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Comparative Analysis of Factor Markets for Agriculture across the Member States

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The Impact of CAP Reforms on Farm Labour Structure

ABSTRACT

The labour force engaged in the agricultural sector is declining over time, and one can observe the reallocation of labour from family members to hired workers. Using farm-level data, this paper analyses the on-farm labour structure in Greece and assesses the factors driving its evolution over the period 1990-2008. The impact of agricultural policies and farm characteristics is examined in a dynamic panel analysis. Family and hired labour are found to be substitutes rather than complements, while agricultural support measures appear to negatively affect demand for both family and hired labour. Decoupled payments and subsidies on crops are found to have a significant impact on both sources of labour, as well as subsidies for rural development that do not favour on-farm labour use. The paper also finds that structural labour adjustments are the result of farm characteristics, such as farm size and location. The results are robust to various estimation techniques and specifications.

JEL Classification: J43, Q18, Q12

Keywords: Agricultural employment, agricultural policy, farm households

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Contents

1. Introduction	1
2. Farm labour force	2
2.1 Hired labour: Migrant farm workers	4
3. Theoretical framework	6
4. Methodology	7
4.1 Empirical model	7
4.2 Data and descriptive statistics	8
5. Empirical results	9
6. Conclusion.....	12
References	13

List of Figures and Tables

Figure 1. Agriculture and the farm labour force in the Greek economy.....	3
Figure 2. Development of farm output and inputs in Greek agriculture	3
Figure 3. Farm labour and income in the Greek agricultural sector.....	4
Figure 4. Farm size distribution in Greece.....	8
Table 1. Evolution of agricultural employment by age and working time in Greece, 2000-2007 (%)	4
Table 2. Nationality of migrant farm workers in Greece	5
Table 3. Descriptive statistics of Greece's agricultural sector	9
Table 4. Empirical estimations, Fixed-effects.....	10
Table 5. Empirical estimations, GMM estimations	11

The Impact of CAP Reforms on Farm Labour Structure

Eleni A. Kaditi*

Factor Markets Working Paper No. 63/August 2013

[F]arming has developed so that farmers cannot live without support, yet the support does not deliver the proximate objectives – to improve farm incomes and maintain farm employment.

Jambor & Harvey (2010)

1. Introduction

The Common Agricultural Policy (CAP) has been reformed on many occasions, evolving into a multifunctional policy that aims, inter alia, at achieving economic efficiency, strengthened competitiveness as well as social and territorial balance. The CAP has effectively moved away from supporting commodity prices to supporting producers' income and rural development in order to ensure sustainable farming, to contribute to farms' growth or survival and to provide basic public goods in line with consumer concerns (OECD, 2011). Thus, the CAP plays a significant role in fostering prosperity in rural economies, and policy-makers argue that it is of vital importance for maintaining the farm labour force (European Commission, 2005). However, this policy has been strongly criticised for its ineffectiveness and its inefficiency in achieving its objectives.

For instance, agriculture in Greece is fully regulated by the CAP and remains the most heavily subsidised sector, yet the rural economy has undergone significant changes over the last two decades and the agricultural sector has experienced a sharp decline in its relative size as well as structural labour adjustments. Greek agriculture was traditionally dominated by family farms with a near absence of hired labour. A decline in both the absolute level and the relative importance of farm labour is currently observed, accompanied by the reallocation of labour from family members to off-farm workers (Labrianidis & Sykas, 2010). The continuous CAP reforms have essentially resulted in lower competitiveness, reduced farm income, and greater demand for hired labour (Demoussis, 2003; Kasimis & Papadopoulos, 2005).

Along with the gradual implementation of more decoupled payments, four major driving factors have been affecting the Greek farm labour structure as well. First, the restructuring of labour markets has been associated with the expansion of non-farm rural employment sectors (e.g. tourism), which has increased the alternative employment opportunities of farmers and endorsed their pluri-activity (Kasimis et al., 2000). Second, a dual labour market was developed leading to the division of the labour force and the segmentation of labour markets into the so-called 'primary' and 'secondary' (Piore, 1979). In the former, workers are well paid and benefit from full-time employment and security, whereas the 'secondary' market is characterised by flexibility, seasonality, low wages and uncertainty (Labrianidis & Sykas, 2009). Third, the roles of family-farm members have been redistributed due to the entrance of women in non-farm employment, and labour deficiencies

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have also been observed owing to the unwillingness of young native-born Greeks to work in agriculture and the retirement of the older farmers (Cavounidis, 2006). Finally, migrant labour complemented family labour by filling seasonal deficits and allowing for a more flexible combination of capital and labour in the production process (King, 2000; Jentch, 2007; Kasimis, 2008).

