Land-use conflicts and the Common Agricultural Policy: The case of Poland

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Abstract

Urban sprawl is one of the most important reasons behind conflicts over farmland use. In that context, agricultural policy can be perceived as a guardian protecting farmland for agricultural purposes. The paper aims at investigating the role of the Common Agricultural Policy (CAP) in shaping farmland market in Poland. With use of regional Computable General Equilibrium (CGE) model we found out that CAP has led to farmland price distortions in most Polish regions but at the same time it has allowed to maintain land in agricultural use particularly in regions which heavily depend on agriculture and have fragmented farm structure.

Keywords: land-use conflicts, farmland prices, Common Agricultural Policy, regional CGE, Poland

1 Introduction

Land-use conflicts occupy a prominent position in the academic and political debates. The most striking examples include issues like urban sprawl and land grabbing. Scientists agree that government policy, and especially land-use and agricultural policies are, apart from historical conditions, geographical location, demographic and climate changes, the factors which influence significantly the use of agricultural land. This is shown in both theoretical and empirical research (e.g. Rudel, Meyfroidt, 2013, Renwick et al., 2013). The role of government and efficiency (or lack thereof) of various land use policies link so different phenomena from around the world as soil degradation, illegal acquisition of land, land abandonment, and alike. In some circumstances farmland is treated as a "brown gold" and there is a high competition or conflicts around it, while in others it is considered "a burden" which is doomed to abandonment.

Common Agricultural Policy (CAP), especially thanks to decoupled payments and environmental schemes, directly influences land markets in the EU countries. Most of the research concentrates on CAP influence on land prices (e.g. Feichtinger, Salhofer, 2013; Ciaian et al., 2013, Latruffe, et al., 2013) or land abandonment phenomenon (Terres et al., 2013). In this paper we are attempting to analyse CAP influence on land markets from a different perspective. Namely, we scrutinize how CAP measures - through relative contribution to total changes in farmland prices - can influence incentives for farmland use by different actors – e.g. agricultural versus non-agricultural users. In addition, we analyse that from regional perspective since – as mentioned above - farmland use is determined by several factors in which regional ones play an important role. To the best of our knowledge, this paper is the first to analyze CAP measures influence on farmland prices from the regional perspective by use of Computable General Equilibrium (CGE) model for Poland.

The reasoning in our paper can be summarized as follows. As long as the markets are not distorted, we can talk about fair market competition and the resulting land-use structure can be considered as economically optimal. However, when the policy intervenes and, in a more indirect way, distorts the prices of land then it may create conflicts by changing "the rules of the game" where some

actors may benefit or lose more than the others. In case of farmland market there is an evidence that market failures exist (Moss, Schmitz, 2003) so without any intervention of any agent there is a risk that the farmland could be converted into other uses and food production would be threaten. In addition, environmental incidents, soil degradation processes and other phenomena give arguments for maintaining the farmland in working condition (Gant et al., 2011). That is why there is a role and justification for agricultural policy actions to prevent agricultural use of farmland. This is especially important if we take into account the fact that once farmland is turned into other purposes, it cannot be easily recovered for agricultural production.

Hence on one hand, if CAP measures influence farmland prices substantially this means that the policy highly distorts the prices and affects competition, and thus might exacerbate conflicts between different stakeholders. On the other hand, the role of CAP is to guard the farmland for agricultural purposes and it does it both directly by strengthening farming activities via substantial subsidies and supportive instruments (pillar 1 and pillar 2) and indirectly by increasing the value of their production factor – land. In light of that, we prove empirically the role of CAP in maintaining farmland for agricultural purposes and then we investigate how land-use conflicts may be linked to CAP via the price distortions it causes.

The specific example that we examine comes from the Polish land market, which seems to be particularly well suited for investigating policy impacts on the market and resulting conflicts over agricultural land use. The most important agricultural land-related phenomena in Poland include growing competition between the use of the land for farming and non-farming purposes as well as the land abandonment in some regions on the other hand. Thus, the situation on the agricultural land market in Poland is shaped by two processes: utilisation of the farmland for non-agricultural purposes, which results in declining resources of agricultural land particularly strongly felt in suburban and peri-urban areas, and abandonment of land which formally still counts as a farmland. In addition, those processes differ considerably across the regions (see e.g. Dzun, Musiał, 2013; IERiGŻ, 2001, 2005, 2014). These tendencies have been accompanied by substantial rise of land prices. Prices of agricultural land in Poland have been growing very dynamically over the past decade, as regards trade in both private land as well as the land belonging to the state. However, it has not been yet investigated to what extent the observed changes in the farmland prices are solely attributed to CAP intervention. This paper aims to fill in this gap.

