in farmer incomes to the levels of other sectors. To show this graphically, in Figure 12, the intensity of the relation between poverty and agriculture on the X-axis is plotted against the degree of association between poverty the CAP payments on the Y-axis. The correlation between poverty and the CAP payments is measured on the Y-axis. As incomes increase and structural transformation succeeds, countries should move from the upper right quadrant to the lower left quadrant, ideally following a line with a 45-degree angle. Countries in the lower right quadrant show a certain inconsistency: poverty and agriculture are correlated, but the CAP funds go instead to areas which are relatively less poor. Similarly, countries in the upper left quadrant could review the coherence of their policy: poverty and agriculture are no longer correlated, but CAP funds target poorer areas.

The countries in the upper right quadrant are the incomplete transformers (agriculture takes place in poorest regions), with CAP support targeting these regions. Pillar I Decoupled funds reach the poorest regions. As expected, there are several NMS here (Romania, Bulgaria, Latvia and Slovenia). For instance, given the overall income level of Romania, it makes sense that the country's agricultural sector finds itself at the beginning of the process. However, unexpected, is that there are also several OMS here (e.g. Spain, Portugal, Greece, Italy and Sweden).

Overall, countries seem to target CAP support reasonably well. Most countries find themselves close to the 45-degree line. However, in a few countries, agriculture is still associated with poverty, but the CAP support reaches areas which are, relatively for that country, not so poor. This is the case for Latvia and Germany. In the case of Germany, this could be caused by the still existing differences between the former East and West Germany.

Figure 12. Country plot of the association between poverty rate, agriculture, and CAP support

Note: CAP data for the program period 2008–2013; Croatia is removed as it only started to receive CAP funds after 2013

The CAP, agriculture and poverty, and the process of structural transformation. For the successful structural transformers, the CAP no longer targets the poorer regions in the country. In the lower left quadrant are the countries in which poverty and agriculture are no longer associated with each other, on the one hand, and the CAP support is consistent with this: it also does not target the poorer areas in the country. These are the successful transformers, with a CAP policy which is consistent with this success. For the incomplete transformers, the CAP is appropriately targeted towards areas where agriculture and poverty combine (the upper right quadrant). The targeting of the CAP is consistent with the countries' levels of agricultural development: there are no countries in the "wrong" quadrant.

The CAP components, in particular the Pillar I decoupled and Pillar II payments, show a different association with poverty reduction trends over time:

i. For the successful structural transformers, Pillar II is the only payment associated with regions in which poverty declined (Table 5).
ii. For the incomplete transformers, both Pillar I decoupled as well as Pillar II payments are associated with regions which achieve higher poverty reduction.
iii. However, in the incomplete transformers, the magnitude of the correlation for Pillar II is considerably lower than in the successful transformers, pointing to the need to improve the basic conditions which would improve the returns on the investments made.

Policy implications for the incomplete transformers:

i. To make Pillar I support more effective, continue the shift from coupled to decoupled payments, while targeting these to the relatively poorer agricultural areas. This reduces income risk and thereby supports farmers' own investments by making them less dependent on the vagaries of the weather and the market.
ii. To make Pillar II support more effective, improve the probability of higher returns of the Pillar II investments by a better sequencing of basic public service provision and the individual investment projects. This implies more effective coordination between programs targeting other sectors, both at the EU and the member state levels.
iii. In the NMS, policy priority should be given to getting the basic conditions right for agriculture to thrive (roads, social services, markets, extension services, and support to farmers' organizations). The Pillar I payments should be decoupled and targeted towards the poorer areas to incentivize agricultural investment. Care should be taken that the Pillar II support is accompanied by improvements in the basic conditions, in order to improve the return on these investments.
iv. In the OMS, it seems likely that the infrastructure and social sector conditions are already in place, but that the institutional links between stakeholders (farmers, agri-business, educational institutions, including for advisory services) need strengthening. This could be supported by the Pillar II payments. The Pillar I payments should be of lesser importance here than in the NMS, while the rationale for coupled payments is weak.

Policy implications for the successful transformers:

i. Continue to shift from coupled payments to decoupled payments (in Pillar I) and to rural development (in Pillar II) to support agricultural productivity and employment, in support of the continued sustainable modernization of agriculture.
ii. In the NMS, decoupled Pillar I payments would provide income-smoothing support for poor or emerging farmers to enable increased on-farm investment. However, these payments should no longer be necessary for the more successful farmers. A shift of support to Pillar II would be important to further increase investments, both on and off-farm.
iii. In the OMS, Pillar I decoupled payments seem unnecessary, given already high income levels. However, Pillar II support can provide important investments, both of a private and a collective nature.

Table 5. Per capita CAP payments show different poverty reduction on successful structural transformers and incomplete transformers by type of CAP payments

	Model 1	Model 2	Model 3	Model 4	Model 5
Coupled payments (per capita)	-0.098	-0.106			
	(0.082)	(0.087)			
Decoupeld payments (per capita)	-0.228**	-0.219*			
	(0.085)	(0.090)			
Pillar2 payments (per capita)	-0.174+	-0.207*			
	(0.097)	(0.098)			
Coupled payments (per capita) for Incomplete Transformers			-0.146	-0.163	-0.170+
			(0.104)	(0.105)	(0.101)
Decoupeld payments (per capita) for Incomplete Transformers			-0.223*	-0.218*	-0.261*
			(0.096)	(0.099)	(0.101)
Pillar2 payments (per capita) for Incomplete Transformers			-0.168+	-0.190+	-0.275**
			(0.093)	(0.100)	(0.100)
Coupled payments (per capita) for Successful Structural Transformers			0.014	0.004	-0.031
			(0.115)	(0.115)	(0.115)
Decoupeld payments (per capita) for Successful Structural Transformers			-0.175	-0.155	-0.122
			(0.126)	(0.127)	(0.125)
Pillar2 payments (per capita) for Successful Structural Transformers			-0.411*	-0.484*	-0.387+
			(0.205)	(0.192)	(0.219)
Controls: Share of Individuals in Agriculture; GDP per capita; Secondary Education; Tertiary Education; Household Dependency Ratio; Population Density; Regions with no CAP payment; Population; Unemployment	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes
Annual Dummies	Yes	Yes	Yes		
Temporal effects (polynomial degree 3)				Yes	
Temporal effects by IT and SST (polynomial degree 3)					Yes
Sample: All countries	Yes				
Sample: Only IT and SST		Yes	Yes	Yes	Yes
R-within	0.438	0.472	0.481	0.466	0.494
R-between	0.013	0.061	0.054	0.052	0.100
R-overall	0.016	0.057	0.052	0.051	0.094
N	793	705	705	705	705
Tbar	7.552381	7.5	7.5	7.5	7.5

Notes: (1) Panel fixed effects; (2) Anchored relative poverty line (60% of median income in 2011); (3) Data sources: Farm Structure Survey, Eurostat; EU-SILC, Eurostat; (4) Croatia and Germany are not analyzed here; (5) standard erros clustered at the regional level; (6) Symbols: ** P<0.01, * P<0.05, + P<0.1

Risk and Specialization

Decoupled CAP payments can support risk reduction and investment strategies to reduce poverty. Risk-averse farming families diversify their household income. Some family members will have another gainful activity outside the farm business(es).[58] This diversification of income streams within the rural farm household is an important risk mitigation strategy and a common characteristic of farm households worldwide, including in advanced economies. Indeed, in the EU, as elsewhere in the world, only about half of a typical farm family's income comes from agriculture (Table 6). Our analysis of changes in poverty between 2004 and 2014 confirms that this strategy of income diversification pays off. Regions in which households are more diversified show more poverty reduction (Table 7). Regions in which agriculture dependent households can diversify their household income, can better mitigate risks and shocks, and at least partially offset any negative impact that a stronger dependency on agricultural activity might pose to them. However, this result depends on the existence of such employment opportunities: the association disappears when we control for the level of unemployment in the area (Table 7). Conversely, in regions where over time, more and more household members devote themselves to agriculture, this is associated with increases in poverty. At the same time, specialization in production matters. Regions in which farm holdings are more specialized perform better in terms of poverty reduction (Table 7). This seems consistent with theory: when household income risk emanating from agriculture can be offset by other sources of income which are uncorrelated to agricultural risk, the farmer can specialize in the most profitable crops, without needing to hedge by diversifying over a range of crops.