A wide range of approaches and disciplines have been used to examine such structural changes in farm labour markets and the factors that affect labour decisions. Various studies use the theoretical framework of the farm household model to analyse the farmers' time allocation (off-farm labour participation or part-time labour) (Kimhi, 1994 and 2000; Corsi & Findeis, 2000; El-Osta et al., 2008). A few studies have simultaneously examined the demand for hired labour and the supply of family labour (Huffman, 1991; Benjamin, 1996; Benjamin et al., 1996; Benjamin & Kihmi, 2006). Job creation and destruction models are employed to explain intra-sectoral job flows (Bojnec & Dries, 2005; Dries et al., 2010). Considerably less studies use these models to assess the impact of agricultural policy reforms on farmers' behaviour and the different labour market participation strategies (Weiss, 1997; Ahearn et al., 2006; Hennessy & Rehman, 2008). It is generally concluded that in developed countries the share of hired labour in total farm labour has increased over the last decades (e.g. Blanc et al., 2008). The key factors contributing to the reduction of family farming are the agricultural support measures and migrant labour. However, it is evident that their impact on the farm labour structure is complex and difficult to predict. For instance, the institution of family farming is competitive because of the lower transaction costs within families compared with hired labour, so that the use of family labour may be preferred (e.g. Schmitt, 1991). In any case, the introduction of decoupled payments is likely to decrease the incentives to produce and therefore may have negative effects on the use of production factors (e.g. Corsi, 2007; Swinnen & Van Herck, 2010).

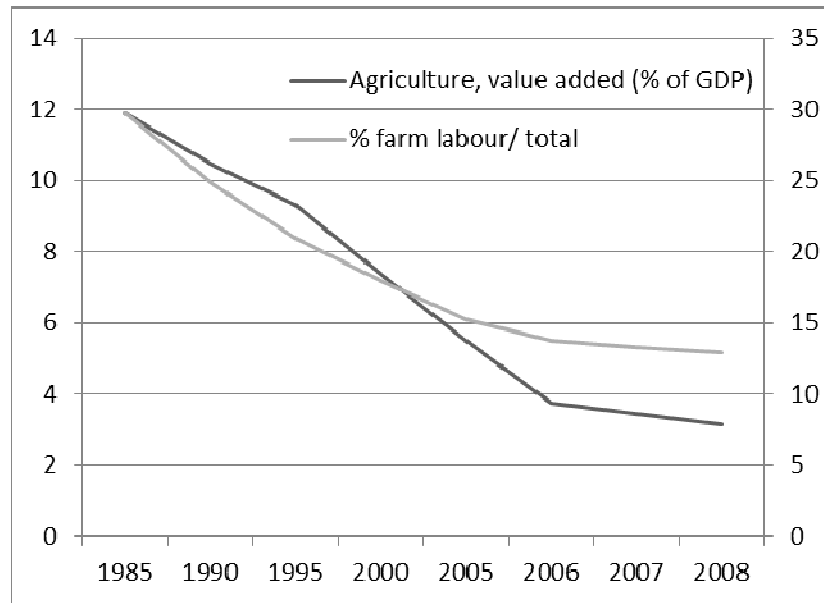
Using FADN data (Farm Accountancy Data Network)¹ at the farm-level, the objective of this paper is to analyse the on-farm labour structure and to assess the factors driving its evolution in Greece over the period 1990-2008. Emphasis is given to agricultural policies, providing indications as to the contribution of migration to the shifts in labour structure. The factors that influence farms' decisions concerning the use of both family and hired labour will also be examined, identifying the agricultural support measures that have an impact on the different types of on-farm labour.

The paper is organised as follows. Section 2 provides an overview of changes in farm labour, analysing labour adjustments that have occurred in the agricultural sector over the last years, and focusing on the increasing presence of migrant farm workers. Section 3 describes the theoretical framework used in the analysis and section 4 provides details in terms of the empirical model, the farm-level data and their descriptive statistics. The empirical estimates are presented in section 5, and section 6 concludes.

2. Farm labour force

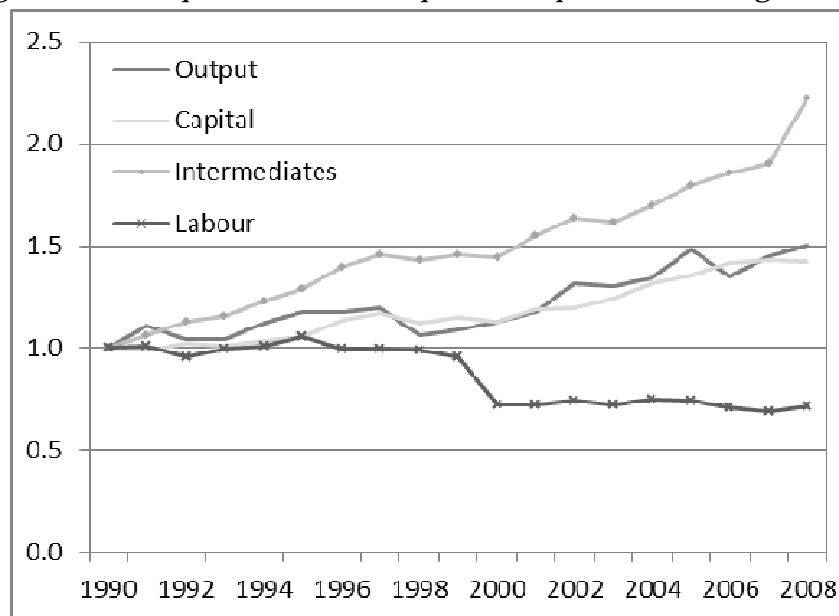
Over the last four decades, the contribution of Greek agriculture to the national gross domestic product (GDP) fell from 12% in 1985 to less than 4% in 2008, while the number of persons employed in this sector constantly declined (Figure 1). The fundamental structural problems of the sector are the small average farm size, the demographic ageing of farmers, the low level of annual work units (AWU) per farm and the extensive presence of farm holdings in Less Favoured Areas (LFAs).