As presented above, the main mechanism through which the agricultural policy changes the rules of the game in the land market is via its impact on land prices. That is why the main goal of our paper is to show the influence of the Common Agricultural Policy (CAP) on farmland prices, and hence the degree of the price distortion and the way it affects different users of farmland in Poland. Large contribution of CAP to the change in farmland prices means that the policy highly distorts the prices and the competition is biased to benefit farmers over other users/consumers. Thus farmers benefit both from CAP payments and higher value of their land assets. As a result CAP can be seen as a guardian of keeping land for agriculture-related purposes. However, it is not always the case if we introduce the spatial context to the analysis and look at differences at regional level. Hence, we add this viewpoint that is the regional analysis with use of the regional CGE model for Poland (POLTERM) which, to the best knowledge of the authors, was not done in previous studies. The next section presents background information on impact of Common Agricultural Policy on farmland use and prices in the European Union as well the situation in Poland. The third section shows methodology, and how CAP pillar 1 and pillar 2 measures were modelled within POLTERM and then the specificity of land market in the model. This section is followed by the results, showing contribution of CAP to the regional farmland prices vis-à-vis other factors influencing them. The final section discusses the research findings taking into account the characteristics of the regions and interprets the results in the context of farmland use conflicts there.

2 Farmland use and prices in the European Union: Background information

2.1. Impact of Common Agricultural Policy on farmland use and prices in Europe: past research

The influence of CAP on the land use in different EU Member States was frequently analysed with the use of different economic and econometric models. Such analyses include e.g.: Scenar 2020 (Novicki et al., 2009); EURURALIS (Verburg et al., 2010); FP6 SENSOR (Helming et al., 2011), Land Use Modelling Implementation (Pérez-Soba et al., 2010; Verburg et al., 2012). Pan-European research by Renwick et al. (2013) where major attention was paid to the assessment of the influence of CAP pillar 1 on land abandonment by making use of CAPRI and Dyna-CLUE models.

The results of this research led to the following conclusions: if all CAP pillar 1 transfers were discontinued[1], a total of ca. 8% of UAA would be abandoned[2] in the whole EU-27.[3] Grassland area would be reduced by ca. 10%, and arable land by ca. 6% (as compared to maintaining CAP support). Larger impact could be expected in the EU-10, where the abandonment of UAA would reach 9%, grassland – 13%, and arable land – 8%. The response to discontinuing CAP pillar 1 transfers differs greatly depending on a Member State, from relatively small decrease in the use of UAA in the UK (-6%) to more than twice that amount in Greece (-14%). Greece would also suffer from the greatest decline in the arable land use (-13%), while Hungary would experience the greatest decline in the use of grassland (-18%) (Renwick et al., 2013).

Changes in the use of the land as a result of discontinuing CAP pillar I transfers have the same result in all the Member States concerned: CAP pillar 1 aid facilitates the maintenance of agricultural land (both grassland and arable land). At the same time, changes in prices of the farmland as a result of CAP pillar 1 aid do not have the same result. This is confirmed by historical data, which show that in period 1992-2010 real sale prices of farmland in Greece dropped by 25%, while they increased by 250% in Ireland at the same time. On the other hand, farmland lease prices dropped in Finland by 25% since 1992, while in Spain rose by ca. 55% (Ciaian et al., 2010). The differences can be explained by the fact that transmission of farmland prices via CAP was indirectly influenced by a number of factors which differ across the Member States. Among them the most crucial are e.g. organisation of land market, level of farm subsidies in individual Member States, degree of integration of the related markets (e.g. agricultural loan market, market of means of production, sales market, scale of national and foreign investments in farming and in agro-food sector, etc.). However, one can observe clear similarities among the Member States in land price shaping in the period directly following the accession to the EU. At that time, the prices usually rise. This is evident e.g. when comparing the situation in the new Member States between 2003 and 2005 (a year before and a year after the EU enlargement). Real increase in the sale prices of land amounted to 35% in Poland, 21% in Slovakia, 50% in Estonia, 143% in Lithuania. At the same time, prices of land lease increased by 15%-45% in the same countries. It can therefore be concluded that in the short term, CAP implementation results in major increases in farmland prices, and in the mid- and long-terms, the price levels are determined by a lot of factors.

[1] The scenario entails discontinuation of direct payments (per hectare and in relation to production volumes) and market support under CAP pillar 1 in the whole EU. In other words, the results of the scenario relate the influence of the whole CAP pillar 1 to land use, because they compare situations of the current interventionism (base scenario) and hypothetical lack thereof (the discontinuation of pillar 1 support).

[2] Only the "clear" impact of pillar 1 is studied, with assumed *ceteris paribus*. Naturally, considering that some kind of budget transfers for agriculture would fill the gap, most probably lower decline in the UAA could be expected. However, the model would require modifications to take account of such new transfers, which exceeds the scope of this analysis.

