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The impact of decoupling and modulation in the enlarged Union: A sectoral and farm level assessment

Agricultural land markets:

Main issues in the recent literature

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Agricultural land markets: Main issues in the recent literature[1]

1. Introduction

As part of the IDEMA project, workpackage 8 (Land market in current and new Member States) is aimed at drawing a land market review to support modelling work carried out in workpackage 4 (AgriPoliS model improvement and adaptation to regional characteristics) and workpackage 9 (Improvements of existing ESIM sectoral model and country specific GE models).

Workpackage 8 includes two steps: i) a land market review which aim is to enable to assess broadly the way land markets are operating and allow the confirmation or rejection of basic assumptions of regional as well as sectoral and general equilibrium models; ii) a compilation of land market information (legal aspects and basic statistics) for the involved partners' countries which will serve as an empirical background for the modelling work (specification and calibration) carried out in workpackages 4 and 9.

Land has a key role in all economies. Land may be seen primarily as a production factor, immovable and which supply is strictly limited. As many alternative uses are possible for land, many activities (among which agriculture, forestry, housing, transport for example) are competing for land. But land may also be considered as an asset in the sense that it allows for accumulating wealth and transferring it between generations. Hence, this is not so surprising that many fields of Economic theory are concerned with land and land markets. Consequently, when undertaking a literature review on land markets, one faces a huge amount of work that can be roughly related to four main fields of Economic theory: Agricultural Economics, Development Economics, Environmental and Resource Economics and Urban Economics.

Obviously, this is out of the scope of this paper to provide an exhaustive review of the existing literature on land markets. Instead, as our literature review has as its main objective to support modelling work carried out elsewhere in the IDEMA project, the scope of this paper has been restricted to several issues that are particularly relevant for the purposes of modelling land markets within global models of agricultural sectors.

In this perspective, one may distinguish two main issues in recent literature on land markets: i) What are the conditions for agricultural land markets to emerge and operate correctly? ii) What are the main determinants of farmland prices and especially is support to agriculture capitalised into farmland prices and who finally benefits from agricultural support programs? The first is-

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sue is a typical issue in Development Economics and has been widely analysed in this context. Since the beginning of the 1990's this issue has attracted increased attention because of its importance in transition processes such as in Central and Eastern Europe, the former Soviet Union and East Asia. Relying on the general framework and recommendations primarily provided in the Development Economics literature, a large part of existing work is devoted to the analysis of land reforms and land institutions in transition countries, the assessment of the stage of development of their land markets, the detection of obstacles that prevent well-functioning of these land markets and finally the relationship between initial conditions and applied land policies on the one hand and the evolution of farm structure and agricultural performance on the other hand.

The second issue has a long tradition in Agricultural Economics, with some ramifications in Urban Economics as far as land prices in the urban-rural fringe are concerned. Most of existing studies dealing with farmland price formation are of empirical nature and rely on capitalisation formulas derived within the general present value framework. A first stream of this literature has been directed at emphasising what can explain the large variations that have been observed in farmland prices in several developed countries (mainly the US and, to a lesser extent, some EU Member States) over the last decades. Many explanations have been advanced resulting in many modified capitalisation formulas proposed and tested empirically as well as some divergent views regarding the appropriateness of the present value method for examining land price movements. A second stream of existing literature has focused on the critical policy issue of the distribution of the benefits of agricultural support programs. Such studies have attempted to measure the extent to which farm program benefits are capitalised in land values and prices, resulting in some insights regarding the transfer efficiency of agricultural support as a whole or of alternative farm support programs.

As regards the modelling work under the IDEMA project, the first issue is particularly relevant for land market modelling in new EU Member States while the relevance of the second issue mainly relates to the modelling of agricultural support programs and especially of direct government payments.

The paper is organised as follows. Section 2 focuses on the literature dealing with the conditions for agricultural land markets to emerge and operate correctly. The general framework and recommendations provided as part of the Development Economics literature are first presented. Then, some key studies dealing with the specific context of transition countries are reviewed and their main insights synthesised. Section 3 deals with the recent literature concerned with land price formation. The general present value framework is described first. In a second stage, main studies, which have been devoted to explain agricultural land price variations are reviewed, emphasising the various land price determinant-types that have been explored together with the corresponding refinements of the basic capitalisation formula. In the third stage, some

studies specifically dedicated to the empirical analysis of the relationship between agricultural land prices and agricultural support programs are reviewed and an overall synthesis of empirical results regarding this specific land price determinant-type is provided. Section 4 concludes by investigating how insights provided by this literature review may be used to support the modelling work undertaken in workpackages 4 and 9 within the IDEMA project, while helping to specify the most useful empirical information on land markets to be compiled as the second step of workpackage 8.

2. Conditions for emerging and well-functioning agricultural land markets

Like any other market, the basic role of land sales and rental markets is to allow for permanent or temporary transfers of land between potential users. And from an economic point of view, what is expected from well-functioning land sales and rental markets is to help to bring this factor of production to its most productive use allocation. Restricting this reasoning to agricultural land, potential users are farmers and what is expected from well-functioning land sales and rental markets is to allow for transfers of land from less efficient farmers to more efficient farmers in order to lead to the optimal land allocation.

Starting from this basic principle the extensive existing literature in Development Economics but also, to some extent, in Agricultural Economics has looked into the four following questions: i) What are the conditions for land sales and rental markets to emerge? ii) What are the conditions for well-functioning agricultural land sales and rental markets? ii) Is there an optimal size of agricultural holding and which, between owner-operated family farms and large scale hired labour-operated farms, is the most efficient? iv) Why have land reforms seemed necessary to change (most often extraordinarily unequal) land ownership distributions in many parts of the world and which conditions for efficiency and equity-enhancing land reforms?

The first question relates to the existing literature on property rights and land tenure security. The second question gathers the extensive literature on the determinants of land market participation (mainly credit, labour and insurance market imperfections). The third question refers to the extremely abundant literature on economies of scale and the farm size-productivity relationship. Finally, the fourth question covers the existing literature on land policy and land reforms.

Firstly the main economic mechanisms are highlighted and the main insights drawn by these various streams of literature are synthesised. Then, some recent studies specifically focusing on the land reform process and the functioning of agricultural land markets in transition countries are reviewed.

2.1. Agricultural land market functioning: Theory and evidence

This sub-section heavily draws on Binswanger et al. (1995), Deininger and Binswanger (1999) and Deininger and Feder (2001).