¹ The Farm Accountancy Data Network is an instrument for evaluating the income of agricultural holdings and the impacts of the CAP. For more information, see http://ec.europa.eu/agriculture/rica/concept_en.cfm.

Figure 1. Agriculture and the farm labour force in the Greek economy

Source: World Bank, World Development Indicators (WDI).

Factors such as geographical relief, lack of adequate spatial organisation of land use and adherence to traditional management models (inheritance and property) have resulted in small scattered holdings. The average farm size is about 5 hectares (Ha), even if the number of large farms has been increasing at a rate higher than the one for smaller farms. Moreover, 56% of cultivable land is located in the plain and the remainder is in (semi-) mountainous districts, while more than 60% of the land is located in LFAs. Figure 2 illustrates an increasing trend in farm output and use of inputs, although labour input has declined over the last years. Technological progress has resulted in an increased use of material inputs and capital, so that farm productivity has increased. The decline in the farm labour force can therefore be attributed to the reduced growth in demand for farm output and the higher productivity.

Figure 2. Development of farm output and inputs in Greek agriculture

Sources: Eurostat and FADN.

The structural labour adjustments can also be explained by the higher educational level observed in rural areas that resulted in fewer farmers' children willing to succeed their parents. Out-migration of young people, along with in-migration of retirees in rural areas, has led to significant ageing of rural population. At the same time, women are being integrated into the labour market and the engagement of hired labour increases. Consequently, the majority of farmers are aged between 45-64 years old, and more than 35% are over 65 years. Only 10% are full-time farmers and the majority are spending less than 25% of their work time on on-farm activities (Table 1).

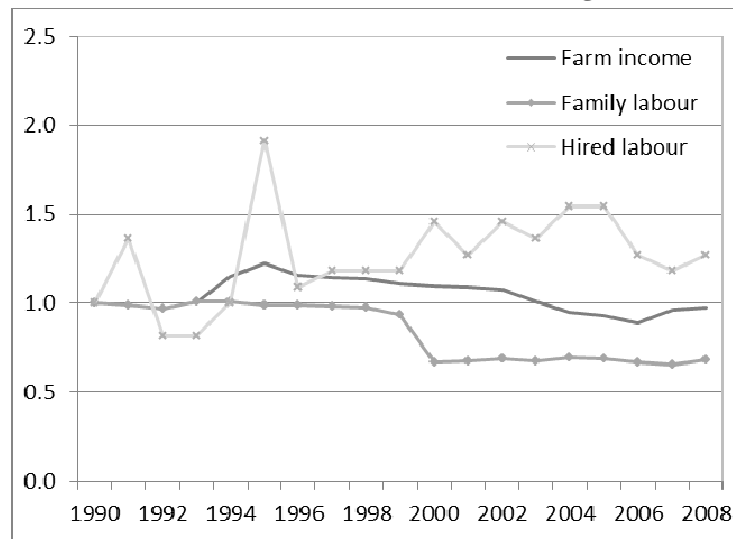
Table 1. Evolution of agricultural employment by age and working time in Greece, 2000-2007 (%)

Age	2000	2005	2007	Work time	2000	2005	2007
<i>Less than 35 years</i>	8.72	6.82	7.03	<i>Less than 25%</i>	49.44	49.96	53.37
<i>35-44 years</i>	15.38	15.19	14.95	<i>> 25 - < 50%</i>	18.81	19.34	18.49
<i>45-54 years</i>	20.21	20.56	20.87	<i>> 50 - < 75%</i>	14.11	14.82	13.40
<i>55-64 years</i>	24.65	20.61	19.79	<i>> 75 - < 100%</i>	5.18	4.84	4.14
<i>Above 65 years</i>	31.04	36.82	37.36	<i>100%</i>	12.46	11.04	10.60

Source: Eurostat.

As the share of part-time farmers increases over time, the phenomenon of pluriactivity of family members has grown rapidly and about 70% of the farm labour force has a second income – from small-scale businesses and tourist activities. Unpaid family labour is rather common, while farm income declines (Figure 3). Between 1991 and 2008, total farm labour input decreased by almost 17%, while the share of hired labour accounts for more than 10% of total farm labour force in 2008. However, there is a notable difference with respect to the types of labour: while family labour decreased by 26%, hired labour increased by 81%.

Figure 3. Farm labour and income in the Greek agricultural sector



Sources: Eurostat and FADN.

2.1 Hired labour: Migrant farm workers

The above-mentioned trends of declining family involvement in farm labour can be partially attributed to migrant workers. Farm labour deficits had a negative impact on the competitiveness of Greek agriculture, yet migrant workers ensured the growth and survival of farms by means of restraining production costs. The arrival of migrants from both developing and CEE (Central and Eastern European) economies has generated demand for labour and immigrants have nearly become the exclusive contributors of hired labour in Greek agriculture (Kasimis, 2005).