[3] The research includes 27 EU Member States as it was conducted before the accession of Croatia.

2.2. Changes in farmland use and prices in Poland

The most important agricultural land-related phenomena in Poland include growing competition between the use of the land for farming and non-farming purposes, and land abandonment in some regions.[4] The paradox, referred to above, whereas in some regions there is huge demand for agricultural land, which translates into growing land prices, while in other regions agricultural land is abandoned, is also observed in Poland. Thus, the situation on the agricultural land market in Poland is shaped by two processes: using agricultural land for non-agricultural purposes, which results in declining resources of agricultural land, and land abandonment without changing its formal purpose. Dzun and Musiał (2013) underline that the pace of land abandonment is faster than the pace of decline of agricultural land resource. In addition, those processes differ significantly across the regions (see e.g. Dzun, Musiał, 2013; IERiGŻ, 2001, 2005, 2014).

As in other countries, the decrease of the available farmland is first of all the consequence of economic development. The accession of Poland to the European Union has accelerated the decline of available land resources, partly due to the increased number of infrastructure investments (Dzun 2007). What is more, this phenomenon is also highly influenced by the most recent urban dynamics in rural surroundings of large cities and medium-sized towns manifested through urban sprawl, suburbanization and peri-urbanization (e.g. Raszeja, 2005; Bański, 2006; Radziszewska et al., 2012). A number of analysts have stressed, however, that changing the purpose of land from agricultural to non-agricultural is excessive and there is a greater need for policy shifts towards more balanced and consistent state regulations of land management (e.g. Kamiński, 2008; Górska, Michna, 2010; Dzun, Musiał, 2013).

According to the authors, the reason for the second trend, i.e. land abandonment – is low profitability of farming, which is especially true in case of small farms (e.g. Baer-Nawrocka, Poczta, 2014). Based on the data from the National Agricultural Census 2010, Dzun and Musiał (2013) calculated that 1.4 million ha, which accounts for almost 9% of utilised agricultural area (UAA), is not actually used for food production.[5] However, the amount of UAA used differs a lot across the Polish regions. The largest areas of UAA which is not farmed[6] occur in regions featuring the biggest fragmentation: Podkarpackie, Śląskie and Małpolskie regions, where the share of unused UAA largely exceeded 10%; in Podkarpackie region it even exceeded 20%.[7] A big (exceeding 10%) share of unused UAA also occurred in the areas of the former State Agricultural Farms, i.e.: Lubuskie, Pomorskie, Zachodniopomorskie, and Warmińsko-mazurskie regions.[8] In case of those regions it is "mainly the consequence of winding up State Agricultural Farms and still unfinished process of efficient management of the land" (Dzun, Musiał, 2013: 72-73). The smallest scale of land abandonment has been observed in regions of favourable agricultural structure and highly developed farming culture: Kujawsko-pomorskie, Opolskie, and Wielkopolskie regions (Dzun, Musiał, 2013).[9]

Actual resources of agricultural land in Poland can be assessed by studying the statistics provided by Agency for Restructuring and Modernisation of Agriculture (ARMA). The area under direct

[4] Other important phenomena of agricultural market in Poland, not elaborated on in this paper due to its capacity, include the competition of Polish farmers for high-quality agricultural land released by other owners and conflicts related to land leased by farmers from the former State Agricultural Farms.

[5] The authors have also pointed out a growing trend. In 2005, the agricultural area uncultivated by farmers amounted to ca. 1 million ha (6.5% of the total UAA; Dzun, Musiał, 2013).

[6] In both farms which did not produce food and in production farms which set aside land or used the land for non-agricultural purposes.

[7] In 2010 respectively: 21.2%, 18.9%, and 13.9% (Dzun, Musiał, 2013).

[8] The share of UAA not used for agricultural purposes was respectively (in 2010): 14.3%, 12.1%, 11.8%, 11.1% (Dzun, Musiał, 2013).

[9] The share of unused UAA was around 3% in these regions (Dzun and Musiał 2013).

payments[10] amounts to approx. 14.1 million ha (ARMA, 2014)[11] and "it may be assumed that the 14.1 million ha of UAA makes up the production potential of the Polish farming which is contained within agricultural land resources" (Baer-Nawrocka, Poczta, 2014: 90).

Agricultural land prices in Poland have grown very dynamically over past several years, as regards trade in both private land as well as the land belonging to the state.[12] In 2000-2013 an average price of a hectare of agricultural land in Poland increased more than five times, i.e. from PLN 4,786 in 2000 to PLN 26,339 in 2013 in the case of privately owned land and seven times, i.e. from PLN 3,554 per hectare in 2000 to PLN 21,813 in 2013 in the case of state owned land (IERiGŻ, 2001, 2005, 2014). The year 2014 brought further price increases. As with the phenomenon of land abandonment, land prices and price dynamics varied depending on a region. In regions with the highest land abandonment rate (Podkarpackie, Śląskie and Małopolskie regions) prices of private land[13] and their growth rate were lower than the state's average. These parameters vary to a large extent among regions featuring the lowest land abandoned rate (i.e. Kujawsko-pomorskie, Opolskie, and Wielkopolskie).