Given this context, decoupled CAP support would allow farmers, especially the poorer farmers, to optimize both the diversification and specialization strategies. Targeting towards the poorer segments is appropriate as non-poor farmers typically can afford other risk reducing strategies, such as weather insurance and financial portfolio diversification.

Table 6. Diversification of farm household income

	Period	Farming	Off-farm	Investment and property	Transfers	Others	Total
Austria	2004-6	54	30			17	100
Denmark	2004-6	42	43	7	7	0	100
Finland	2003-5	27	42	18	13	0	100
France	2003	53	31	9	8		100
Germany	2003/4-5/6	80				20	100
Ireland	2004/5	32	45	2	19	2	100
Netherlands	2004/6	74	11			15	100
Poland	2003/6	67	8		21	3	100
UK	2002/3-4/5	40	28	21	11	0	100
Average		52	30	11	13	7	100

Source: OECD, 2009

[58] For instance, the 2005 Farm Structure Survey reports that more than one third of farmers were pluri-active, in the sense that they had some other gainful activity outside the farm businesses. The contribution of such activities is higher among small farms, but even among the largest farmers at least one fifth of farmers had another gainful activity.

Table 7. Regions with higher household income diversification have greater poverty reduction

	Poverty rate			
	(1)	(2)	(3)	(4)
Share of individuals living in agriculture households	0.66*	0.24*	0.60*	0.42*
Household diversification index	-1.75*		-1.07+	-0.29
GDP per inhabitant		-10.57*	-10.13*	-8.46*
Share of inhabitants with secondary education		0.16+	0.15	0.04
Share of inhabitants with tertiary education		-0.06	-0.06	-0.10
Unemployment rate				0.34+
R-Squared:				
Within	0.33	0.49	0.50	0.54
Between	0.21	0.14	0.16	0.24
Overall	0.25	0.14	0.16	0.23
Observations	959	959	959	959

Notes: (1) Panel Fixed Effects including year fixed effects; (2) Anchored Relative Poverty line (60% of national median household income at 2011); (3) Data Source: EU-SILC, Eurostat; (4) Symbols: ** P<0.01, * P<0.05, + P<0.1; (5) Standard errors are clustered at country level

Capping the CAP

CAP subsidies drive up the price of land, making it more difficult for potential new farmers, including the young and the poor, to enter agriculture and for existing farms to expand through renting or purchasing land. Land prices, of course, depend on many factors, other than CAP subsidies (coupled or decoupled): land market regulations, commodity prices, infrastructure provision, interest rates, urbanization, taxation, etc. Several studies concluded that CAP subsidies have an impact on land values, but the impact varies importantly across countries, and appears relatively modest in countries where land prices are already high. The functioning of land markets is found to be strongly affected by land market regulations that affect land prices and land exchange modalities, which differ substantially between member states. The most recent modeling estimates suggest that in NMS, the capitalization rate of decoupled area payments could be over 70 percent: one Euro of payments results in a 70 percent increase in the land rental price. In OMS, where one would expect these rates to be lower due to the higher overall land prices, the rate could still be nearly 40 percent[59]. On average, decoupled payments are capitalized at a rate of 47 percent.[60] However,

[59] Of course, CAP subsidies are higher in the OMS: for instance, 444 € /ha in the Netherlands. In the NMS, examples are 106 € /ha in Latvia and 165 €/ha in Romania in 2014.

[60] In NMS, the capitalization rate varies from 76 percent before 2013, to 72 percent in the post-2013. The rate is lower in OMS, but almost doubles (from 20 percent to 39 percent) due to the reforms of 2013 (Ciaian, Kancs and Espinosa, 2016). Earlier studies had found lower capitalization rates of SAPS in NMS: between €0.15 and €0.32 per additional euro of SAPS: Ciaian and Kancs (2012), and Van Herck, Swinnen and Vranken (2014). However, these were results from the first years of implementation: land sales and rental prices might not have fully adjusted. In OMS, capitalization rates could also have a long lag or be lower because of regulation of sale and rental markets, e.g. disallowing short-term rentals, exercising pre-emptive purchase rights by a public authority to keep prices low. A study in Northern Ireland, which focused on rentals of one year or less, found a capitalization rate of more than 100 percent (Patton et al., 2008).

the size of the capitalization effects cited here are projections: there are still insufficient data to econometrically estimate the actual impact. And macrotrends supported EU-wide increases in land prices: high commodity prices and low interest rates. Nonetheless, the direction seems clear and this price raising effect is confirmed in a recent stakeholder survey undertaken as part of the consultations for the CAP mid-term review: high land prices were seen as the most important barrier for access — cited by nearly a third of all respondents.[61] Artificially high land prices make it more difficult for young farmers and poorer segments of the population to get access to land (Swinnen et al., 2013). It does, however, provide an important social safety net for existing landowners, including the elderly.[62] On the other hand, it makes farm expansion and consolidation difficult for efficient farms seeking to expand.[63] In the US, for instance, farm consolidation typically takes place through rental markets in significant amounts — on average about 30 percent of a typical farm's used area is rented in. In the EU, the amount of farm land rented is even higher: 54 percent on average. It is lower in Denmark, Ireland, Poland and Portugal — less than 30 percent — but higher in Slovakia, Bulgaria, Czech Republic, France, Belgium and Malta (more than 70 percent). This implies that a large share of the CAP subsidies — estimated at 25 percent[64] — does not reach the intended beneficiaries, but rather benefits non-farming land owners and investors.

High land prices also constrain women. The high land prices also constrain access to land by women. Nearly a third of farms in Europe are run by women. But women farmers are poorer: in terms of output per holding, women farmers produce about €12,000 in 2013, compared to nearly €40,000 for men. Women farmers also control far less of the land (12 percent) than men (61 percent) and companies (28 percent)[65]. And in rural areas the gender pay gap is wider than in urban areas, while unequal access to land constrains the ability of women to set up businesses in agriculture.

Finally, the Pillar I area-based payments, when they are not capped or made degressive, are biased towards large land holdings, which are less labor-intensive than smaller family farms. The benefit incidence of the direct payments made under the income support program is highly unequal and biased towards large landholdings.[66] About 80 percent of these payments made under Pillar1 and equivalent to 70 percent of the CAP or 28 percent of the total EU budget, go to only 20 percent of the farmers (Figure 13)[67]. In some NMS, this bias is even more pronounced. For instance, in Romania, over half of the direct payments goes to only one percent of the farmers.[68] In Croatia, less than one percent of farms receive about one third of CAP payments, and nearly half

[61] Ecorys, 2017.

[62] However, if the threshold is set too high and excludes the poorest elderly, the social safety net argument becomes incoherent.

[63] In Romania, the threshold below which farms would not qualify for CAP subsidies was set at 1 ha, excluding 1 million farmers (a quarter of all farmers). One of the rationales behind this controversial policy was to promote the consolidation of farms. However, given the substantial increases in land prices, this has now become more difficult, instead of easier (Romania Country Report, 2017).

[64] Ciaian et al. 2016.