During the 1980s, the first Africans and Asians (Pakistanis, Indians and Egyptians) as well as Polish migrant workers entered Greece. In the early 1990s, the first massive waves of Albanian immigrants arrived, and an extensive back and forth movement of immigrants between Greece and neighbouring countries occurred. Until the first regularisation programme in 1998, migrant workers were staying in the country illegally and they preferred to live in rural areas so as not to be arrested and deported (Cavounidis & Hadjaki, 2000; Kasimis, 2005). Bilateral agreements on the entrance of migrants as 'guest-workers' were implemented to avoid any farm-labour deficits, yet many unauthorised immigrants stayed in the country after the expiration of their work permit or visa. The accession of Bulgaria and Romania to the EU has also lifted mobility barriers, so that the share of migrants coming from these countries has increased (Table 2). In 2011, about 10% of all immigrants were working in agriculture; they have thus become the main contributors of hired labour in the Greek sector accounting for more than 80% of farm workers.

Table 2. Nationality of migrant farm workers in Greece

	1991			2001			2011		
	<i>Total</i>	<i>Agriculture</i>	<i>% of migrant workers in the agri sector</i>	<i>Total</i>	<i>Agriculture</i>	<i>% of migrant workers in the agri sector</i>	<i>Total</i>	<i>Agriculture</i>	<i>% of migrant workers in the agri sector</i>
Albanian	3,303	215	6.51	99,648	3,133	3.14	188,593	24,152	12.81
Bulgarian	503			6,892	461	6.69	29,484	3,815	12.94
Romanian	431			3,280	125	3.82	21,758	3,443	15.82
Georgian				4,068			19,242	410	2.13
Pakistani				2,764			15,235	1,878	12.33
Polish	3,447	144	4.18	7,312			6,407	224	3.50
Egyptian				3,162	359	11.36	6,102	529	8.67
Armenian				1,003			4,919	350	7.12
Indian				1,886			2,914	228	7.82
Serbian				1,221			2,816	94	3.34
EU-10	4,525	144	3.18	18,975	586	3.09	61,406	7,696	12.53
EU-15	4,740	216	4.56	8,046	354	4.40	10,055	668	6.64
Former USSR	1,723			16,662			41,181	760	1.85
Other	15,871	933	5.88	14,565	138	0.95	37,829	457	1.21
TOTAL	33,609	1,652	4.92	166,929	4,571	2.74	366,053	36,462	9.96

Source: ELSTAT, Labour Force Surveys.

Migrant farm workers have covered seasonal labour needs, and contributed to an increased farm output, keeping wages and commodity prices low with a more efficient use of production factors (Kasimis & Papadopoulos, 2005). They also help farmers to implement new production strategies. That is, migrant workers help active farmers to expand their holdings, intensify production and diversify their cultivations. Migrants offer an opportunity for farm operators to avoid any heavy and dangerous tasks and to focus on management and marketing activities, while farming women can seek off-farm employment or focus more on the household (Kasimis et al., 2010). In addition, they enable farmers who had abandoned their land to re-enter the agricultural sector and maintain their land, keeping simultaneously their off-farm activities, thus increasing their income sources (Lambrianidis & Sykas, 2009). Owing finally to the unwillingness of highly skilled young native-born Greeks to work in agriculture, immigrants do not appear to substitute for local workers (Papadopoulos, 2008).

Consequently, migrant farm workers address three structural needs of the Greek agricultural sector: the labour deficits in rural areas that have resulted from the restructuring of the sector and rural economy, the social rejection of life and labour in rural areas by the younger generation and the increased opportunities of the rural population for off-farm employment.

Thus, the presence of migrants willing to take on work for low wages appears to have contributed to the transition from family farm labour to hired labour, thereby implying important shifts in the farm labour structure.

3. Theoretical framework

Farm labour decisions depend on factors with an impact on the marginal rate of substitution between labour and income and on labour productivity. Labour decisions can also be affected by the conditions prevailing in agricultural markets as well as by the agricultural support measures (Weiss, 1997). It is assumed that the decision to hire farm labour and the allocation of family labour to farm and off-farm activities is made jointly (Benjamin et al., 1996). Farm households undertake a wide variety of gainful activities, including both on-farm (non-) agricultural activities and off-farm work so as to diversify their income sources. Farms may further decide to hire workers aiming at the maximisation of the household utility, which depends on leisure and consumption.²

The higher the number of family members in a farm, the less dependence on hired labour. Larger farms may be more dependent on hired labour, while family and hired farm labour are characterised by different incentives, different types of activities and different skill levels. Specialised workers may be hired, and farms operators may be responsible for the management tasks. Thus, their marginal productivity may deviate, while a structural improvement on the farm, which implies a higher productivity or a larger scale of production, is associated with a higher demand for (hired) labour. In this case, hired labour is assumed to be a complement to family labour and off-farm labour is less likely for family members. However, hired labour may substitute for family labour. If family and hired labour are considered as perfect substitutes, the wage of hired workers is assumed to be equal to the off-farm wage of the family members. If imperfect substitutability is assumed, hired labour is treated as a heterogeneous farm input in agricultural production (Jacoby, 1993).

In terms of agricultural payments, the impact of CAP reforms on farm labour markets is not clear *a priori*. Receiving a farm subsidy that is conditional on farm production encourages farm work by family members and thus reduces the demand for hired labour. Yet, direct payments coupled with certain production activities may induce additional employment if more (hired) workers are required to maintain these activities. If direct payments are fully decoupled, either they will not affect labour use or they may result in farmers reducing family labour – i.e. supply of off-farm labour will increase (Ahearn et al., 2006; Hennessy & Rehman, 2008). The impact of decoupled payments on hired labour is also ambiguous and depends on whether family and hired labour are substitutes or complements of one another. Moreover, rural development payments may increase labour use assuming higher output prices or reduced production costs, making it essentially easier to hire (or fire) workers. An empirical investigation is therefore necessary to assess the impact of agricultural payments on the labour structure of farms.