2.1.1. Property rights in land

As suggested by the Boserup (1965)'s pioneering analysis, the emergence of land rights and the process of gradual individualisation of property rights in land may be viewed as an endogenous response to increased scarcity of land. Underlying mechanisms have been summed up by Deininger and Feder (2001) and may be decomposed as follows:

- When land is abundant, there is no need to invest in soil fertility and, as fertility is restored by long fallow periods, ownership security is not required to induce investment.
- When population density rises and land scarcity increases, fallow periods are gradually shortened and higher investments are required to maintain soil fertility. In addition, marginal lands are brought under cultivation requiring also higher investments to make them productive. Thus, ownership security becomes an important incentive for the required investments to be undertaken.
- Within the course of economic development, arising technical progress and expansion of trade increase incentives for a better definition of rights in land, furthering evolution towards individual property rights to land. By increasing the stream of incomes that can be derived from one unit of land, technical progress and trade expansion increase the need for tenure security so that individuals can be sure to reap the benefits of investments.
- As the demand for credit to finance inputs and investments in land improvements raises, the issue of land as collateral becomes important, furthering evolution towards individual and transferable property rights to land.

Earlier stages of economic development are generally characterised by communal property right systems while later stages are rather associated with individualised property right systems. There is an extensive literature dealing with relative benefits and costs of both types of land ownership. Emerging conclusions are that the main benefits of individualised property rights are:

- increased tenure security, which by contributing to eliminate the threat of loss of future income due to conflicting challenges, increases the subjective expected returns of productivity-enhancing long-term investments together with the incentives for the owner to undertake such investments. Studies which have explored the relationship between tenure security and farmers' investment behaviors show clearly that tenure

security affects significantly farmers' investment decisions (see Deininger and Feder, 2001, for references);

- transferability which, when there is heterogeneity of skills across the population and non-agricultural labour opportunities, contributes to enhance the overall resource allocation by allowing the transfer of land from less to more productive uses (provided that markets are well-functioning);
- increased credit access through the collateralisation of land. The provision of a collateral is generally required for participation in formal credit market. Land with secure, well-defined and easily transferable property rights (as formal land titles) is an ideal collateral. There is empirical evidence of the relationship between land titles and improved formal credit supply as well as increased farmers' investments (e.g., Feder et al., 1986). However, the positive impact of land titles on credit supply and farmers' credit access can be strongly size-differentiated (e.g., Carter and Olinto, 1996). This differential impact relates to the question of transaction costs and imperfect credit markets. More specifically, if credit markets are imperfectly functioning with high transaction costs to small producers in rural areas (a common situation in developing and transition countries), the increased creditworthiness brought by land titles is likely to be insufficient to facilitate access to formal credit by small farmers. Hence, this suggests that in an environment where other markets (such as credit markets) are imperfectly operating, the benefits of titling may accrue mainly to medium and large landowners unless complementary measures to reduce transaction costs and ensure credit access to small farmers are undertaken. This idea is largely developed in the literature on land reform and land policy (e.g., Deininger and Binswanger, 1999);

while the main costs result from:

- the expenditure needed to physically demarcate and delineate plots, to establish and maintain land records and to enforce property rights and resolve disputes. When public recording and enforcement of property rights are not available, these costs are borne by landowners. In that case, individuals may spend large amount of resources on means of protection. Some authors have shown the social inefficiency of such private rights enforcement systems (see Deininger and Feder, 2001, for references). This suggests that public provision of rights enforcement (records, police and law) is preferable from a social efficiency point of view;
- the loss of the insurance function provided by communal land ownership, when markets are highly incomplete (a common feature in developing countries). It has been long recognised that in a very uncertain environment when markets (especially for in-

surance) are incomplete group ownership and/or joint communal production may perform an important insurance function in terms of elimination of the threat of permanent asset loss and/or facilitation of smooth consumption (e.g., Platteau, 1996).

What is interesting to note is that at low level of development (where population density is low and land relatively abundant, markets are highly incomplete, commercial integration is low), the benefits of individualised property rights are low while their costs are high. Once the level of development increases (land becoming more scarce, markets emerging and operating better, access to markets and trade increasing, infrastructure increasing, etc.) the benefits of individualised property rights rise while their costs decrease. This implies that, with economic development, it is likely that at some point, it becomes economically rational for a community to allocate permanent and fully tradable land ownership rights to individuals.

However, most authors recognise that historically, the evolution towards individual property rights has been, in most parts of the world, far from the smooth process outlined above. History shows that as population and land scarcity increase, boundary conflicts and social tension rise. This often leads, when strong community-level institutions are missing, to the appropriation of property rights by powerful individuals. Binswanger et al. (1995) provide an interesting and extensive exposition of this process.

2.1.2. Key determinants of land market participation

The shadow price of land for individuals is determined by the agricultural production function, their skills and managerial ability and eventual imperfections in land, labour, credit and insurance markets. Such market imperfections are common in rural areas. This probably explains the extensive literature that has been devoted to the analysis of the impact of these market imperfections on land sales and rental transactions. According to this literature, the main factors that affect farmers' productivity and, in turn, influence their land demand are:

- the existence of non-tradable or imperfectly tradable factors of production such as: draft animal power (Bell, 1977; Bliss and Stern, 1982), family labour (Jodha, 1984), technical know-how (Reid, 1976), managerial ability (Bell and Zusman, 1976). The underlying idea in all these studies is that if some production factors are difficult to adjust because of their indivisible nature or because their markets are not or imperfectly functioning, households will adjust their operational size (i.e., their cultivated land) according to their factor endowments;
- labour supervision costs, which affect the optimal operational size of farms. This argument is in fact at the core of the long-standing debate on the relationship between farm size and farm productivity. Consequently, it is also a central issue in the land policy and land reforms discussions (see below). The basic idea is that because of the

need to manage hired labour and enforce effort in large-scale operations, owner-operated family farms would be more productive than large-scale holdings. The idea of labour supervision costs derives from the agency costs framework as proposed in their seminal work by Jensen and Meckling (1976). Agency costs result from the lack of incentives for wage workers to exert effort and the induced need to supervise labour or to offer incentive contracts. Applied to agriculture, this argument implies that large-scale farms relying on hired labour would bear these supervision costs, giving a productivity advantage to own-operated family farms. Indeed, family members, as residual claimants to profits, have higher incentives to exert effort than hired labour. Numerous empirical studies have been devoted to test whether there is an inverse relationship between farm size and farm productivity (details and references are provided in the next paragraph);

- limited credit market access, which can limit the ability of farmers to acquire production factors (including land). Asymmetric information and moral hazard may lead to quantity rationing in credit markets (Stiglitz and Weiss, 1981). Formal credit markets may overcome part of the information problem by imposing a collateral requirement. Owned land is often used as such a collateral. In that case, the supply of credit depends on the amount of land owned, which is likely to confer a credit access advantage to large landowners over the smaller ones. Furthermore, transaction costs are often higher when providing credit to small producers mainly because transactions costs tend to decrease with loan size (e.g., Adams and Nehman, 1979; results obtained by Miller and Ladman, 1983, also suggest a negative relationship between transaction costs and the amount of collateral, while Petrick and Latruffe, 2003, find an inverse relationship between borrowing costs and land owned). Consequently, smallholders are likely to face high borrowing costs;
- limited insurance market access which may lead risk-adverse farmers to adopt less risky but also less productive asset portfolios (see Deininger and Feder, 2001, for references);
- transaction costs associated specifically to land sales markets. As in the context of credit markets, transaction costs on land sales markets usually decrease with the size of the land transaction and tend to discourage small land transactions. One explanation is the high costs of subdividing large plots or large farms to many purchasers. Another explanation is the existence of costs that are independent of the size of the transaction (such as registration and fees).