[65] European Commission, 2017.

[66] Matthews (2016).

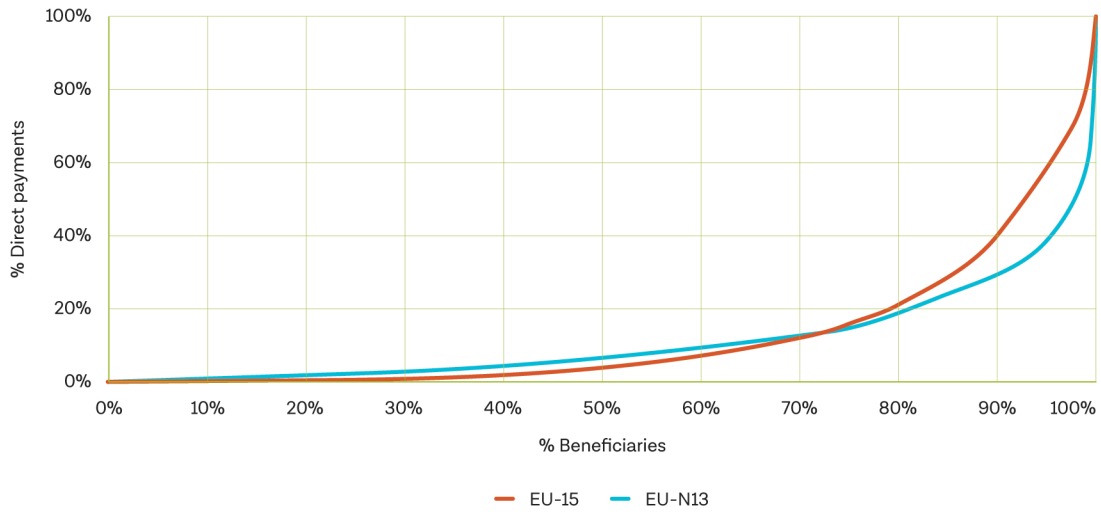
[67] Member States apply the degressivity mechanism included in the 2013 reform differently. For instance, they are allowed to take into account salaried labor intensity. The mechanism required Member States to reduce basic payments over €150,000 per farm by a minimum of 5 percent. Member States could opt for any reduction percentage up to 100% ("capping"). Nine Member States opted to cap payments at amounts between €150,000 and €600,000.

[68] World Bank, 2014. Romania CAP Country Report, 2017.

of all registered farms do not receive any CAP payments at all.[69] And in Bulgaria, about one percent receives nearly 45 percent.[70] Since small family farms are more labor intensive than the large farms, this bias could have a negative impact on jobs. Finally, small farms can be more efficient than large farms on a per hectare basis: in Romania, this is the case (Figure 14). However, this efficiency in production need not, of course, translate into higher productivity per worker: the jobs generated can be "bad" jobs from an income perspective.

Figure 13. 80 percent of CAP direct payments goes to 20 percent of the farmers (2015)

Distribution of direct payments between beneficiaries in the EU in financial year 2015



Notes: EU-15 are the OMS; EU-N13 are the NMS

Source: European Commission, 2016

Capping the CAP would help to reduce the pressure on land prices. Making the Pillar I decoupled area-based payments regressive and agreeing on appropriate levels and thresholds by country makes sense from an equity perspective. However, more analysis, using more recent empirical data, is needed to substantiate the exact impact of the CAP on land prices. And much will depend on how exactly the capping of the CAP would be implemented to ensure that both equity and efficiency goals are achieved. Land purchase and rental prices would go down, ceteris paribus, if thresholds or degressivity for the area-based payments under Pillar I would be uniformly introduced.[71] Capping the payments would also reduce the leakage to non-farming landowners. Under a degressive scale, Pillar I area-based payments would still allow poorer farmers to better deal with risk, while the rationale for such subsidies to non-poor farmers is weaker, as they are typically able to afford private solutions to risk reduction (insurance, portfolio diversification). Finally, even though CAP support should go to active farmers who use the land to farm, in practice CAP payments

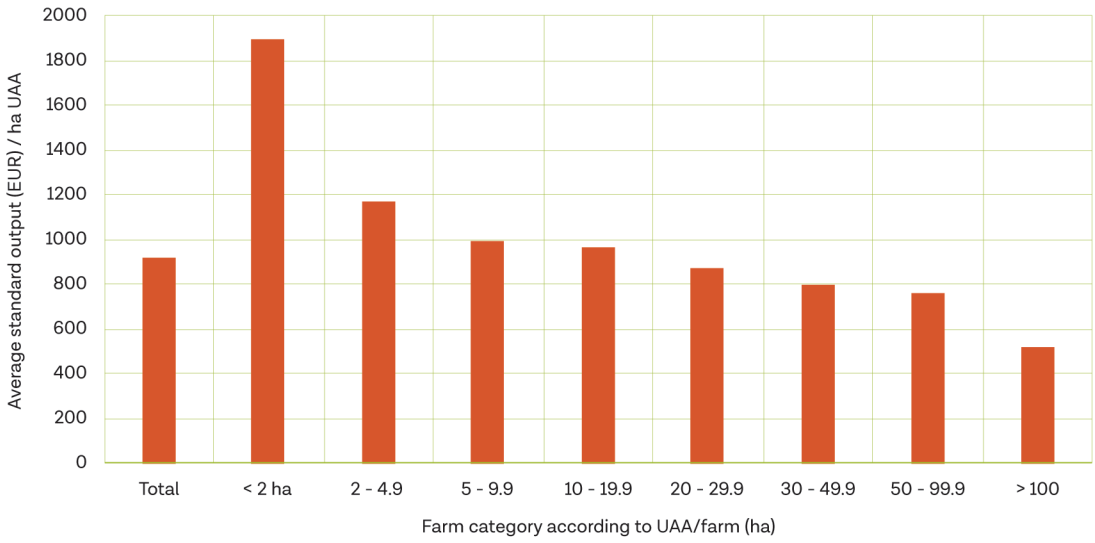
[69] Croatia CAP Country Report, 2017.

[70] Bulgaria CAP Country Report, 2017.

[71] The principle of degressivity agreed to earlier required Member States to reduce basic payments over €150,000 per farm by a minimum of 5%. Member States could opt for any reduction percentage up to 100 percent (capping). Nine Member States opted to cap payments at amounts between €150,000 and €600,000. Member States were allowed to take into account salaried labor intensity when applying the degressivity mechanism included in the 2013 reform.

sometimes go to land owners instead, depending on the political economy in the member state. Setting a threshold above which such payments are reduced would help to reduce this extraction of rents. However, more analysis, using more recent data, is needed to substantiate the exact impact of capping the CAP on land prices and on different farms' access to land. And much will depend on how exactly the capping of the CAP would be implemented to ensure that both equity and efficiency goals are achieved. There are also likely to be important differences among regions and member states as the farms affected by capping are regionally concentrated in the EU.

Figure 14. Small farmers are more productive per ha than large farmers in Romania



Box 4. Greening the CAP

Half of Europe's land is farmed, so agriculture matters for the environment. Three "greening" practices are required: maintaining permanent grassland for carbon storage; crop diversification for soil health; and keeping an "ecological focus area" (EFA) of at least 5 percent of the arable area in larger farms (greater than 15 ha) for biodiversity. However, these requirements do not appear to have had significant impact. While three-quarters of arable land is covered by the crop diversification requirement, the Commission estimates that cultivation practices have changed only on about 1 percent of this land.[72] Most farmers were already following these practices as part of good farm husbandry. And the permanent grassland protection has also had no immediate impact as no Member State breached the limit in 2015. Finally, there is a large margin of discretion in fulfilling the requirements.[73]

Farmers seem to have adopted those greening practices that fit best into their existing farming practices and that require relatively little change. The positive element arising from the introduction of the greening payment is that it recognizes the importance of paying farmers for the achievement of environmental objectives. This can be built upon in the next CAP reform by introducing greater differentiation of greening measures at the various geographical levels, while measuring real changes and results on the ground. Whether this should be done while retaining the Pillar I greening payment or by merging the payment with agri-environment-climate payments in Pillar II will be a matter for debate.