The present analysis is based on a neoclassical labour demand model such as is used in Hamermesh (1993), and labour demand of farm i is assumed to be denoted by:

$$L_i^D = L^D(p, w, r, s, T_i, H_i) \quad (1)$$

where p is the vector of output price, w is the wage rate, r is the vector of other input prices, s denotes subsidies, T is for technology and H is for the farm-specific characteristics. The output produced by the farm household, and thus the labour demand, depends on: i) the production technology, ii) the expected profits from selling the produced output – i.e. output prices and iii) the relative prices of the production factors – i.e. input prices (Kancs et al., 2009). On-farm labour is therefore dependent on the production function, which imposes a constraint on the household's maximisation of utility (Ahituv & Kimhi, 2002).

² Consumption is a function of the family's financial resources, which consist of income derived from on- and off-farm activities.

4. Methodology

4.1 Empirical model

Labour use of farm i at time t can be represented empirically by the following baseline equation:

$$l_{it} = \beta_0 + \beta_1 S_{it-1} + X'_{it}\beta + u_{it} \quad (2)$$

Agricultural payments are assumed to be predetermined instead of strictly exogenous, so that lagged levels are used as independent variables – and as instruments in the estimation methods presented below. To resolve the problem of endogeneity bias due to farm heterogeneity or selection bias, farm- and time-fixed effects are used. That is, the disturbance term is specified as a two-way error component model:

$$u_{it} = \alpha_t + \mu_i + \varepsilon_{it} \quad (3)$$

Farm heterogeneity is denoted by μ_i , which is the unobserved or fixed farm-specific effect; while year-specific dummies, α_t , are included to account for common trends in labour use. Equation (2) is therefore equivalent to a Difference-in-Differences (DiD) estimation (Olper et al., 2012).

The dependent variable lagged by one period is also introduced as an explanatory variable. The significance of this term will indicate that labour demand at farm-level is a dynamic one. The equation to be estimated in this case is given by:

$$l_{it} = \beta_0 + \lambda l_{it-1} + \beta_1 S_{it-1} + X'_{it}\beta + \alpha_t + \mu_i + \varepsilon_{it} \quad (4)$$

Parameters λ and β are to be estimated, and a set of additional explanatory variables are used in a dynamic panel-data analysis to determine the significance of agricultural payments for farm family and hired labour, taking into account important factors related to farm characteristics, such as specialisation and location.

In terms of agricultural support measures, *Total subsidies*, *Subsidies on crops*, *Subsidies on livestock*, *Support for rural development*, *Coupled payments* and *Decoupled payments* are used as instruments for the Common Agricultural Policy. A dummy variable for the Fischler CAP reform is also included to isolate the structural effects of decoupling that cannot be captured by a mere change of transfers measured in monetary values. This is equal to one after 2005 and zero otherwise. As already mentioned, the impact of these variables used for subsidies on labour demand is not clear *a priori*.

Farm-specific variables likely to be associated with higher labour use are introduced in what follows.³ The *Labour cost* is expected to have a negative impact on labour demand, as labour is considered to be a normal good. The impact of the cost for hired labour on family labour is expected to be positive, assuming the two labour inputs are substitutes. The cost of labour is measured by the ratio of wages over the hours of hired workers. The *Land cost* is likely to negatively affect labour demand, as this is a main input for farm production. This cost is measured as the rental per hectare of rented land for those farms using external land. The *Output cost* may be positively related to labour use, as higher sales revenue could be associated with farm expansion. This variable is the ratio of farms' sales revenue over the production quantity. As larger farms and farms using irrigation are likely to use more labour, *Size* indicates each farm's economic size expressed in European Size Units (ESU), and *Technology* is proxied by the UAA in hectares under irrigation. *Specialisation* is likely to denote higher seasonal labour needs, as crop farms rely more on seasonal labour and livestock farms hire workers on a permanent basis. The standard groups of farms determined according to their specialisation and provided by FADN are used for this parameter. The

³ The farm-specific explanatory covariates were chosen following Dupraz et al. (2010). All cost variables are also normalised using output, while agricultural support measures are divided by ESU to avoid capturing size effects.

localisation variable is a dummy parameter on *LFA*, while *Rented land* is the share of rented land in total UAA. Both parameters are likely to be negatively related to labour use. Each farm's operators' *Age* is also included, as older farmers are expected to be more experienced, but they need more help in operating their farms.

Equation (2) is estimated using fixed-effects estimators. An *F*-test indicated that fixed-effects were significant in all specifications. The estimation approach may then capture any unobserved farm-level heterogeneity and measurement error that is constant over time.

To estimate equation (4), a Generalised Method of Moments (GMM) procedure is used, following Arellano & Bover (1995) and Blundell & Bond (1998). Within many panels and few periods, estimators are constructed by first-differencing to remove panel-level effects and using instruments to form moment conditions. In this case, moment conditions are based on both differences and levels. In particular, a system estimator that uses moment conditions in which lagged differences are used as instruments for the level equation in addition to the moment conditions of lagged levels as instruments for the differenced equation is employed. The Windmeijer (2005) biased-corrected two-step robust standard errors are reported.