There are of course much more factors that affect the participation of farmers to land sales and rental markets, than the key ones mentioned above. In addition, these key determinants are usually not acting independently but simultaneously to influence land market functioning and land transactions. As a result, there are other mechanisms, which can be found in the literature that have not been described above. This is the case for example of land distress sales. When both credit and insurance market imperfections deny farmers (mainly smallholders) insurance against shocks, such as bad harvest or accident, they may be forced to sell off land in period of distress (Cain, 1981).

Finally, one realises at this stage how land market functioning is a complex matter. The above discussion suggests that there are a lot of factors affecting land market functioning and land transactions. Another general insight that can be drawn from reviewed literature is that many factor market imperfections are likely to be detrimental rather to small farmers in the sense that they contribute to bias land allocation structure in favour of large landholders. From the point of view of land policy this means that improving the functioning of land markets will not necessarily lead to better resource allocation (in terms of overall efficiency and equity) if other markets' distortions are not tackled.

To this regards, one must however make a distinction between land sales and land rental markets. Indeed, the latter are less affected by credit and insurance market imperfections than the former (e.g., Carter and Salgado, 2001). Moreover, rental markets are associated with lower transaction costs than sales markets (e.g., Skoufias, 1995). This leads the World Bank in its recent land policy recommendations to emphasise the higher priority to liberalise land rental markets (Deininger and Binswanger, 1999). There is an extensive literature that has not been reviewed here dealing with the effects and the relative efficiency of the different tenancy contracts (for an extensive review of this literature, see Otsuka and Hayami, 1988, and Otsuka et al., 1992).

2.1.3. Farm size and productivity

As noted by Benjamin (1995), "one of the oldest empirical regularities in economics is the inverse relationship between farm productivity and farm size: small farms produce more output per acre".[2]

One thinks instantaneously to eventual decreasing returns to scale in agricultural technology to explain such an inverse relationship. However there is little empirical evidence of the existence

[2] To this regards, Benjamin (1995) refers to Berry and Cline (1979) who provide a thorough review of empirical evidence regarding this inverse relationship. See also Binswanger et al. (1995) who report a number of additional references.

of such decreasing returns to scale.[3] Indeed most studies suggest that agricultural production is characterised by constant returns to scale (e.g., Berry and Cline, 1979; Carter, 1984; see also Deneinger and Feder, 2001, for several other references).

Alternative explanations that have been advocated by authors all rely on market imperfections. The role of labour market imperfections was first investigated. For example, with poorly functioning external labour markets, smallholders may have excess family labour available for use on farms. Therefore, small farms cultivate more intensively. In the same vein, as previously mentioned, the existence of labour supervision costs may be a reason for small family farms to be more productive than large farms relying on hired labour. Hence, the presence of imperfections on labour markets has been the most common explanation for the inverse farm size-productivity relationship (e.g., Bhalla, 1979; Berry and Cline, 1979; Carter, 1984; Benjamin, 1995, and a lot of other studies cited by these authors as well as by Deininger and Feder, 2001).

Some authors however challenged the idea of an universal inverse relationship between farm size and farm productivity. For Berry and Cline (1979) for example, there is evidence that yields may be positively related to farm size or that yields do not vary systematically with farm size. Similarly, Squire (1981) underlined the lack of conclusive evidence in a number of studies. This lead several researchers to go further into the analysis of the complex farm size-productivity relationship. Two directions were proposed: the presence of multiple market imperfections on the one hand, the presence of unobservable heterogeneity across farmers or households on the other hand.

Feder (1985) in his seminal work demonstrated formally that a combination of labour and credit market imperfections could lead to different forms of relationship between farm size and farm productivity. More specifically using a model where the efficiency of hired labour depends on the intensity of supervision by family labour, while the supply of credit for working capital depends on the amount of available collateral (owned land), he showed that very differentiated farm size-productivity relationships could arise. In the absence of credit market imperfections, the supervision cost associated with hired labour makes small farms more productive. Thus, if land rental markets are well-functioning, farmers rent in or rent out the amount of land that allow them to reach a uniform ratio of family labour to operated area. In that case, there is no relationship between farm size and farm productivity. When the imperfection on the credit market is taken into account, the advantage to small farms due to the existence of the supervision cost is balanced by the advantage to large farms resulting from the existence of the land owned-related constraint on credit access. In that case, the optimal size of the operational holding varies systematically with the size of the owned holding. As a result, there is a relationship between

[3] Except for some highly specialised productions or plantation crops. This point is detailed in Binswanger et al. (1995).

the size of the farm and its productivity. The magnitude and the direction of this relationship depend on the relative elasticities of output with respect to effective labour and of labour effort with respect to supervision. Feder (1985) provided a numerical example showing that using various sets of parameters, the farm size-productivity relationship may be negative, positive or U-shaped (see also Carter and Kalfayan, 1988, Eswaran and Kotwal, 1986, and Carter and Wiebe, 1990).

Feder demonstrated formally that the farm size-productivity relationship could exist or not and be positive or negative. Obviously, due to the complexity of this relationship because of the multiple factors that may potentially affect it, it is very difficult to test it econometrically, and even more difficult to test empirically for Feder's hypotheses. Hence, the second direction of investigation rather derives from these empirical difficulties and proposes to examine the statistical robustness of the inverse farm size-productivity relationship. More specifically the question is raised whether the inverse farm size-productivity relationship obtained in a number of empirical studies could simply be a statistical artifact, generated by omitted variables. Indeed, especially when cross-sectional data are used, it is likely that there is a significant heterogeneity across farms or households that is unobservable and often uncontrolled in estimations. The source of heterogeneity that has been most commonly investigated is land quality. The idea was that they may have some correlation between measures of farm size and land quality on the one hand and that this correlation could eliminate the inverse farm size-productivity relationship, on the other hand. Indeed, Bhalla (1988) and Bhalla and Roy (1988), using Indian data, found that measures of land quality were negatively correlated with farm size and that including variables to proxy soil quality in their estimated model eliminated the inverse productivity relationship. Benjamin (1995) using a framework and data (from Java) allowing him to address both the imperfect labour markets question and the land quality issue, obtained similar results.