[72] European Commission, 2016, and Hart et al., 2016.

[73] European Commission, 2017.

New digital technologies can make it easier to monitor the increasing demands on farmers' practices. The conditions attached to a farmer's "license to farm" are increasing. Past concerns with the quantity of food produced are now accompanied by an increasing emphasis on standards for how food is produced, including impacts on water quality, soil, biodiversity, air quality, climate mitigation, animal welfare and reductions in the use of chemicals in both crop and animal production. Schemes that pay farmers to change their behavior will inevitably have higher compliance costs, and will require more costly monitoring to observe that these changes have taken place, than schemes that simply pay farmers a check for being a farmer. However, the potential of new digital technologies to simplify the process of collecting, inputting and analyzing information with respect to actual results achieved on the ground is substantial and can be realized rapidly.

Going forward, this report suggest that more in-depth policy analysis would be helpful on strengthening the environmental impact of the CAP. Nearly €18 billion of the annual CAP budget supports the environment. Under Pillar I, around €12 billion annually of direct payments is focused specifically on environmental and climate objectives, in addition to the indirect impact through the environmental provisions in cross-compliance standards. Under Pillar II, around €6 billion is earmarked to support environmental and climate objectives.[74]

[74] Under Pillar I, in addition to the Basic Payment Scheme or the Single Area Payment Scheme payments (depending on the Member State), each holding receives a payment per hectare for respecting certain agricultural practices beneficial for the climate and the environment. Member States are required to use 30 percent of their national envelope for this purpose. Adoption of the greening practices is a compulsory requirement for farmers in receipt of direct payments. Failure to respect the greening requirements results in penalties. The green payment sits on top of cross-compliance which includes the basic compulsory layer of environmental requirements and obligations. Under Pillar II, more ambitious environmental management options can be supported through voluntary agri-environment schemes financed through rural development schemes projects.

Conclusion

Why bother about agriculture? As a share of GDP, agriculture is small and declining. And agricultural employment is also declining, while the income gap with other sectors is significant (about 50 percent). This is as it should be: it reflects the normal process of structural transformation in which agriculture gives way to manufacturing, first, and services, later. However, international experience demonstrates that this process is not always easy. Many countries struggle to complete it, often leaving substantial pockets of stubborn rural poverty behind, linked to an under-performing agricultural sector.

This report argues that the process of structural transformation in the EU is largely on track, with the CAP playing a positive role in the reduction of poverty and the creation of better jobs for farmers. The gap between agricultural incomes and incomes in other sectors is closing. And across the EU agricultural incomes are converging with each other. The successful transformers, about half of the Member States, have turned agriculture into a key sector for shared prosperity in rural areas: agriculture is no longer associated with poverty. The other half — the incomplete transformers — still have some way to go, which includes ensuring that the basic conditions for agriculture to thrive are in place.

The results from our analysis on growth, jobs and poverty give rise to the following policy suggestions. They differ with respect to the phase of structural transformation of the country:

i. **For the successful transformers:** continue reform shift from coupled payments to decoupled payments (in Pillar I) and to rural development (in Pillar II) to support agricultural productivity and employment.
ii. **For the incomplete transformers:**
    a. make Pillar II support more effective by a better sequencing of basic public service provision (e.g. roads, power, advisory services) and the individual investment projects. This implies more effective coordination between programs targeting other sectors, both at the EU and the member state levels.
    b. target CAP support to areas where agriculture and poverty are linked.
iii. **Monitor the impact of CAP support on results** (growth, jobs, poverty reduction) instead of inputs (project proposals, processes, and land area) by combining the CAP's monitoring system, continuous remote sensing data to track land use and other agro-environmental variables, and the key social-economic variables at the NUTS3 or below. This would also allow the CAP to introduce greater differentiation, but stricter results-based monitoring, of greening measures at member state and regional levels.

In conclusion, the CAP can be a powerful instrument for supporting inclusive growth. Around 40 million transactions are financed, and monitored, every year. It is true that as a share of GDP, agriculture is small and declining. And agricultural employment is also declining, while the income gap with other sectors is large (about 50 percent). However, that income gap is closing and agricultural incomes are converging with each other. The successful transformers have turned agriculture into a key sector for shared prosperity in rural areas. The incomplete transformers can use a well-targeted and coordinated CAP to reduce poverty and create better jobs for farmers. Further reforming the CAP along the lines outlined above can have a substantial impact on inclusive growth: better jobs and less poverty.

Annex 1: Convergence pooled regression

Table 1. Pooled regression

Dependent variable: Growth of GDP per capita of EU countries		
Constant	53.5	***
DUMMY 2012–2016	-44.2	***
LN(GDP per capita)	-4.9	***
DUMMY*LN(GDP per capita)	4.2	***
Adjusted R Square	0.55	
Observations	56	

Source: EUROSTAT, WB calculations

Notes: Pooled regression of periods 2004–2008 and 2012–2016. Growth of GDP per capita is measured in PPS terms and over those two periods. DUMMY 2012–2016 is 1 if the period is 2012–2016, 0 otherwise. LN(GDP per capita) is the log of the initial GDP per capita, 2004 or 2012. DUMMY*LN(GDP per capita) is the interjection of the dummy variable with the variable LN(GDP per capita)

*** Significant at 1 percent.

Annex 2: Decomposition model of the growth of worker compensation per capita

Table 1. Decomposition of the growth of worker compensation per capita

	Average annual growth rate (%)		
	2000–2008	**2008–2012**	**2012–2016**
EU28			
Real worker compensation per capita	**1.49**	**-0.05**	**0.97**
Labour income share	-0.20	0.40	-0.24
TFP	0.66	-0.28	0.67
Capital output ratio	0.10	1.45	-0.61
Weekly hours per worker	-0.16	-0.27	-0.07
Employment share of labour force	0.48	-0.94	0.70
Working age population to total population ratio	-0.01	-0.29	-0.39
Northern Europe			
Real worker compensation per capita	**3.01**	**-0.01**	**1.45**
Labour income share	0.43	0.33	0.01
TFP	1.06	-0.29	0.69
Capital output ratio	-0.38	1.31	-0.40
Weekly hours per worker	-0.22	-0.28	-0.02
Employment share of labour force	0.68	-0.87	0.49
Working age population to total population ratio	0.08	-0.47	-0.57
Western Europe			
Real worker compensation per capita	**1.13**	**0.66**	**0.69**
Labour income share	-0.35	0.64	-0.39
TFP	0.69	-0.21	0.67
Capital output ratio	-0.12	0.80	-0.47
Weekly hours per worker	-0.18	-0.13	-0.06
Employment share of labour force	-0.05	-0.35	0.26
Working age population to total population ratio	-0.06	-0.25	-0.27
Central Europe			
Real worker compensation per capita	**4.55**	**-0.01**	**3.13**
Labour income share	-0.44	-0.86	0.16
TFP	2.53	-0.43	1.02
Capital output ratio	-0.88	2.82	-0.10
Weekly hours per worker	-0.14	-0.25	-0.08
Employment share of labour force	1.77	-0.84	1.71
Working age population to total population ratio	0.29	-0.21	-0.59