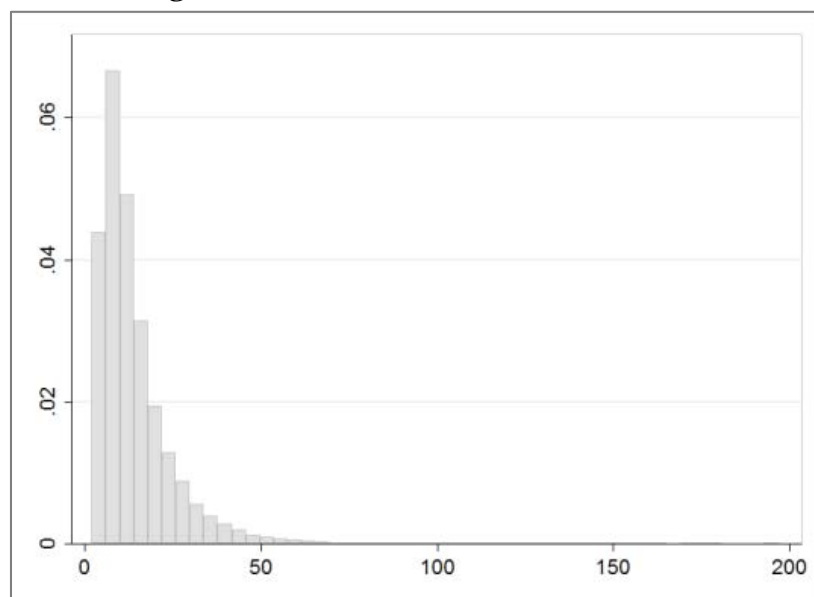
Finally, the direct implication of heterogeneous farm labour is that the notion of a single demand curve for farm labour should be abandoned. On-farm demand of family and hired labour is therefore considered separately and is measured in AWU.

4.2 Data and descriptive statistics

Data for 19 consecutive years (1990-2008) were retrieved for Greece from the FADN dataset, which includes physical, structural, economic and financial data for about 5,000 farms. An unbalanced panel dataset is used for a maximum of 91,357 observations. Statistical recording of migrant farm workers is impeded by their geographical mobility and the seasonal character of their employment; yet as already shown migrant workers have nearly become the exclusive contributors of hired labour in Greek agriculture. Thus, it is here assumed that data on hired labour can be used as an indication of migrant farm labour as well.

The size distribution of farms in Greece appears in Figure 4. An almost unimodal distribution characterises agriculture, as concentration in small farms is observed. The small size of farms is a persistent phenomenon in farming structure, so that family labour may be the most important cost factor for small farms.

Figure 4. Farm size distribution in Greece



Source: FADN.

Descriptive statistics for the variables included in the empirical estimations are shown in Table 3. It appears that farms operate on average 10 Ha of UAA, land operated by 53% of the farmers is between 5 and 20 Ha and 11% of the producers operate in a farm that is larger than 20 Ha. Labour input is about 1.66 AWU, while hired and family labour inputs are on average 1.45 and 0.21 AWU, respectively. Farms employ about 3,650 labour hours, 88% of which come from family labour. The share of hired labour is about 12%, and 47% of the sample farms do not employ hired workers. Over the examined period, crop payments were the main type of subsidies received by the sample farm, reaching on average €2,770 per farm per year, and the payments for rural development accounted for the smallest share (€190 on average). Moreover, 71% of the sample farms receive subsidies of value lower than or equal to €5,000, while the average share of subsidies is about 27% of the farms' revenue. Sample farms' average annual output totals around €19,500 per year. Finally, almost 57% of the farms are located in less favoured areas, and the average farmer's age is 50 years.

Table 3. Descriptive statistics of Greece's agricultural sector

	Mean	SD	Min	Max
Family labour, AWU	1.446	0.614	0.040	5.982
Hired labour, AWU	0.212	0.549	0.000	19.273
Utilised agricultural area, Ha	10.099	11.726	0.000	235.770
Size, ESU	14.212	11.441	2.002	196.778
Total output, €	19,457	18,327	0.000	584,613
Rented land, Ha	4.744	10.353	0.000	235.770
Total subsidies, €	4,187	5,668	0.000	119,614
Subsidies on crops, €	2,771	4,780	0.000	119,159
Subsidies on livestock, €	557.9	1,658	0.000	31,209
Support for rural development, €	192.1	1,012	0.000	83,129
Decoupled payments, €	620.2	2,449	0.000	101,578
Labour cost, Wages/Labour ^{Hired} (€/Hour)	2.732	0.771	0.000	15.045
Land cost, Rental/Rented land (€/Ha)	243.8	319.8	0.000	10,360
Output cost, Sales revenue/Production (€/tonne)	217.4	473.7	0.000	19,815
Technology, UAA under irrigation (Ha)	3.954	5.502	0.000	91.700
Age, years	50	13	17	99

Note: All value variables are deflated by the national consumer price indices with base year 1990.