Results of agricultural land management analyses before and after the accession of Poland to the EU show that the EU accession and the introduction of area payments under the Common Agricultural Policy (CAP) slowed down the process of land abandonment (which is also to be associated with a slowdown in the decline of the number of farms). However, in recent years the process of land abandonment has been more intensive, being a result of overlapping tendencies i.e. deteriorating profitability in farming activity and growing opportunities of generating income from non-farm activities (Dzun, Musiał, 2013).

3 Methodology

In order to separate the "pure" impact of CAP on the farmland prices in the Polish regions we use a regional CGE model called POLTERM. It is an implementation of the TERM model (Horridge, 2011) to the Polish economy. It is a bottom-up multi-regional CGE model that explicitly captures the behaviour of industries, households, investors, government and exporters at the regional level. The theoretical structure of TERM follows the familiar neoclassical pattern common to many applied general equilibrium models. Producers in each region are assumed to minimize production costs subject to industry-specific production technologies. A representative household in each region purchases goods in order to obtain the optimal commodity bundle in accordance with its preferences and disposable income.[14] In the short-run, investors allocate new units of capital to regional industries on the basis of expected rates of return. Long-run capital supply to each regional industry is elastic at given rates of return. Commodity-specific export demands for each region are modelled via constant elasticity demand functions.

The Polish version of TERM models 86 economic activities in the 16 NUTS2 regions. The sectoral dimensions of POLTERM have been tailored for rural and agricultural analyses. In its full disaggregation, the model has 20 sectors related to agricultural production and 8 to food production. In this study, for simplicity we aggregated our database to 11 agricultural activities, 6 food products, and 16 remaining sectors). The benchmark year for the model is 2005, with the model's

[10] This is well cultivated land on farms, the size of which exceeds 1 ha.

[11] As of 2005 the declared area under single area payments included around 14.0-14.3 million ha of UAA (ARMA, 2014).

[12] The differences between the two markets result from the fact that prices of private land usually refer to arable land, while the prices of government-owned land refer to the broader category of agricultural land. Different plots size and geographical location of the land offered for sale by the State Treasury resources is also a factor in pricing.

[13] In these regions, due to historical background, the share of land owned by former State Agricultural Farms is significantly lower than in western and northern regions.

[14] Household preferences are assumed to be Klein-Rubin, generating a household demand system of the LES form.

primary data source being the 2005 Polish input-output tables (see EUROSTAT, 2011 and GUS, 2009 a, b). EU Agricultural subsidies are included in the official 2005 tables as "other net taxes on production". Hence, our initial model calibration, which is based on the official 2005 input-output data, includes CAP payments for that year. In moving from the national input-output data described by GUS (2009a) to the regional input-output system required by TERM, we used the methods described in Horridge (2011). For more details on construction of the POLTERM model one can refer to Zawalińska, Giesecke, Horridge (2013).

As for modelling land market in POLTERM, we distinguish two types of farmland – one eligible for LFA (less favoured area) payments which accounts for about 50% of UAA in Poland and the rest of farmland. We allow the supply of LFA land to respond endogenously to movements in its post-tax rental price as suggested in the literature (Latruffe, Mouël, 2009). We set our central value for the elasticity of supply of LFA land with respect to post-tax rental ($\eta_r^{(S)LFA}$) at 0.2, In using this value, we note that Van Meijl et al. (2006) places the land supply elasticity in the EU within the range 0.01 to 0.2. This supports a similar range found by Abler (2003), who put the value between 0.0 and 0.2. In CAPRI model, Poland's land supply elasticity is set at 0.15 (Britz, Witzke, 2008). The LEITAP Model sets the same elasticity at 0.475 (Woltjer et al., 2011). As an approximate mid-point in the range of available estimates, we take 0.2 as our value for the land supply elasticity. For non-LFA land, we set the corresponding elasticity ($\eta_r^{(S)non-LFA}$) at 0, as there is very little fallow land in Poland that can be easily turned into arable non-LFA land.