Nevertheless, contradicting results have been obtained by other studies and the land quality issue (more generally the issue of uncontrolled farmers' or households' heterogeneity) is still controversial. For example, Carter (1984) and Rosenzweig and Binswanger (1993) found that, even when controlling for land quality difference, the inverse productivity relationship survived although it was attenuated.

Finally, as noted by Binswanger et al. (1995), most of the empirical work on the farm size-productivity relationship suffers from several drawbacks and has not succeed yet to deal adequately with the complexity of the issues involved. Hence, even if there is actually evidence of a negative productivity relationship, more work is needed on this subject.

2.2. Land reform, land markets and farm restructuring in transition countries

Much has been written on land reforms and farm restructuring in transition countries. In line with the general objective of this paper, the aim of this sub-section is not to provide an exhaustive review of the existing literature but rather to extract from this literature the main relevant features and insights as regards the modelling of land markets functioning in Central and Eastern European Countries (CEECs).

While a thorough overview of land reform, land markets and farm restructuring situation and issues in CEECs may be found in Swinnen et al. (1997)[4], our review focuses on two relatively recent synthesis reports that constitute, at least to our knowledge, the current broadest sources of factual and analytical information about the development and functioning of agricultural land markets in CEE countries, together with the process of restructuring and the performances of their farming sectors. Both reports result from World Bank's initiatives (Environmentally and Socially Sustainable Development Unit and Development Economics Research Group). The first one is a proceedings volume (Csaki and Lerman, 2000), which presents a selection of papers presented at the second EU Accession Workshop organised jointly by the World Bank and the FAO and held in Warsaw, June 27-29, 1999. The second one synthesises work undertaken under a cooperative project initiated and managed by the World Bank (Lerman et al., 2002).

In addition to these synthesis reports a recent paper by Swinnen and Vranken (2003) is also reviewed. This paper is the first to provide a formal conceptual model and an econometric analysis of the main determinants of households' participation to rental markets in CEE countries.

Main insights of both synthesis reports are first summarised. Then, the modelling and analysis proposed by Swinnen and Vranken (2003) are presented and discussed.

2.2.1. Land reforms, land markets and farm restructuring in transition countries

Emerging land markets

Csaki and Lerman (2000) report several papers, which aim at analysing and assessing the state of development of land markets, the way they operate and their level of activity in CEECs. Dale and Baldwin's study proposes a general framework allowing for comparative cross-country assessments. According to the authors, land market operations need to be supported by three regulatory pillars: land registration and cadastre (ensuring secure titles and rights), land valuation (establishing a connection between the property and a monetary value) and financial services (providing capital and credit). Then, a set of indicators allowing to assess the state of develop-

[4] Periodical information and data regarding the evolution of markets and farm structures in CEECs are also provided by the series of country and summary reports published by the DG Agriculture of the European Commission, under the general title: *Agricultural situation and prospects in the Central and Eastern European Countries.*

ment within each pillar is proposed. Based on country case studies, supported by the EU's ACE program, retained indicators are given a score for each country (i.e., the Czech Republic, Hungary, Latvia, Poland, Slovakia and Slovenia), a higher score meaning a further stage toward a well-functioning land market. Finally, an additional set of indicators is defined and scored in order to assess and compare the level of land market activity in each considered country. Prosterman and Rolfes's study provides a detailed review of the legal framework for land in Lithuania, Poland and Romania. Several dimensions are explored, encompassing private ownership of agricultural land, land use regulations, the transaction regime, land mortgage, land registration and land taxation.

The main conclusions that can be drawn from both studies are the following:

- Land market reforms have progressed in all CEE countries. However, substantial progress still must be made in some areas.

  Dale and Baldwin notice that the market reforms have progressed fastest in the land registration and cadastral pillar and less quickly in the two other pillars: valuation and financial services. According to these authors, the main reason for the slower development of the valuation pillar is the lack of historical role for property valuers and the lack of a central agency or institution charged with responsibility in this area. As for the financial services pillar, the need for strengthening capital and credit markets development is emphasised. To this regards, authors underline the remaining need for clearer mortgage laws and stronger foreclosure and bankruptcy laws in order to protect the interests and lessen risk of the various parties.

  Similar findings are pointed out by Prosterman and Rolfes. The country case studies for Lithuania, Poland and Romania show that the three countries' law contains much of the needed provisions for a market economy in agricultural land to develop. The three countries have progressed reasonably well in most of the considered dimensions, but some delays are observed in the areas of transition to private land ownership (privatisation and restitution of land) and land mortgage legislation.

- Several CEE countries still face problems and obstacles in the completion of land privatization and restitution programs.

  According to Dale and Baldwin's study, in several CEECs there are still substantial inconsistencies or inadequacies in the completion of the land registers relating to "missing owners" or "missing parcels". Such problems are mainly due to either the lack of updating during the socialist years resulting in large numbers of unknown owners (Slovakia), the potential claims of groups who were expelled (the Czech Republic, Poland, Slovakia) or the loss of boundary data (the Czech Republic, Slovakia). Thus, in

some countries, substantial amounts of land are still held by the State and restitution is still not completed. Prosterman and Rolfes also point out similar problems of conflicting claims along with the restitution process in Lithuania.

- Usually, there is a lack of a high level integrated policy and no formal mechanism for inter-ministerial debate.

  Dale and Baldwin underline the complexity of the institutional structures in Poland (with no single land registration and cadastral authority as the responsibilities are split between different ministries) and the lack of technical infrastructure within the land registry in Slovenia.

- Generally, land market activity is low. Land transactions are still difficult to conduct, the turnover of land is low and market prices of agricultural land are relatively low.

  Normalising the EU score to 100, Dale and Baldwin find that the overall land market performance in their case countries scores between 20 and 45 (Hungary ranking first). The low level of activity on land markets is pointed out especially for Latvia, Slovenia and Slovakia.

  This low level activity-characteristic of land market is also emphasised by Prosterman and Rolfes for Lithuania. Besides, these authors underline the low level of market prices of agricultural land observed in all three case countries: 333-440$/hectare in average in Romania, 375-500$/hectare in Lithuania, 790-1850$/hectare in Poland, as compared to a 3500$/hectare average observed in the Western region of Germany.

- Restrictive provisions and disincentives such as high transaction costs, difficult access to credit and many parcels unviable as agricultural units hamper land markets development in most CEECs.

  The emergence of a well-functioning credit market, especially in rural areas, has not yet materialised. The need for a further developed credit market as a tool to support the development of land markets is advocated by both Dale and Baldwin and Prosterman and Rolfes for all considered CEE countries.