5. Empirical results

The results of the fixed-effects estimations are reported in Table 4. It is in general indicated that agricultural support measures are among the variables that have a statistically significant impact on both family and hired farm labour. Agricultural payments negatively affect labour use, especially family farm labour. Hired labour is negatively related to decoupled payments, while there is no statistically significant impact of crops and livestock subsidies on hired labour. In addition, support for rural development increases demand for family labour, while it does not increase the use of hired labour. The dummy used to capture the structural changes due to the Fischler reform indicates that decoupled payments may favour the use of labour as a production input, but the overall impact of subsidies on labour demand is estimated to be negative.

In terms of the farm-specific variables, the cost of hired labour significantly influences the demand for both family and hired workers. The positive effect of the labour cost on family workers indicates that the two types of labour are substitutes rather than complements. This can be considered as an indication of migrant labour used to substitute family labour owing

to the unwillingness of farmers' children to succeed their parents and the expansion of non-farm rural employment sectors (e.g. tourism) that increased alternative employment opportunities for farmers.

The costs of both land and output negatively affect labour use, while the estimation for the share of rented land is positive only for the case of family labour. This may be explained by the fact that expansion of a farm's operations is possible when additional unpaid family workers are available, while the option of hiring labour to be used for rented land increases the cost of production in two major inputs simultaneously. Farm size and the proxy for technology are positively correlated to labour use, implying that larger and more efficient farms require more labour sources. Regarding specialisation, it appears that only family labour use is positively affected, while the impact of the localisation dummy is not significant. Finally, the age of the farm operator positively affects hired labour demand, as older farmers are likely to need more help provided by hired workers.

Table 4. Empirical estimations, Fixed-effects

	Family Labour	Hired Labour	Family Labour	Hired Labour	Family Labour	Hired Labour
Total subsidies	-.000028*** (0.000)	-.00002*** (0.000)				
Coupled payments			-.00003*** (0.000)	-.00001 (0.171)		
Decoupled payments			-.000018* (0.098)	-.00012*** (0.000)		
Subsidies on crops					-.00003*** (0.000)	.00002 (0.735)
Subsidies on livestock					-.00001 (0.637)	.00002 (0.452)
Support for rural development					.00019*** (0.000)	-.00014*** (0.005)
Fischler dummy	.1212*** (0.000)	.0173*** (0.003)	.1199*** (0.000)	.0289*** (0.000)	.1158*** (0.000)	.0223*** (0.000)
Labour cost	.0286*** (0.000)	-.1493*** (0.000)	.0286*** (0.000)	-.1492*** (0.000)	.0288*** (0.000)	-.1492*** (0.000)
Land cost	-.1807*** (0.000)	-.1040* (0.045)	-.1792*** (0.000)	-.1176** (0.023)	-.1765*** (0.000)	-.1097** (0.035)
Output cost	-.1466*** (0.000)	-.0092 (0.778)	-.1468*** (0.000)	-.0078 (0.812)	-.1477*** (0.000)	-.0106 (0.746)
Size	.0068*** (0.000)	.0096*** (0.000)	.0068*** (0.000)	.0095*** (0.000)	.0068*** (0.000)	.0097*** (0.000)
Technology	.0021*** (0.000)	.0017** (0.020)	.0021*** (0.000)	.0014** (0.044)	.0023*** (0.000)	.0016** (0.027)
Specialisation	.0054*** (0.000)	.0009 (0.600)	.0054*** (0.000)	.0013 (0.453)	.0052*** (0.000)	.0009 (0.606)
LFA	.0022 (0.738)	-.0057 (0.474)	.0021 (0.743)	-.0053 (0.505)	.0017 (0.791)	-.0055 (0.487)
Rented land	.1058*** (0.000)	-.0547*** (0.000)	.1054*** (0.000)	-.0511*** (0.000)	.1045*** (0.000)	-.0551*** (0.000)
Age	-.0003 (0.296)	.0012*** (0.002)	-.0003 (0.302)	.0012*** (0.003)	-.0003 (0.334)	.0012*** (0.002)

Notes: Region and year fixed effects are included in each regression. The P-values are reported. Number of observations: 73,364. Significance levels: 0.01***, 0.05**, 0.1*.

The estimations of equation (4) are included in Table 5. The coefficient of the lagged variable for family labour is positive and statistically significant at the 1% level. The coefficients for hired labour are also significant but with a negative sign, indicating that farms that already

have hired workers are less likely to further increase this input of production in the future. On the other hand, agricultural support measures appear to negatively affect both family and hired labour demand, as expected; while coupled payments and subsidies on crops have a significant impact of both labour sources. Moreover, subsidies for rural development do not favour on-farm labour, similarly to the other payments that discourage farm labour demand. Family labour is particularly affected by the introduction of decoupled payments, as indicated by the estimated coefficient for this parameter and the dummy variable for the Fischler reform. Regarding the estimations of farm-specific characteristics, the coefficients on LFA and Age appear to be negative and statistical significant in all specifications, while the remaining coefficients are similar to those obtained in the previous estimation case.