Figure 1 describes the modelling of regional agricultural land supply and land demand. At the bottom level of this diagram, regional endowments of LFA and non-LFA land (X_r^{LFA} and $X_r^{non-LFA}$ respectively) are potentially supplied to agricultural industries 1 – N in region *r*. Land supply functions across land users are modelled via constant elasticity of transformation (CET) functions. We assume that landowners seek to maximise land rentals subject to constrained land transformation possibilities described by CET functions. At the top level of Figure 1, users of agricultural land face imperfect substitution possibilities between LFA and non-LFA land, which are described by constant elasticity of substitution (CES) functions. In modelling the behaviour of users of agricultural land, we assume they minimise the cost of acquiring a given input of land by substituting across land types, subject to the constraints posed by the CES functions. Equations (E1) – (E5) in Table 1 set out, in percentage change form, the system of supply, demand and unit-cost functions arising from revenue-maximising and cost-minimising behaviour under the production technology assumed in Figure 1.[15] Equations (E1) and (E2) describe the operation of the land supply nests at the bottom level of Figure 1. In (E1), the percentage change in the supply of land type *n* to agricultural user *j* in region *r* ($x_{j,r}^{(S)n}$) depends on both the availability of land type *n* in region *r* ($x_r^{(S)n}$) and the relative land rental received when supplying to user *j* ($p_{j,r}^n - p_r^n$).[16] The average rental on land type *n* in region *r* (p_r^n) is defined by (E2) as the revenue-share-weighted sum of the percentage changes in rentals received from each user of land type *n* in region *r*. Equations (E3) and (E4) describe the operation of the land demand nests at the top level of Figure 1. In (E3), the percentage change in the demand for land type *n* by agricultural user *j* in region *r* ($x_{j,r}^{(D)n}$) depends both on the demand for land in general by such users ($x_{j,r}^{Land}$) and the relative user price of land type *n* ($p_{j,r}^n - p_{j,r}^{Land}$). The percentage change in the average cost of agricultural land to user *j* in region *r* is defined by (E4) as the cost share weighted sum of the percentage changes in the rental

[15] For a formal derivation of these percentage change forms from economic problems such as those described by Fig. 1, see Dixon *et al.* (1992). In particular, see Dixon *et al.* (1992: 128-133) for discussion of the CET function and Dixon *et al.* (1992: 124-126) for discussion of the CES function.

[16] Because the subsidy rate in any region is the same across all uses of LFA land, in (E1) we can assume that land supplies to activities respond to pre-subsidy rental prices.

prices of the LFA and non-LFA land employed by user *j*, *r*. Together, (E1) and (E3) define percentage changes in user-, region- and land-specific land supply and demand. Equation (E5) imposes a market clearing condition on these user-, region- and land-specific land markets, thus allowing endogenous determination of land rental prices ($p_{j,r}^{n}$). Equation (E6) defines the percentage change in net land rentals received by land owners. In the original levels form, (E6) expresses net land rentals as the product of pre-subsidy land rentals and the power (one plus the rate) of land subsidy. In (E6), the percentage change in the land subsidy appears as s_r^n. It is s_r^n that we shock when modelling CAP support that is in form of the per hectare payments (i.e. direct payments under pillar 1 and most of pillar 2 measures). Other pillar 2 measures, apart from land subsidies, are modelled as investments in physical and human capital, direct income transfers and subsidies for non-agricultural services in rural areas (see more detailed description of this approach in Törmä, Zawalińska (2011)). In calculating values for s_r^n, we obtain data on region-specific values from Paying Agency (ARMA). Equation (E7) defines the supply of land type *n* in region *r*. Under (E7), the percentage change in the supply of land type *n* in region *r* is positively associated to the land's real post-subsidy rental rate. The strength of the land supply response to changes in the post-subsidy rental rate depends on the supply elasticity $\eta_r^{(S)n}$. As discussed in the introduction to this section, we set $\eta_r^{(S)LFA}$ =0.2 and $\eta_r^{(S)non-LFA}$ =0.

4 Results

The results at the national level have proved that due to CAP the yearly average prices of farmland increased in Poland by 27% in period 2004-2013. The first pillar contributed 77% to this rise while the second, the remaining 23%. It can be concluded that the influence of the first pillar is more than 3 times higher than that of the second pillar. This is a consequence, on one hand, of the differences in the type of support between the two pillars, and on the other hand in the volume of support. In the first pillar, direct transfers are higher, and directly linked to the land, i.e. they are area subsidies, paid by the hectare, as part of uniform area transfers and auxiliary area transfers. Conversely, in the second pillar transfers are paid as part of a variety of economic instruments, frequently unrelated to the land itself, e.g. as investment subsidies (e.g. for farm modernisation), costs reimbursement (e.g. of trainings, costs of running a producer group), income transfers (structural benefits). The only part of the transfers within pillar 2 delivered as area support is through natural limitation areas or via agricultural-environmental programmes.[17]

However, at the regional level the situation differs substantially. The influence of CAP on the farmland prices differs across regions in terms of strength, main drivers and the direction. That is the level of analysis where we can observe the land use conflicts and the role of CAP.