	Average annual growth rate (%)		
	2000–2008	2008–2012	2012–2016
Southern Europe			
Real worker compensation per capita	**1.78**	**-2.58**	**0.33**
Labour income share	0.73	-0.26	-0.15
TFP	-0.19	-0.80	0.40
Capital output ratio	1.11	2.96	-0.68
Weekly hours per worker	-0.19	-0.59	-0.19
Employment share of labour force	0.73	-2.48	0.91
Working age population to total population ratio	-0.16	-0.37	-0.40

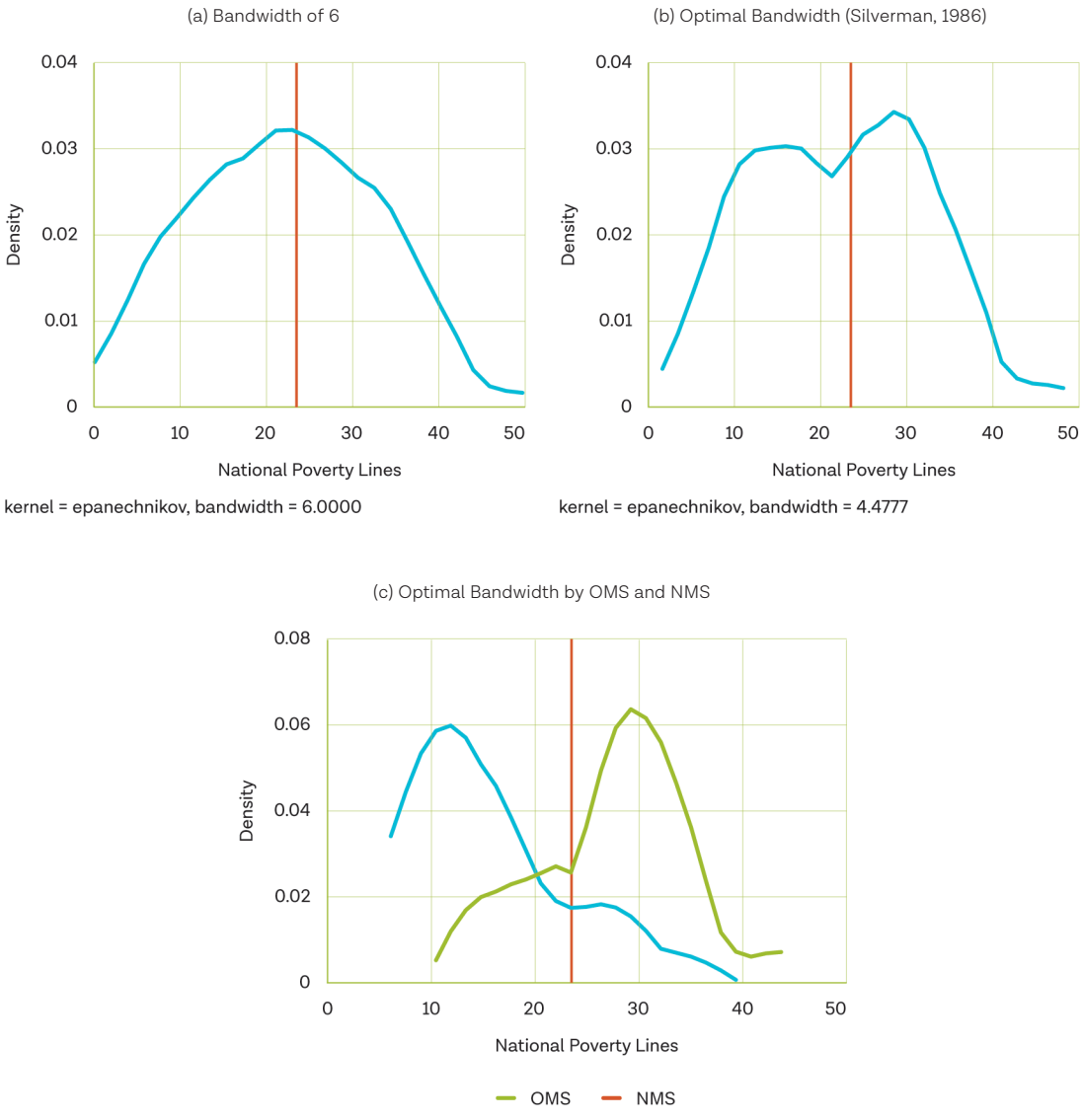
Source: WB staff calculations based on the Hall (2017) methodology

Annex 3:
Constructing an absolute poverty line for the EU

For the construction of an absolute poverty line for the EU Member States, this RER applies the method proposed by Jolliffe and Prydz (2016) to construct the new global lower and upper middle income class poverty lines, which uses the median value of the national official poverty lines of countries in this particular income class groups to derive the values of 3.2 and 5.5 USD-PPP per day. Using a similar logic in the context of the EU, we first obtain the national official poverty lines of each member state, determined as 60% of their median adult equivalized disposable income, and compute its median value in Euros PPS at 2011 prices. Figure 1(a) shows that the median and mean values are extremely close, and are 22.2 and 23.5 per day, respectively.

This exercise is a simple benchmark, but as Figure 1(b) and Figure 1(c) suggest, the National official poverty lines in Europe follow a bimodal distribution, with most OMS following the mode closer to 30 Euros PPS, while most NMS with a mode closer to 12 Euros PPS per day. This result reflects the duality of Europe and the importance of the convergence agenda to reduce these significant differences between countries.

Figure 1. Distribution of National Poverty Lines across EU Member States



Annex 4: Data and methodology

Growth, productivity and jobs. We model the CAP as a "treatment" to estimate ex post impacts based on historical panel data. This research approach is in contrast with ex ante impact evaluations of the CAP relying on simulation models. With regard to the assessment of the impact of the CAP treatment on growth of regional GDP and agricultural productivity, we applied the empirical estimation strategy developed by Esposti (2007). To estimate the impact on the outflow of labor out of agriculture, the estimation model of Olper, Raimondi, Cavicchioli and Vigani (2014) was followed.

Panel data. We constructed a unique EU-wide panel dataset covering 28 countries and 220 regions at NUTS2[75] level over the period 2004–2014. The dataset includes key economic variables, such as regional GDP growth, agricultural productivity and agricultural and non-agricultural employment. To calculate our dependent economic variables, we employed regional data at NUTS2[76] EU regional level coming from the Cambridge Econometrics Regional Database (CERD) based on Eurostat. In particular, we measured the GDP growth as the rate of regional GDP growth per worker deflated at 2005 constant price, the agricultural productivity as the change in regional agricultural value added per worker and the out-farm migration as the change in regional agricultural employment, corrected for the growth rate of the total labor force, following Larson and Mundlak (1997).

Controls. For the inclusion of other covariates in the growth regressions, we follow the method of Esposti (2007) and control for labor force growth, the share of the labor force employed in agriculture and population density. As for the out-farm migration regressions, following Olper et al (2014), we include population density, unemployment rate, the share of family labor involved in farm work, relative income, and relative labor[77]. Data for these variables stem from several sources, such as CERD, Eurostat and FADN[78].

Subnational poverty and inequality trends were produced using EU Survey on Income and Living Conditions (EU-SILC). The EU-SILC collects cross sectional and longitudinal data on income, poverty, social inclusion and living conditions. The agricultural households are a subset of the

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

[76] More specifically, it covers all CAP payment of the EAGF (European Agricultural Guarantee Fund) and EAFRD (European Agricultural Fund for Rural Development), and up until financial year 2006 to the recipients of the EAGGF (European Agricultural Guarantee and Guidance Fund).

[77] Relative income and relative labor are defined as the ratio of non-agricultural income (labor) to agricultural income (labor).