  High transaction costs are reported as an impediment to land markets development by Dale and Baldwin, especially for the Czech Republic where the loss of boundary data has resulted in the lack of effective land units. Prosterman and Rolfes also point out the existence of high transaction costs, especially for small parcel transactions, due to high notarial fees and surveying charges in Lithuania, Poland and Romania.

  As noted by Prosterman and Rolfes, in many CEECs, there exist impediments to land transactions and/or restrictive provisions that reduce the range of participants to land

markets. For Lithuania for example, they suggest that the ban on agricultural land ownership by Lithuanian legal entities constitutes a strong impediment to land markets development, first because legal entities are a major class of likely market participants, and second because they, especially banks, may be discouraged from mortgage lending. Prosterman and Rolfes also underline that restrictions on foreign ownership and foreign purchases of agricultural land, which are in force in Lithuania, Poland and Romania contribute to reduce the range of participants to land markets.[5]

Finally, both the Dale and Baldwin's study and the Prosterman and Rolfes's study suggest that all considered CEE countries have a solid base for the development of active land markets, that land sales markets are not yet very active, but that this is changing and that the amount of land transactions should increase as the countries move closer to EU accession. At this stage, it is important to underline that such conclusions rely on rather old data and information (Dale and Baldwin use observations for the year 1997 while Prosterman and Rolfes's analysis relies on data and information gathered on the beginning of 1999). Therefore, it is likely that land markets have further developed since the beginning of 2000 and that some updating is required in order to get a clear view of the current land market situation in CEECs.[6]

Farm restructuring

As part of the Csaki and Lerman (2000)'s report, the Mathijs and Swinnen's study synthesises results of survey work in CEE that sought to analyse the joint evolution of farm structure and farm competitiveness. The main conclusions that can be drawn from this study are the following:

- Significant restructuring of farms has taken place since 1989 in most CEE countries. Individual farming is growing while cooperatives continue to decline in all CEECs. However, large companies and cooperatives still account for a significant share in total agricultural land in Hungary, the Czech Republic, Bulgaria and Slovakia, while they represent a very low share in Poland, Slovenia and Latvia.
- The most efficient farm organisations are the larger family farms and some farming companies. Cooperatives are the least efficient farm organisations.
- There is no clear evidence about the relationship between the shift to individual farms and overall productivity growth in agriculture. To achieve productivity gains, farm restructuring needs to be complemented by supporting institutions and policies that provide conditions for improved access to land, credit, technology and information, allow

[5] Prosterman and Rolfes point out a number of other impediments to land transactions such as penalties for quick-turnaround sales, minimum landholding size requirements, maximum size limit on ownership of agricultural land, etc

for a better allocation of labour and contribute to overall economic development. As an illustration, the three countries with the most success in farm restructuring (the Czech Republic, Hungary and Slovakia) are those in which rural labour has found alternative employment outside agriculture.

The role of land policies in the evolving farm structure

The second reviewed report by Lerman et al. (2002) has as its main objective to show how different policies in terms of private property rights in land, degrees of control of land markets and procedures for restructuring of farmer collective and state farms result in different farm structures. For that purpose authors analyse the land reform and farm restructuring in CEE countries as compared to CIS (Commonwealth of Independent States) countries. The main findings of Lerman et al.'s study may be summarised as follows:

- CEE and CIS countries started from a common heritage reflecting the socialist model of agriculture.
- Mainly due to cultural and political differences, CEE and CIS have implemented different land reforms:

  Most countries allow private ownership of farmland. The latter remains largely state-owned only in Belarus and parts of Central Asia. All CEE countries plus four CIS countries have no legal barriers to land transactions. Inversely, the two largest CIS countries in terms of available farmland, Russia and Ukraine, recognise private ownership but buying and selling of land is restricted in practice.

  Nearly all CEE countries have chosen to privatise land by restitution to formal owners (except Albania which opted for distribution, and Hungary and Romania which used a mixed restitution-distribution strategy). At reverse, CIS countries generally adopted the "land to the tiller" distribution strategy.

  All CEE countries plus four CIS countries allocate land to individuals in the form of physical plots. In other CIS countries, individuals usually receive paper shares that certify their entitlement to a certain amount of land, without specifying a concrete physical plot.
- As a result different farm structures emerged in CEE and CIS countries.

  In the CIS countries, the land resource represented by individual shares are typically left in joint cultivation in the former collective farm or some corporate successor. Therefore, the extent of individual cultivation is substantially lower in CIS as com-

[6] This is the objective of the second-step work under workpackage 8.

pared to CEE (16% of agricultural land is cultivated individually in CIS countries, compared with 63% in CEE countries).

Despite reallocation of land to the individual sector, large collective and corporate farms still play a much more prominent role in CEE and CIS than in market economies. However important differences are emerging between such organisational forms in CEE and CIS. Most large farms in CIS continue to operate like the former collectives, while the corporate farms in CEE are substantially smaller than the former collectives and much more sensitive to market signals than previously. CEE corporate farms have a stronger profit orientation and exhibit greater ability to adjust their labour force. These market-oriented operations are still not observed in most large farms in CIS.

- There is still no conclusive evidence that family farms in CEE and CIS are significantly more efficient than large collective and corporate farms. Available results allow only to conclude that large collectives or cooperatives certainly do not outperform the newly created individual farms.

  Other less direct indicators, such as agricultural output and GDP growth indicate that the CEE countries as a group appear to have outperformed the CIS group by the two measures of growth between 1992 and 1997.

  Similarly, the agricultural labour productivity indicator shows that labour productivity increased substantially since 1992 in the CEE countries and declined in the CIS countries.

The farm size-efficiency/productivity relationship

Previously reviewed studies all conclude that there is still no conclusive evidence about the relationship between the shift to individual farms and overall productivity growth in agriculture (Mathijs and Swinnen) or that family farms in transition countries are more efficient than large collective and corporate farms (Lerman et al.).

Indeed, several studies have been devoted to assess the performances (global competitiveness, technical and scale efficiency, partial or total factor productivity) of farms in CEE countries according to their size or their organisational forms. And obtained results are contrasted.

Davidova et al. (2002), Lerman (2002), Davidova et al. (2003), Gorton and Davidova (2004) provide extensive analyses and assessments for various CEE countries. Latruffe (2004) proposes a review of existing studies as well as a sound empirical examination of the farm size-efficiency/productivity relationship for Poland. An extensive review of these studies (data, methodologies used and detailed obtained results) still remains to be undertaken for being able

to draw reliable and relevant conclusions on this key issue of the farm size/organisational form-efficiency/productivity relationship in CEE countries.