Table 5. Empirical estimations, GMM estimations

	Family Labour	Hired Labour	Family Labour	Hired Labour	Family Labour	Hired Labour
Labour	.1821** (0.000)	-.1186** (0.000)	.1758** (0.000)	-.1190** (0.000)	.1787** (0.000)	-.1178** (0.000)
Total subsidies	-.000061** (0.000)	-.000031** (0.000)				
Coupled payments			-.000044** (0.002)	-.000027** (0.000)		
Decoupled payments			-.000098** (0.000)	-.000063** (0.000)		
Subsidies on crops					-.000043** (0.003)	-.000025** (0.000)
Subsidies on livestock					.000066 (0.166)	.000044 (0.889)
Support for rural development					-.00038** (0.050)	-.00027** (0.017)
Fischler dummy	-.0414** (0.000)	.0044 (0.497)	-.0343** (0.000)	.0061 (0.346)	-.0395** (0.000)	.0054 (0.413)
Labour cost	.0076** (0.023)	-.0999** (0.000)	.0076** (0.024)	-.0993** (0.000)	.0074** (0.028)	-.1005** (0.000)
Land cost	-.0524 (0.591)	-.0259 (0.631)	-.0733 (0.473)	-.0313 (0.539)	-.0550 (0.579)	-.0213 (0.697)
Output cost	-.1042 (0.111)	-.1341 (0.111)	-.1016 (0.122)	-.1303 (0.124)	-.1029 (0.118)	-.1355 (0.106)
Size	.0136** (0.000)	.0305** (0.000)	.0131** (0.000)	.0307** (0.000)	.0143** (0.000)	.0311** (0.000)
Technology	-.0064 (0.136)	.0036 (0.440)	-.0063 (0.154)	.0031 (0.505)	-.0082* (0.078)	.0028 (0.560)
Specialisation	.2206** (0.000)	.0654** (0.008)	.2322** (0.000)	.0702** (0.005)	.2232** (0.000)	.0651** (0.008)
LFA	-.4017** (0.000)	-.2295** (0.010)	-.4008** (0.000)	-.2288** (0.010)	-.4129** (0.000)	-.2299** (0.010)
Rented land	.7988** (0.000)	.0686 (0.644)	.8873** (0.000)	.1199 (0.422)	.7864** (0.000)	.0510 (0.730)
Age	-.0307** (0.000)	-.0101** (0.017)	-.0304** (0.000)	-.0096** (0.022)	-.0307** (0.000)	-.0098** (0.021)

Notes: Values in the parentheses are Windmeijer-corrected Robust Standard Errors. Tests of autocorrelation were computed based on Arellano & Bond (1991). The results presented strong evidence against the null hypotheses that the overidentifying restrictions are valid, and that there is zero autocorrelation in the first-differenced errors at order 1. There is also no significant evidence of serial correlation in the first-differenced errors at order 2. Year fixed effects are included in each regression. Number of observations: 73,364. Significance levels: 0.01***, 0.05**, 0.1*.

6. Conclusion

The prevalence of family-based forms of production and the relatively limited extent of hired labour have long characterised the farm labour structure in Greece. Yet, the substitution of unpaid family labour by (migrant) hired labour has occurred and much of the work previously carried out within the framework of the family is now undertaken by workers for wage. Trends show that while farm labour has declined significantly over time, this trend has been coupled with an increasing proportion of the farm labour force that is hired.

In particular, off-farm employment of family members increases, as well as the proportion of the total farm labour force that is hired. Family labour is reduced mainly due to the low profitability of farming, the attractiveness of alternative employment opportunities, the ageing of the farm population and the increasing outflow of young natives from rural areas. At the same time, (migrant) hired workers are willing to undertake unskilled, temporary and low-wage tasks in the farm labour market. Changes in farm structure, technological innovation and agricultural policy reforms are likely to have an impact on the trends observed the in farm labour force.

This paper examined a set of explanatory variables used in a dynamic panel data analysis to determine the significance of agricultural payments for farm family and hired labour, taking also into account important factors related to farm characteristics, such as specialisation and location. The analysis showed that in Greece family and hired labour are substitutes rather than complements, while agricultural support measures appear to negatively affect both family and hired labour demand. Decoupled payments and subsidies on crops have a significant impact of both labour sources, as well as subsidies for rural development that do not favour on-farm labour use. Farm-specific characteristics, such as farm size and age of the farm operator, also appear to have a significant impact on farm labour. The results were robust to various estimation techniques and specifications.

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Comparative Analysis of Factor Markets for Agriculture across the Member States

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The Factor Markets project in a nutshell

Title	Comparative Analysis of Factor Markets for Agriculture across the Member States
Funding scheme	Collaborative Project (CP) / Small or medium scale focused research project
Coordinator	CEPS, Prof. Johan F.M. Swinnen
Duration	01/09/2010 – 31/08/2013 (36 months)
Short description	<p>Well functioning factor markets are a crucial condition for the competitiveness and growth of agriculture and for rural development. At the same time, the functioning of the factor markets themselves are influenced by changes in agriculture and the rural economy, and in EU policies. Member state regulations and institutions affecting land, labour, and capital markets may cause important heterogeneity in the factor markets, which may have important effects on the functioning of the factor markets and on the interactions between factor markets and EU policies.</p> <p>The general objective of the FACTOR MARKETS project is to analyse the functioning of factor markets for agriculture in the EU-27, including the Candidate Countries. The FACTOR MARKETS project will compare the different markets, their institutional framework and their impact on agricultural development and structural change, as well as their impact on rural economies, for the Member States, Candidate Countries and the EU as a whole. The FACTOR MARKETS project will focus on capital, labour and land markets. The results of this study will contribute to a better understanding of the fundamental economic factors affecting EU agriculture, thus allowing better targeting of policies to improve the competitiveness of the sector.</p>
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Partners	17 (13 countries)
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