In all the regions farmland prices increased over the analysed period ranging from 266% in Małopolskie to 570% in Dolnośląskie region (Table 2). In the majority of the regions, price increase was mostly due to direct payments (CAP pillar 1), rather than due to RDP transfers (CAP pillar 2) (Figure 2). There is however, a major difference in total contribution of CAP to the total observed increases in farmland prices. At the regional level we can distinguish 3 different cases of CAP incidence on farmland prices. First, in the regions where the prices of farmland soared due to CAP while the other factors worked counter this increase. That is the case where CAP contribution to the actual farmland price is higher than 100% (Table 2). It means that without CAP, the farmland prices would be lower than with the policy in place. In the case of Świętokrzyskie and Lubelskie regions, the prices would be almost twice and three times lower, respectively, if CAP was not implemented there. These two regions are traditionally small-scale farming areas with prevalence of small, family

[17] The share of funds for individual support forms as part of CAP is presented in more detail by Zawalińska (2009).

and self-subsistence farms with often dispersed and fragmented plots. If the prices of farmland were low, then the farmland would be exposed to high competition from non-agricultural users. With CAP present there, the farmers benefited from it by receiving support through pillar 1 and 2. At the same time, they have experienced relatively high prices of their land, which otherwise would be much lower and exposed to a high competition and urban sprawl. In this case, the competition over the land is highly affected by distorted prices from CAP. In this case, the policy might have protected agricultural land from land-use conversion and have played a role of a guardian of the farmland used solely for agriculture-related purposes. Although at the same time, it has contributed to petrifaction of the unfavourable fragmented structure of farms and agricultural land there.

The second case is where the contribution of CAP to the total farmland price changes was between 50-100%. So we can say that CAP contributed significantly to the farmland price increase and played a decisive role on the farmland market. Here belong regions with strong agriculture and quite large family farm structure. Among the others here belong Zachodniopomorskie and Lubuskie regions, where there used to be state farms so the farms are quite large at the Polish standards. The increase in farmland prices over CAP-driven level indicates that some competition for land use is taking place. The prices of farmland are distorted by the policy but the strong demand for this land outside the agriculture is increasing the prices above CAP policy level. That is due to urbanization and other phenomena taking place there.

The third case is where the contribution of CAP to the increase of the farmland prices was up to 50%. That means that CAP had a minor role in determining price level, so that there was a high competition over that land and other than CAP factors were prevailing. This group includes the leading agricultural region (Wielkopolskie), regions with relatively large-size farms (Pomorskie, Kujawsko-pomorskie) and highly urbanized regions (Śląskie, Opolskie, Łódzkie). That means that the high competition is taking place and even with CAP intervention the farmland is not saved for agricultural purposes.

5 Discussion and conclusions

With use of regional Computable General Equilibrium model we found out the degree of the price distortions induced by CAP and the way the policy affected agricultural versus non-agricultural users of farmland in Poland. We ranked the regions according to the degree to which CAP distorted the farmland market prices there. Then we identified the regions where the influence of CAP was the highest and hence might exacerbated a conflicting situation (by favouring one group of land users – farmers). On the other hand we showed that those regions were otherwise exposed to strong urbanization so CAP in fact played effectively its role of a farmland guardian there. Therefore, CAP can be perceived as a guardian of the agricultural use of farmland in the regions which heavily depend on agriculture and in Poland it is particularly effective in doing so in the regions with fragmented plot structure, however at the price that tends to conserve this unfavourable farm size structure there.

CAP might be linked to land-use conflicts by offering benefits only to one group of players – i.e. farmers - both directly via payments of the first and second pillar and indirectly by increasing value of the agricultural land which becomes more expensive for potential other users. The competition becomes distorted by the policy but this way it plays also a role of a guardian of agricultural land which, otherwise, might have been turned into non-agricultural purposes. Such a threat was especially visible in predominantly agricultural regions with the very fragmented plots – such as Lubelskie, Świętokrzyskie and Podkarpackie. In these regions the farmland would have been otherwise very easily sold out by farmers, due to the pressure caused by city sprawl. CAP made land more expensive and changed the incentives of farmers from selling land into keeping it as it became both a guarantee of entitlements and an asset with a growing value.

The opposite example comes from regions such as Opolskie and Śląskie - highly urbanized regions with important mining industry. In that case, non-CAP related factors were primary drivers of the farmland prices' changes. In those regions the non-CAP phenomena have overcome CAP payments.

All in all we conclude, that the role of CAP in maintaining the farmland use for agriculture depends on the relative impact (strength) of CAP versus other processes and phenomena like urbanization, demographic changes, climate changes and influence of other policies in each region. In highly agricultural regions, where CAP payments are large and their impact on prices significant farmers have higher incentives to maintain agricultural land. On the contrary, in more urbanized regions, where CAP intervention is lower (due to fewer farms and hence lower total intervention), the land price distortions do not discourage the urbanization and the high competition over the non-agricultural use of the land.