2.2.2. Land rental markets and household farms in transition: Theory and evidence from Hungary

Swinnen and Vranken (2003) examine the main determinants of households' participation to rental markets in CEE countries. The analysis first proposes a theoretical model of the decision-making process of farming households to participate in the rental markets (i.e., to rent in or rent out land), which incorporates transition characteristics of land ownership, land use and rural market imperfections. Then, based on a dataset on rental activity of a representative sample of Hungarian rural households, an econometric investigation of the determinants of households' rental activities during transition is provided.

The main features of the theoretical model may be summarised as follows:

- The representative household owns a fixed quantity of land and family labour, and derives income from agricultural production on farm and from off-farm wage employment. Agricultural output is produced by combining land, effective labour and variable inputs. Land used can be larger (some land is rented in) or smaller (some land is rented out) than the land owned by the household.
- There are some transaction costs on the land rental market, which result in the price for land rented in to be higher than the price for land rented out.
- There are some imperfections on the credit market. It is assumed that access to loans depends on the amount of land owned and productive asset, and that the household has some own liquidity.
- There are some imperfections on the labour markets. It is assumed that the effective labour supplied by hired workers depends on the amount of family labour working on farm (supervision cost). In addition, the assumption of rationed off-farm employment opportunities is incorporated in the model by allowing that the wage paid to hired labour differs from the wage that family labour can gain off farm and by setting an upper limit to the amount of labour employed off farm.

First-order conditions of the household's utility maximization program allow thus to derive the main following analytical results:

- The household is more likely to rent in land if the marginal productivity of land is higher. The marginal productivity of land, and in turn the decision to rent in or rent out, is affected by the land endowment of the household, the intrinsic quality of land and the skills of the household.

- The household is more likely to rent in land if the land rental price is lower. Transaction costs cause a gap between land rent in and rent out prices, and consequently contribute to reduce both renting in and renting out. An important cause of such a price gap in transition countries may be obstructions or imperfect competition in the land market by large farm organisations.
- Credit market constraints reduce the likelihood that a household will rent in land. Credit market constraints also reduce labour use on farm, further decreasing renting in of land.
- Labour market imperfections also affect land rental decisions. Scarcer off-farm labour opportunities induce a farming household to rent in more land. Supervision costs make hired labour more expensive than family labour, and family labour endowment affects positively the decision to rent in land.
- Higher wages, either for off-farm employment and/or for hiring farm labour increase the shadow price of labour on farm and/or the actual wages, reducing renting in of land.

In the sample used for the empirical analysis, 76% of the 1400 involved Hungarian households do not participate to the land rental market, 16% rent out land (with an average of 5 hectares rented out) and 8% rent in land (with an average of 15 hectares rented in).

Empirical estimations, using censored Tobit regressions, provide the following results:

- Renting in of land is affected by the age and education of the household head. Renting in increases with the age up to 45 years, and then falls. Education, as measured by the years of schooling (ranging from 3 to 20 over the sample), has a significant positive effect on renting in when household heads have more than 8 years of education.
- There is no significant effect of the average land quality in the county on household decision to rent in or rent out land.
- Households, which own more land are likely to rent out land and less likely to rent in land. In addition, a positive relationship between buying of land in previous years and renting in of land in the current period is found. This suggests that households, which wish to extent their cultivated area, do so by a combination of buying and renting land.
- Land renting is more important in regions where the sales price of land is higher, suggesting that when buying land is more expensive, households prefer renting land.
- Credit market constraints affect positively (resp. negatively) and significantly the renting in (resp. renting out) of land.

- Constrained access to off-farm employment may have an even larger impact than credit market imperfections on the land rental market. Access to off-farm income has a strong negative impact on renting in of land.

Such study suggests that even if there exist imperfections in some or all rural factor markets in CEECs that prevent some farm households to buy or sell agricultural land, rental markets can nevertheless enable such households to adjust their holding size. Indeed, Swinnen and Vranken (2003) show that land rental markets are playing in important role in CEECs in reallocating land to farm households most in need. Therefore, from the IDEMA project perspective, it is important to pay attention to land rental markets in CEECs (but also in Western EU) since by allowing land reallocation between farms they may contribute to enable these farms to adjust their operational size and, in doing so, to make output supply more responsive to policy changes, even in a context of imperfectly functioning factor (sales) markets.

3. Agricultural land price formation

What are the main determinants of farmland prices and what is the exact influence of agricultural support programs on these prices are two typical questions in Agricultural Economics. Indeed, the large fluctuations in farmland prices that have been observed in some developed countries (especially the United States) over the past decades have stimulated much research on the factors influencing land prices. And among these factors, government agricultural support programs have received special attention because their potential impact on farmland prices raises the question of the distribution of the benefits of farm support programs. This issue is very sensitive in any agricultural policy debate. Supporting farmers' income is a major objective of agricultural policies. But if implemented policy programs make the farmland prices to drive up, they raise production costs, hence transferring benefits toward landowners rather than producers. This distributional aspect is of particular importance in countries where a large proportion of land is cultivated by producers who do not own this land (as this is the case in the US and the EU).

Studies on farmland prices are mostly, even totally, of empirical nature. Their main objective is to explain, using various econometric and statistical techniques, farmland price variations either over time (using time series data), or over space (i.e., across some geographical zones or over a sample of farms, using cross-section data) or both (using panel data), and doing so to detect the main factors that affect this price. It is interesting to note that most of these studies focus on farmland price in North America (US and Canada), while very few studies are concerned with farmland price in the EU.

The most common approach has been to rely on the present value framework. The present value model stipulates that the price of an income-earning asset is equal to the discounted expected value of the stream of future net returns or rents to this asset. Hence, according to the present value model, the price of farmland should be driven essentially by the discounted expected value of the stream of future net returns to farming or rents. Early studies used a basic capitalisation formula derived under basic assumptions regarding individuals' expectations of net returns to farming and the used discount rates. Then, this basic capitalisation formula has been widely modified in order to account for many aspects that authors thought as to be important determinants in farmland price formation. These aspects cover mainly different expectations schemes, the explicit account of government support programs, capital gain considerations, credit market constraints and imperfections, changes in risk and nonfarmland returns to land. Such studies usually used traditional regression analyses and their obtained results most often supported the underlying basis of the present value model. However, no consensus was reached as regards to the relevance and explanatory power of the various additional aspects considered by authors. For each of these aspects, including farm support programs, one can find some papers that concluded positively on its role as a major determinant of farmland price fluctuations and others that rejected this conclusion.

Moreover, more recent studies using cointegration analysis have found that farmland rents and prices do not have the same time series properties, questioning the appropriateness of the present value model for explaining farmland price fluctuations.

Therefore, the main insights that emerge from existing literature are, firstly that researchers have not agreed yet on which are the main determinants of farmland price fluctuations, nor on the extent of government farm programs impact on farmland prices. This section emphasises both these points.