[78] The Farm Accountancy Data Network (FADN) is an instrument for evaluating the income of agricultural holdings and the impacts of the CAP. Launched in 1965, it consists of an annual survey carried out by the Member States of the European Union. FADN collects every year accountancy data from a sample of the agricultural holdings in the European Union. Derived from national surveys, the FADN is the only source of microeconomic data that is harmonized, i.e. the bookkeeping principles are the same in all countries. Holdings are selected to take part in the survey on the basis of sampling plans established at the level of each region in the Union. The survey does not cover all the agricultural holdings in the Union, but only those which due to their size could be considered commercial. This is a limitation of the data set. The methodology applied aims to provide representative data along three dimensions: region, economic size and type of farming. Currently, the annual sample covers approximately 80,000 holdings. They represent a population of about 5 million farms, covering approximately 90 percent of the total utilized agricultural area (UAA) and account for about 90 percent of total agricultural production.

households surveyed. The EU-SILC provides an unbalanced panel of subnational poverty and inequality measures at NUTS1 and NUTS2 from 2002 until 2014. Households in the EU-SILC were classified as having household members working in agriculture and non-agriculture jobs.

The EU Poverty Map allowed us to investigate the spatial correlation of CAP funds with monetary poverty at NUTS3 in 2011. The EU Poverty Map is the largest cross country effort to produce small area estimation of poverty in a methodologically and temporally consistent manner ever done. This work of made possible by DG REGIO, and was implemented by the World Bank and a consortium of European research centers, and close collaboration and coordination with the National Statistical offices of all member states.

CAP data. To construct our policy variables related to the CAP expenditures, we used data extracted from the Clearance Audit Trail System (CATS) database provided by the European Commission (DG AGRI). The CATS database compiles detailed annual data of all payments paid to the recipients under the CAP. Given the degree of detail within the CATS database, we were able to disentangle total CAP payments into several components, distinguishing within Pillar I support between decoupled and coupled payments, and Pillar II. Data for the construction of a dummy variable on regional Objective 1 status for the EU Structural Funds Programme were retrieved from documents of the European Commission[79]. The European Commission receives digitalized files each year from the Member States concerning details of all individual payments (in Euro) made to CAP recipients following Commission Regulation (EC) No 2390/1999 (as amended)[80]. The detailed information is compiled in a large database known as the Clearance Audit Trail System (CATS). We used a data extraction from CATS database provided by the European Commission (DG AGRI, 2017)[81]. The data are aggregated at NUTS1-3 regional level for the period 2004-14. We classify the CATS budget codes into four categories based on CAP policy measures: Pillar I payment, distinguishing between Pillar I coupled payments and Pillar I decoupled payments, and Pillar II payments. The classification is reported in the table below.

[79] For the period under investigation we used data coming from three programming periods. 2004–2006 data refer to the programming period 2000–2006 and stem from Commission Decision (1999/502/EC). The regions covered by Objective 1 in 2007–2013 are listed in Commission Decision (2006/595/EC). For 2014 year data comes from COMMISSION IMPLEMENTING DECISION (2014/99/EU). These Decisions are available on EUR-Lex, the database for European Law, http://eur-lex.europa.eu/homepage.html?locale=en.

[80] Commission Regulation (EC) No 2390/1999 of 25 October 1999 laying down form and content of the accounting information to be submitted to the Commission for the purpose of the clearance of the EAGGF Guarantee Section accounts as well as for monitoring and forecasting purposes (Official Journal L 295, 16.11.1999).

[81] The availability of CAP data at the NUTS3 has significantly improved, and much credit should be given to DG AG for investing on the creation of this Management Information System (MIS). Shucksmith et al (2005) report that at the time of their work DG Agriculture only had national level CAP information, and that any subnational CAP data had to be produced based on the Farm Accountancy Data Network (FADN). This is certainly no longer the case.

Table 1. Budget lines used to classify CAP measures

Budget line (2004-14)	Description	Pillar I	Pillar I coupled	Pillar I decoupled	Pillar II
0502	Intervention in Agricultural Markets	x			
050201	Cereals	x	x		
050202	Rice	x	x		
050203	Refunds on Annex 1 products *Direct payments for arable crops (2004/5 classification)*	x	x		
050204	Food programmes	x	x		
050205	Sugar and monetary measures	x	x		
050206	Olive oil	x	x		
050207	Textile plants	x	x		
050208	Fruit and vegetables	x	x		
050209	Products of wine-growing sector	x	x		
050210	Promotion *Tobacco (2004/5 classification)*	x	x		
050211	Other plant products	x	x		
050212	Milk and milk products *Direct aids of horizontal nature (2004/5 classification)*	x	x		
050213	Beef and veal**	x	x		
050214	Sheepmeat and goatmeat***	x	x		
050215	Pigmeat, eggs and poultry, bee-keeping and other animal products****	x	x		
050216	Sugar restructuring fund	x	x		
0503	Direct aids	x			
050301	Decoupled direct aids	x		x	
050302	Other direct aids	x	x		
050303	Additional amounts of aid	x	x		
050304	Ancillary direct aids (reliquats, small producers, agrimonetary aids, etc.)	x	x		
0504	Rural Development (by ex-EAGGF Guarantee Section)				x
050401	Rural development financed by the EAGGF Guarantee Section — Programming period 2000–2006 *RD in the EAGGF Guarantee Section (2004/5 classification)*				x
050404	Transitional instrument for the financing of rural develoment by the EAGGF Guarantee Section for the Newer MS (only in 2005–2006)				x
050405	Rural development financed by the EAFRD				x

Description of budget codes in italics refer to 2004/ 5 classification of budget lines. Also, some budget lines were recoded differently from 2006 onward. In particular:

* Budget line 050212 'milk and milk product' was coded 050301 in 2004–2005

** Budget line 050213 'beef and veal' was coded 050302 in 2004–2005

*** Budget line 050214 'sheep and goatmeat' was coded 050303 in 2004–2005

**** Budget 050215 'pigmeat, eggs and poultry, bee-keeping and other animal products' was coded 050304 in 2004–2005

Annex 5: Convergence of growth in agricultural value added per worker

We measure convergence trends in agricultural value added per worker on yearly data. We use a sample of 220 NUTS 2 and NUTS 1 (for UK and Germany) regions. In addition to the full sample of EU Member States (EU28), we also look at two sub-groups — the EU 15 (older Member States — OMS) and the EU 13 (Newer Member States — NMS) regions. We use two different measures of convergence. First, we estimate whether regions with a low agricultural value per worker grow faster than regions with a high agricultural value per worker: this is known as Beta-convergence. In other words, "are they catching up?". Second, we estimate how much the inequality in agricultural value per worker between regions is reduced over time: this is known as Sigma-convergence.

Regions are catching up: agricultural value added per worker is converging across the EU

We regress the level of agricultural value added per worker of the previous year on the current year's growth rate of the agricultural value added over the 1990–2014 period. Formally:

$$g_{it} = \alpha + \beta \log(y_{i,t-1}) + \varepsilon_{it}$$

where $g_{it} = \log(y_{i,t}) - \log(y_{i,t-1})$ is the yearly growth rate from t-1 to t.

The convergence coefficient is β. A negative and significant sign means convergence, namely regions with (initial) lower level of agricultural value added per worker, on average, growth faster than other regions. This is confirmed by the results reported below.