Although we cannot unequivocally say that CAP increases land-use conflicts at the national level, the regional specificity allows us to discover a different role of the policy in the possible conflicts by assessing the relative price distortions it causes in regions with different farm structures.

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Tables and figures

Table 1. Percentage change form of the equations underlying Figure 1

(E1)	Land supply response functions $x_{j,r}^{(S)n} = x_r^{(S)n} + \phi_r^n (p_{j,r}^n - p_r^n)$	$(n \in \text{LANDTYPE}), (j \in \text{AGRIND}) (r \in \text{REGION})$
(E2)	Average rental price of land $p_r^n = \sum_j B_{j,r}^n p_{j,r}^n$	$(n \in \text{LANDTYPE}), (r \in \text{REGION})$
(E3)	Demand function for land cultivated on LFA areas under activity j in region r $x_{j,r}^{(D)n} = x_{j,r}^{Land} - \sigma_{j,r} (p_{j,r}^n - p_{j,r}^{Land})$	$(n \in \text{LANDTYPE}), (j \in \text{AGRIND}), (r \in \text{REGION})$
(E4)	Average user price of land $p_{j,r}^{Land} = \sum_{n \in LANDTYPE} S_{j,r}^n p_{j,r}^n$	$(j \in \text{AGRIND}), (r \in \text{REGION})$
(E5)	Land market clearing conditions $x_{j,r}^{(D)n} = x_{j,r}^{(S)n}$	$(n \in \text{LANDTYPE}), (j \in \text{AGRIND}), (r \in \text{REGION})$
(E6)	Net land rentals received by landowners $pps_r^n = p_r^n + s_r^n$	$(n \in \text{LANDTYPE}) (r \in \text{REGION})$
(E7)	Land supply functions $x_r^{(S)n} = \eta_r^{(S)n} (pps_r^n - p_r^{GDP})$	$(n \in \text{LANDTYPE}) (r \in \text{REGION})$

Source: Authors' own presentation of model's equations.

LANDTYPE (LFA land, non-LFA land), REGION (16 NUTS 2 Polish regions), AGRIND (Wheat, Rye, Barley, Other cereals, Oil seeds, Vegetables and fruit, Other crops, Other animals, Pigs, Poultry, Cattle).

where:

$x_r^{(S)n}$ is the percentage change in the supply of land type *n* in region *r*;

$\eta_r^{(S)n}$ is the elasticity of supply of land type *n* with respect to its real post-tax rental price;

pps_r^n is the percentage change in the post-subsidy rental price of land type *n* in region r.

p_r^{GDP} is the percentage change in the regional GDP deflator for region *r*.

p_r^n is the percentage change in the pre-subsidy rental price of land type *n* in region *r*;

s_r^n is the percentage change in the power (1 plus the rate) of the land rental subsidy on land type *n* in region *r*;

$x_{j,r}^{(S)n}$ is the percentage change in the supply of land type *n* in region *r* to agricultural industry *j*;

ϕ_r^n is the elasticity of transformation of land type *n* in region *r* between alternative agricultural uses *j*;

$p_{j,r}^n$ is the percentage change in the price faced by agricultural producer *j* in region *r* for land type *n*;

$B_{j,r}^n$ is the share of type *n* land rentals in region *r* generated by agricultural industry *j*;

$x_{j,r}^{(D)n}$ is the percentage change in demand for land type *n* by agricultural user *j* in region *r*;

$x_{j,r}^{Land}$ is the percentage change in demand for land (undistinguished by type) by agricultural industry *j* in region *r*;

$\sigma_{j,r}$ is the elasticity of substitution between different land types faced by agricultural industry *j* in region *r*;

$p_{j,r}^{Land}$ is the percentage change in the average user price of land faced by agricultural industry *j* in region *r*;

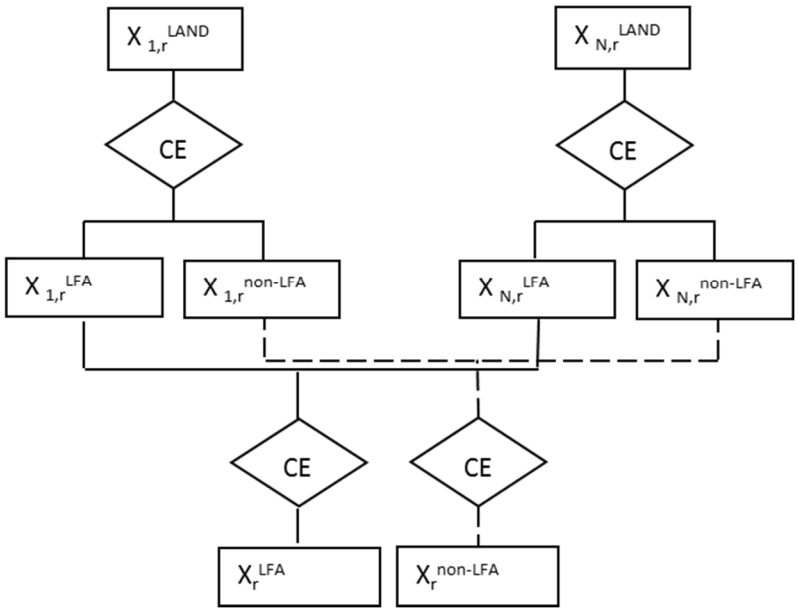
$S_{j,r}^n$ is the share of industry (*j*,*r*)'s total land costs represented by rentals on agricultural land type *n*.