The first sub-section presents the basic capitalisation formula, which forms the foundation for most studies dealing with farmland price formation. The second sub-section reviews how this basic formula has been modified by authors in an attempt to better explain farmland price fluctuations. The third sub-section puts emphasis on results obtained as regards the impact of farm support programs on farmland prices.

3.1. The basic capitalisation formula

Assuming that the value of an income-producing asset is the capitalised value of the current and future stream of earnings from owning this asset, the equilibrium asset price at the beginning of time period t (L_t) may be written as:

$$L_t = \sum_{i=0}^{\infty} \frac{E(R_{t+i})}{(1+r_{t+1})(1+r_{t+2})..(1+r_{t+i})} \qquad [1]$$

where R_t is the net real return at the end of time period *t*, generated from owning the asset, r_t is the time varying real discount rate for year *t* and *E* is the expectation on return conditional on information in period *t*.

If it is assumed that the discount rate is constant, agents are risk neutral and differential tax treatments of capital gains and rental income are ignored, then equation [1] becomes:

$$L_t = (1+r)^{-1} \sum_{i=0}^{\infty} \frac{E(R_{t+i})}{(1+r)^i} \qquad [2]$$

Assuming the net return is constant in each period (R^*), equation [2] simplifies to the basic capitalisation formula:

$$L_t = \frac{R^*}{r} \qquad [3]$$

This basic capitalisation formula underlies most of the studies concerned with farmland price formation, with L_t as a farmland value or price and R_t as the real net return to farmland (most often measured by net farm income or some –cash- rent). However, equation [3] is derived under very restrictive assumptions and actually most of existing studies used refined versions of the basic capitalisation formula that were obtained in much more flexible frameworks.

3.2. Land valuation studies: Overview and insights

Considering the set of equations [1] to [3], one realises easily that numerous differentiated capitalisation formulas can be derived, according to the adopted assumptions. For example, starting from equation [1], equation [2] is derived assuming a constant discount rate and risk neutral individuals while ignoring differential tax treatments of capital gains and rental income. Obviously, one would obtain different formulas if it was assumed a time-varying discount rate and/or risk adverse individuals while differentiated taxes were considered. In the same way, equation [3] is derived from equation [2] assuming a constant net return. Once again, one would obtain different formulas if the net return was assumed to change over time and/or if various expectation schemes were considered and/or if it was considered that this return to farmland may result from alternative uses of land (such as farming or housing for example).

Moreover, as it is also possible to mix the various alternative assumptions regarding each of the above aspects, this results in a very wide set of possible capitalisation formulas. This is exactly the situation one faces when reviewing studies on farmland price formation. Furthermore, it is extremely difficult to categorise these studies since they do not differ by one single aspect (for example the studies which have dealt with expectations schemes) but most often by a combination of several aspects (for example, some studies can effectively put emphasis on expectations

aspects but in the same time they also include other aspects such as opportunity cost of capital or other considerations). Consequently, it is also extremely difficult to compare their results.

Nevertheless, adopting a chronological approach, as proposed by Weersink et al. (1999), one can illustrate two main features. First of all, starting from capitalisation formulas essentially centred on agricultural-related explanatory variables (especially the net real return to farming), authors have progressively introduced out of agriculture-related variables (mainly macroeconomic variables such as inflation, alternative uses of capital and alternative uses of land) along with more complex arbitrage-pricing rules and expectation schemes. Secondly, thought on the main determinants of farmland prices has evolved dramatically from studies showing that net real returns to farming are the main determinant of farmland prices to studies suggesting that farmland price fluctuations are mainly driven by macroeconomic and capital use considerations.

3.2.1. Present value approaches and traditional regression analyses

In the mid-60's, the common approach to farmland pricing was to use a supply-demand framework with the quantity of land supplied for sale as an ad-hoc function of the price of land and other variables (urban pressure for example) and the demand for land as an ad-hoc function of the price of land and other variables (such as net farm income or productivity increase for example). Examples of these land supply-demand models are Herdt and Cochrane (1966), Tweeten and Martin (1966), Reynolds and Timmons (1969) and Cowling et al. (1970). Harvey (1974) pointed out however that such an approach is theoretically incorrect for two reasons. Firstly, there is not a stable relationship between the number of transactions and the supply of or demand for land. Given that transactions merely restore equilibrium, a given price may be associated with a large number of transactions or no transactions. Secondly, the same factors (farm incomes, riskiness, capital gains prospects, etc.) cause shifts in both the supply and the demand functions. Therefore, their separate influences cannot be identified. Due to these theoretical and other empirical unresolved problems, following studies focused exclusively on the role of demand side forces.

One major modification of the basic capitalisation formula was proposed by Melichar (1979) who supported the idea that the growth rate in returns had been the driving force behind increasing land values throughout the 70's in the US. This idea may be incorporated into the traditional capitalisation formula by considering that the price of land at the beginning of each year t is equal to the discounted expected real return over t plus the discounted expected real price of land at the beginning of year $t+1$. Traill (1979) used the Melichar's capital gains formulation for specifying a farmland price equation, which was then estimated on the basis of UK time series data. He specified the current farmland price as a linear function of expected net farm income (calculated as a weighted average of observed net farm income over the three preceding years), discounted by the expected rate of interest (measured as the one year lagged interest rate), the

expected land price change (calculated as a weighted average of observed land price change over the previous three years) and the current total area of land sold. He found that the estimated equation fit the data fairly well and that the net farm income was a major determinant of UK farmland fluctuations.

Alston (1986) and Burt (1986) also adopted the capital gains formulation. Alston considered in addition the differential tax treatment of income and capital gains and also decomposed the discount rate into a risk premium for land and the nominal interest rate. In doing so, Alston allowed for more flexibility on the capitalisation rate. At reverse, Burt assumed a constant capitalisation rate but proposed a more flexible specification of the composite effects of both expectations with regard to rents and the adjustment mechanism for land price. Although, he found that the percentage change in expected land prices was the major determinant of the annual percentage change in Illinois land prices, Burt noted that expected land prices were not the traditional measure of capital gains but rather an exogenous component depending implicitly on lagged rents. Hence, Burt concluded that land prices were driven mostly by changes in net rents.

In a similar perspective, Feldstein (1980) proposed a capitalisation formula allowing to account, in a flexible way, for the portfolio impacts of changes in nonfarmland investment opportunities and in doing so to consider the role of inflation. The idea supported by Feldstein was that increased expected inflation caused a decrease in the discount rate due to the preferential treatment given to capital gains income. Therefore real land prices should increase with expected inflation. However, Alston (1986) tested for Felsdtein's assumption and concluded that inflation had a non-significant effect on real land prices in the US.