Table 1: Absolute and conditional convergence in agricultural value added per worker across EU Regions

	Absolute convergence (OLS)		Conditional convergence (LSDV)	
Dependent variable:	**EU28**	**EU15 vs EU13**	**EU28**	**EU15 vs EU13**
Growth in agr VA per worker	**(1)**	**(2)**	**(3)**	**(4)**
Log VA per worker (t-1)	-0.021***	-0.025***	-0.204***	-0.226***
	(7.35)	(7.63)	(11.84)	(11.17)
Log VA per worker (t-1) * NMS		-0.011***		0.063***
		(3.30)		(2.68)
R^2 (within for columns 3–4)	0.058	0.060	0.149	0.153
Obs.	5578	5578	5578	5578

Notes: t statistics based on clustered standard error by region in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Regressions in columns 1 and 2 of Table 1 are "absolute convergence regressions" following the basic prediction of the Solow (1956) growth model. The assumption is that the production technology is the same across regions, and so all regions should be converging in the long-run to the same agricultural labor productivity level. They are moving along the same production function. The results

show the presence of absolute convergence in the EU28 regions, though at different rates when considering EU13 and EU15 regions. On average, the EU13 (NMS) are converging at a higher rate with respect to EU15 (OMS) regions.[82]

The second set of regressions of Table 1 (columns 3 and 4) can be called "conditional convergence regressions". In the growth literature, this specification is the result of the so called "augmented Solow model", where the assumption of equal technology is relaxed (Barro and Sala-i-Martin, 1992). To account for this, we include region fixed effects[83] which capture the different steady state to which each region is converging. Under this assumption, we allow for different technologies and different steady states by region. We would expect even stronger convergence. This is what we find for the EU28 as a whole. However, OMS now converge faster than NMS.

A possible limitation of this B-convergence analysis is that the regressions are run on yearly data and do not consider growth averaged over a longer time span, e.g. a 5-year average. Working with yearly data could exacerbate the demand-driven business cycle effects. However, if we used multi-year averages, we would reduce the number of observations significantly. Demand-driven business cycle effects could be a problem for the absolute convergence regressions (columns 1–2), but less so for the conditional convergence regressions, as the cyclical component is partially absorbed by individual effects.

Inequality between regions in agricultural value added per worker is shrinking

While Beta-convergence focuses on the catching-up process between regions, Sigma-convergence simply refers to the reduction of disparities among regions over time. Clearly, the two concepts are interrelated. However, the Beta-convergence is a necessary, but not a sufficient condition for Sigma-convergence. This is because, for example, economies can converge towards different steady-states level (Quah, 1996). We measure Sigma-convergence as the coefficient of variation[84] of regional agricultural value added per worker[85].

Figure 2 shows the trends in the coefficient of variation calculated for the EU28, EU15 and EU13 NUTS 2 (or NUTS 1) regions for the period 1995–2015. For the EU as a whole, and for the two subgroups, Sigma-convergence is happening. The dispersion or inequality in agricultural labor productivity is shrinking. However, there are differences between the EU15 (OMS) and EU13 (NMS) regions, with the former being significantly lower at the outset, while the Sigma-convergence process in the NMS slows down considerable after 2005–2006. The 2007/8 crisis reverses the convergence trend in both OMS and NMS. In OMS, this reversal remains, while in the NMS, convergence resumes after the 2007 set-back.

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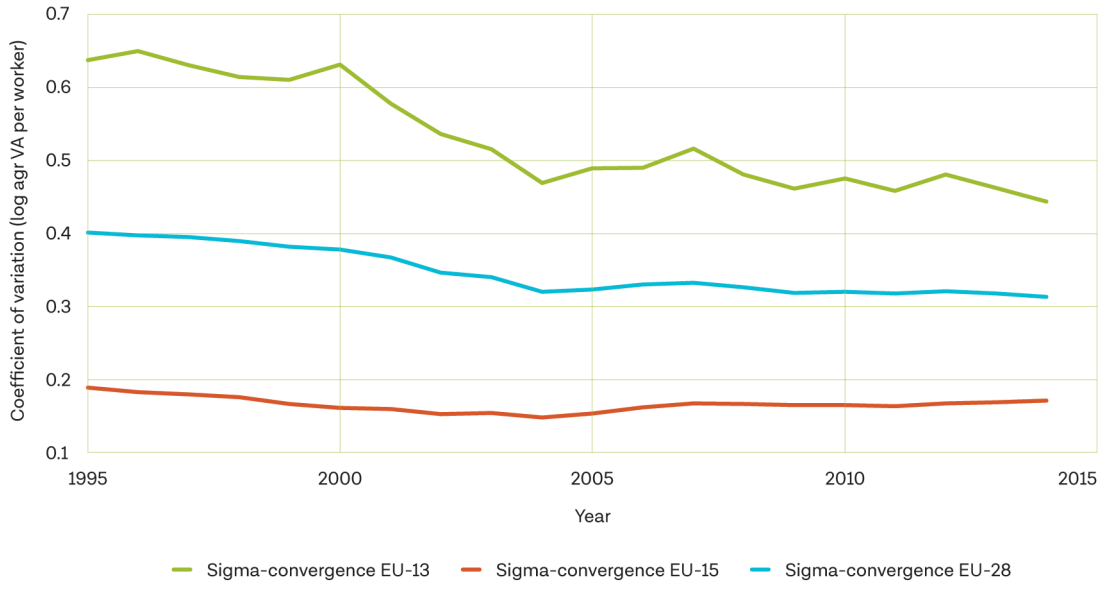
82 The estimate convergence coefficient for the EU15 is -0.025 (first line of column 2). Instead, the EU13 convergence coefficient results by the sum of the EU15 coefficient, plus the coefficient of the interaction between the initial level of value added per worker and the NMS dummy (Log VA per worker*NMS), reported in the second line of column 2. Hence, the EU13 convergence coefficient will be equal to -0.025 - 0.011 = -0.036. The same logic apply to results of column 4.

83 Note, all regressions include also year fixed effects.

84 The coefficient of variation is a normalized measure of dispersion: it is the ratio of the standard deviation over the mean. The coefficient of variation is often preferred to the standard deviation, because it is a relative measure, which is useful for comparing two distributions which have different means.

85 Other measures are discussed in Monfort, 2008.

Figure 2. Sigma-convergence in agricultural value added per worker across EU Regions



Annex 6:
Growth, productivity and outmigration of farm labor and the CAP subsidies

Table 1. Regional GDP per-capita growth and CAP payments

Dependent variable: Δ *GDP per worker*	EU 28				EU 15				EU 13			
Estimator: System-GMM	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
GDP per worker (t-1)	-0.033***	-0.033***	-0.032***	-0.032***	-0.041***	-0.039***	-0.039***	-0.043***	-0.028**	-0.022	-0.029**	-0.039
	(5.58)	(5.46)	(5.22)	(5.37)	(3.23)	(3.07)	(3.17)	(2.61)	(2.12)	(1.60)	(2.02)	(1.23)
Labour force growth (t-1)	0.003	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.009**	0.008**	0.009**	0.008*
	(1.41)	(1.43)	(1.46)	(1.43)	(0.08)	(0.00)	(0.07)	(0.03)	(2.66)	(2.45)	(2.26)	(1.95)
Agricultural labour share (t-1)	-0.096***	-0.096***	-0.094***	-0.094***	-0.169***	-0.168***	-0.166***	-0.176***	-0.032	-0.021	-0.038	-0.072
	(3.77)	(3.66)	(3.52)	(3.64)	(4.01)	(3.96)	(3.98)	(3.46)	(0.84)	(0.49)	(0.86)	(0.72)
Convergence regions (1, 0)	-0.011***	-0.011***	-0.010***	-0.011***	-0.003	-0.003	-0.002	-0.003	-0.004	-0.005	-0.006	-0.008
	(2.69)	(2.74)	(2.68)	(2.69)	(1.01)	(1.04)	(0.88)	(0.93)	(0.49)	(0.72)	(0.85)	(0.64)
Total CAP subsidies (t-1)	0.003				0.005				0.011			
	(0.90)				(1.23)				(1.46)			
Pillar 1 coupled (t-1)		0.016**				0.024***				-0.010		
		(2.26)				(3.84)				(0.35)		
Pillar 1 decoupled (t-1)		-0.002				0.000				0.024		
		(0.38)				(0.06)				(0.98)		
Pillar 2 subsidies (t-1)			-0.003				0.004				0.016**	
			(0.24)				(0.36)				(2.45)	
Total CAP subsidies_High (t-1)				0.003				0.005				0.01
				(0.91)				(1.29)				(0.77)
Total CAP subsidies_Low (t-1)				0.005				0.013				0.01
				(0.73)				(1.56)				(0.33)
Observations	1981	1981	1981	1981	1525	1525	1525	1525	456	456	456	456
AR (1) p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) p-value	0.330	0.362	0.340	0.331	0.086	0.106	0.090	0.085	0.091	0.069	0.083	0.084
Hansen (Test overid.) p-value	0.265	0.404	0.252	0.263	0.990	0.993	0.992	0.986	0.637	0.869	0.620	0.988