Table 2. Changes in farmland prices in Poland in 2007-2013 (in %)

Region/Voivodship	Total change in farmland prices	Changes in farmland prices due to CAP	The share of CAP in total change of farmland prices
Lubelskie	337	963	286
Świętokrzyskie	326	583	179
Podkarpackie	364	399	110
Mazowieckie	363	390	107
Warmińsko-mazurskie	466	497	107
Zachodniopomorskie	412	404	98
Lubuskie	486	401	83
Podlaskie	389	265	68
Małopolskie	266	162	61
Łódzkie	378	144	38
Pomorskie	404	135	33
Kujawsko-pomorskie	471	134	28
Dolnośląskie	570	111	20
Wielkopolskie	430	29	7
Opolskie	500	-64	-13
Śląskie	299	-56	-19

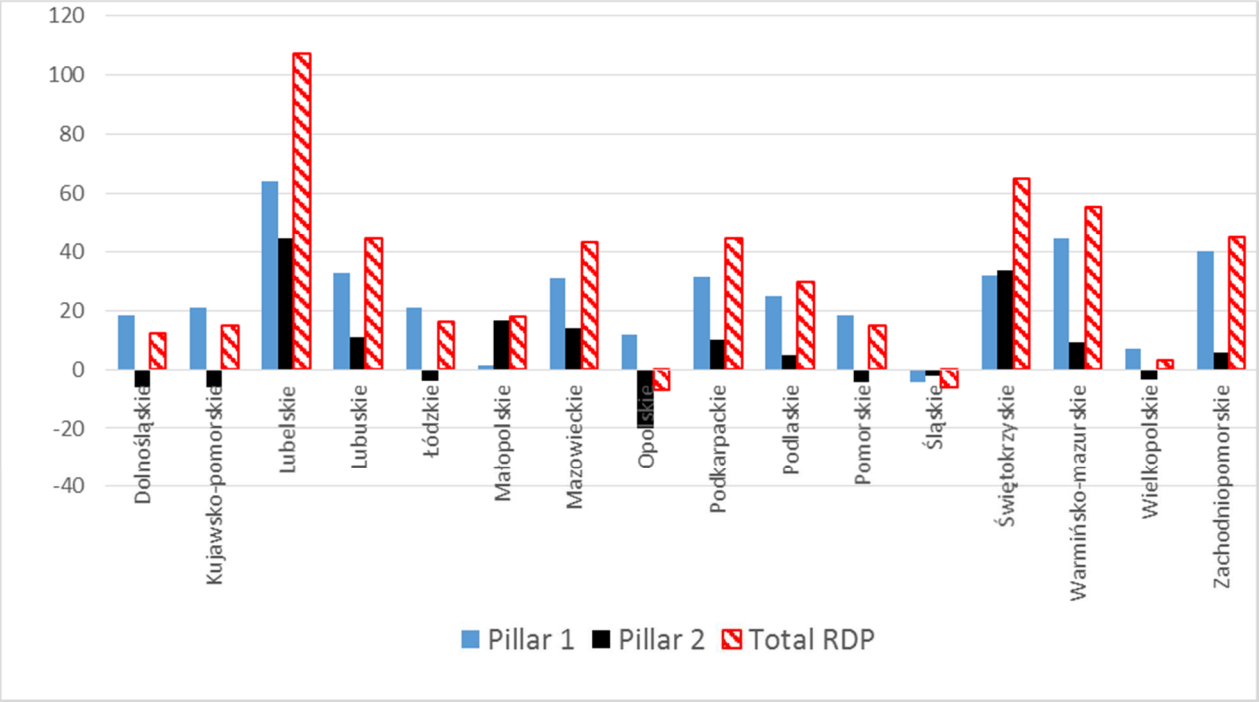
Source: Based on Main Statistical Office and POLTERM model results.

Figure 1. Agricultural land supply and agricultural land demand in POLTERM



Source: Authors' own elaboration

Figure 2. Impact of CAP on farmland prices



Source: Based on the results of the POLETRM model