Notes: (1) Absolute t statistics based on clustered standard error at regional level in parentheses; (2) Each regression include also time fixed effects; (3) Symbols: * p<0.10, ** p<0.05, *** p<0.01

Table 2. Regional VA per-worker growth in agriculture and CAP payments

Dependent variable: ***Δ VA-agr per worker***	**EU 28**				**EU 15**				**EU 13**			
Estimator: System-GMM	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Agr VA per worker (t-1)	-0.119***	-0.097***	-0.123***	-0.112***	-0.138***	-0.106***	-0.176**	-0.112***	-0.146**	-0.144**	-0.130**	-0.104
	(4.98)	(5.49)	(3.71)	(5.19)	(3.72)	(4.13)	(1.99)	(2.88)	(2.63)	(2.23)	(2.25)	(1.58)
Labour force growth (t-1)	0.007	0.006	0.008	0.007	-0.008	-0.01	-0.004	-0.011	-0.038	-0.039	-0.037	0.023
	(0.75)	(0.61)	(0.92)	(0.79)	(0.75)	(0.91)	(0.40)	(1.08)	(1.57)	(1.63)	(1.66)	(1.33)
Population density (t-1)	-0.001	0.002	-0.001	-0.002	0.001	0.005	0.002	0.001	0.012	0.014	0.012	-0.001
	(0.20)	(0.37)	(0.25)	(0.31)	(0.14)	(0.78)	(0.31)	(0.17)	(0.33)	(0.39)	(0.39)	(0.05)
Convergence regions (1, 0)	-0.144***	-0.113***	-0.146***	-0.125***	-0.100***	-0.086***	-0.108**	-0.079***	-0.199***	-0.193**	-0.154**	-0.095
	(4.28)	(4.49)	(3.36)	(4.37)	(3.14)	(3.46)	(1.99)	(3.56)	(2.84)	(2.51)	(2.21)	(1.46)
Total CAP subsidies (t-1)	0.075***				0.073***				0.370***			
	(3.59)				(3.25)				(3.26)			
Pillar 1 coupled (t-1)		0.010				-0.003				0.496**		
		(0.32)				(0.12)				(2.14)		
Pillar 1 decoupled (t-1)		0.110***				0.115***				0.761**		
		(16.53)				(13.45)				(2.04)		
Pillar 2 subsidies (t-1)			0.116*				0.112**				0.368**	
			(1.82)				(2.48)				(2.51)	
Total CAP subsidies_High (t-1)				0.077***				0.071***				0.249***
				(3.75)				(2.87)				(4.10)
Total CAP subsidies_Low (t-1)				0.251***				0.198***				0.629***
				(3.75)				(2.91)				(4.03)
Observations	2000	2001	2000	2000	1544	1545	1544	1544	456	456	456	456
AR (1) p-value	0.000	0.000	0.001	0.000	0.001	0.000	0.011	0.001	0.000	0.000	0.000	0.000
AR (2) p-value	0.661	0.518	0.358	0.683	0.998	0.840	0.710	0.999	0.299	0.206	0.453	0.177
Hansen (Test overid.) p-value	0.268	0.265	0.288	0.272	0.351	0.381	0.336	0.986	0.900	0.882	0.851	1.000

Notes: (1) Absolute t statistics based on clustered standard error at regional level in parentheses; (2) Each regression include also time fixed effects; (3) Symbols: * p<0.10, ** p<0.05, *** p<0.01

Table 3. Migration of agricultural labor and CAP payments

Dependent variable: Out-farm migration	EU 28				EU 15				EU 13			
Estimator: LSDV	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Relative income (t-1)	0.075***	0.077***	0.069***	0.075***	0.046***	0.051***	0.047***	0.049***	0.148***	0.155***	0.133***	0.148***
	(5.30)	(5.43)	(5.44)	(5.32)	(3.15)	(3.35)	(3.90)	(3.23)	(4.80)	(4.89)	(4.73)	(4.77)
Relative labour (diff)	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(5.06)	(5.07)	(5.08)	(5.07)	(3.97)	(3.96)	(3.99)	(3.97)	(3.77)	(3.78)	(3.82)	(3.76)
Population density (t-1)	0.509**	0.454*	0.587***	0.516**	0.266***	0.180*	0.391***	0.276**	0.712	0.61	0.829	0.712
	(2.08)	(1.78)	(2.69)	(2.08)	(2.79)	(1.77)	(3.65)	(2.60)	(0.87)	(0.75)	(1.09)	(0.87)
Unemployment (diff)	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003*	-0.004*	-0.004*	-0.003*
	(3.27)	(3.12)	(3.21)	(3.24)	(3.10)	(2.83)	(3.13)	(3.05)	(1.71)	(1.89)	(1.74)	(1.71)
Family work (t-1)	-0.032***	-0.031**	-0.035***	-0.035***	-0.030*	-0.029*	-0.032*	-0.030*	-0.047**	-0.036	-0.049**	-0.047*
	(2.61)	(2.56)	(2.83)	(2.87)	(1.72)	(1.68)	(1.91)	(1.82)	(2.20)	(1.67)	(2.12)	(1.89)
Convergence regions	0.026**	0.025**	0.024**	0.026**	0.034***	0.033***	0.031***	0.034***	-0.009	-0.008	-0.011	-0.009
	(2.43)	(2.38)	(2.31)	(2.45)	(3.35)	(3.32)	(3.29)	(3.36)	(0.33)	(0.28)	(0.41)	(0.33)
Total CAP subsidies (t-1)	-0.014***				-0.009***				-0.056			
	(4.05)				(3.40)				(1.21)			
Pillar 1 coupled (t-1)		0.017				0.029**				-0.181*		
		(1.30)				(2.00)				(1.71)		
Pillar 1 decoupled (t-1)		-0.017***				-0.013***				-0.144*		
		(4.20)				(3.66)				(1.82)		
Pillar 2 subsidies (t-1)			-0.094***				-0.098***				0.008	
			(3.38)				(2.95)				(0.10)	
Total CAP subsidies_High (t-1)				-0.013***				-0.009***				-0.056
				(4.18)				(3.64)				(1.20)
Total CAP subsidies_Low (t-1)				-0.051*				-0.095*				-0.056
				(1.70)				(1.93)				(0.79)
R square (within)	0.435	0.437	0.433	0.436	0.445	0.449	0.445	0.446	0.482	0.486	0.479	0.482
Observations	1739	1739	1739	1739	1351	1351	1351	1351	388	388	388	388

Notes: (1) Absolute t statistics based on clustered standard error at regional level in parentheses; (2) Each regression include also region and time fixed effects; (3) Symbols: * p<0.10, ** p<0.05, *** p<0.01

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