Shalit and Schmitz (1982) argued that credit market constraints and imperfections could explain part of US farmland price fluctuations. Assuming that rising land prices provide extra equity for loan collateral, Shalit and Schmitz derived a capitalisation formula where the accumulated debts per acre appeared as a positive determinant of land prices. Burt (1986) tested Shalit and Schmitz's hypothesis but found debts per acre to have a very small effect on land prices.

One could mention many other factors considered by authors as important determinants of farmland price fluctuations, implying many other differentiated capitalisation formulas. Among these factors, one may report expectation schemes (Lloyd et al., 1991), risk and risk aversion (Chavas and Jones, 1993), transaction costs (Shiha and Chavas, 1995), etc.[7]

[7] One may also mention urban pressure which effect on farmland prices has been investigated in several studies. Earliest studies relied on the present value framework and used simple capitalisation formulas where exogenous urban variables were introduced (e.g., Arnott and Lewis, 1979). Then, hedonic price equations were proposed with accessibility to a city, a motorway, etc. considered as potential factors (e.g., Maddison, 2000). Recent studies rather rely on urban economic model of residential location derived from Urban Economics (e.g., Cavailhès and Wavresky, 2003).

Pointing out the lack of conclusive results obtained by existing studies regarding all alternative factors hypothesised to affect farmland values, Just and Miranowski (1993) suggested that the partial nature of these studies, examining each factor individually, could explain the conflicting results obtained. Hence, they developed a comprehensive and theoretically consistent framework, encompassing all these factors, and allowing to assess their relative importance as regards farmland price fluctuations. Under the general case, the capitalisation formula derived by Just and Miranowski is rather complex, but the various possible specific cases allow to isolate the specific impact of each considered factor on the current price of land. For example, if all the complications of inflation, taxes, credit market imperfections, transaction costs and risk aversion are ignored, the Just and Miranowski's general capitalisation formula reduces to the basic capitalisation formula. Then, using cross-section/time series data by US state Just and Miranowski estimated their farmland price equation under alternative regimes for expectations on land prices and returns per acre (i.e., naive, extrapolative, adaptative and rational expectations). Overall, obtained results show that the US farmland price fluctuations are largely explained by inflation rates and changes in real returns on alternative uses of capital. For example, the increase in the rate of inflation explained 25% of the predicted 1973 price increase in Iowa, while the effect of the opportunity rate of return on capital explained 23% of this predicted 1973 price increase. By comparison, the increase in returns to farming explained 30% of the predicted land price change in 1973. Over the period 1972-75, the rate of inflation and the real rate of return on capital had effects similar in magnitude to the effects of farming return. Just and Miranowski also found that government payments accounted only for a small part of fluctuations in US farmland prices. Minor effects of credit availability were also estimated (rejecting the Shalit and Schmitz's hypothesis). Hence, Just and Miranowski concluded that inflation and changes in the real returns on capital were major explanatory factors in US farmland price fluctuations, in addition to returns to farming.

At this stage, one may conclude that while it is clear that farm income or rent can help explain a significant portion of farmland price movements, it cannot be considered as the only, even the major, determinant of farmland price fluctuations. This suggests that simple capitalisation formulas fail to provide an accurate representation of farmland prices. This idea was actually present in most of previously mentioned studies. However, Just and Miranowski were the first to provide empirical results on the relative importance of the main alternative explanatory factors proposed across the literature. And the main insight that can be drawn from their study is that if returns to farming are one determinant of farmland price formations, they are not the only one, nor the major one.

3.2.2. Time series and cointegration techniques: The present value approach brought into question

Featherstone and Baker (1987) is one of the first study that questioned the empirical finding that net real returns are the major factor explaining land values. Covering a long time period and using vector autoregression (VAR), Featherstone and Baker estimated the simultaneous system of equations of asset value, returns to asset and interest rates. The lags of each variable were used as regressors in each equation and both authors were able to test for the presence of an asset price fad and/or bubble. Such a fad or bubble may result from speculative behaviours in farmland prices. Featherstone and Baker's results confirmed that speculative forces played a major role in US farmland price fluctuations. Likely large and random price responses are inconsistent with a present value formulation.

A number of studies using cointegration techniques reached similar conclusions. Campbell and Shiller (1987) showed that if the present value model is correct, then land rents and land prices should have the same time series properties and the spread, defined as the stationary linear relationship between land rents and prices should add useful information in forecasting future changes in rents given past changes in rents. These restrictions have been used as a test for the appropriateness of the present value model in a number of subsequent studies.

Falk (1991) found that although highly correlated, US land price movements are more volatile than rent movements. Therefore, Falk rejected the present value model on the basis of the second Campbell and Shiller's set of restriction. Using the same procedure, Clark, Fulton and Scott (1993) also showed that the present value model did not hold for US farmland prices.

Then, a number of studies tested for two main reasons for rejection of the present value model: time-varying discount rates and the presence of speculative bubbles (as already suggested by Featherstone and Baker). Using the Campbell and Shiller's approach, Falk (1992) tested and rejected the time-varying version of the present value model as an explanation of Iowa farmland prices. Hanson and Myers (1995) allowed for a time-varying risk premium, but also rejected the present value model. Tegene and Kuchler (1993) tested for the presence of speculative bubbles in US farmland prices and concluded to the rejection of such an explanatory factor of land price fluctuations. However, their tests were challenged by Engsted (1998). Finally, Falk and Lee (1998) proposed an approach to decompose farmland price series into movements attributable to fundamental factors (i.e., factors that influence the time paths of rents and interest rates) and movements attributable to nonfundamental factors (e.g., speculative behaviour). The approach is then applied to annual Iowa farmland prices (over the 1922-94 period). Falk and Lee found that nonfundamental shocks appear to play an important role in explaining the short-run behaviour of farmland prices. In the long-run however, farmland prices are mostly explained by permanent fundamental shocks. Thus, they concluded that deviations of farmland prices from pre-

dictions of the present value model are important in the short-run but not in the long-run. Furthermore, the short-run deviations appear to be a combination of overreactions to temporary fundamental shocks and reactions to nonfundamental factors.

In line with the underlying idea of Falk and Lee, a number of studies proposed to decompose farmland price movements into a market-driven fundamental price and a speculative nonfundamental price, with the latter allowed to exhibit differentiated dynamic behaviours. A general regime-switching model that may nest many types of speculative behaviours as special cases can thus be estimated in order to test which speculative behaviour prevailed according to the data used. Such an approach, together with a review of previous similar studies, was used by Roche and McQuinn (2001) in order to test for the presence of speculative behaviours in Irish agricultural land prices. Their results suggested that the partially collapsing bubbles model provides a reasonable description of the dynamic movements in Irish agricultural land prices over the 1911-96 period.

3.3. The extent of the impact of farm support programs on farmland prices: Empirical evidence

Some of the previously reported studies considered farm support programs as potential determinants, among others, of farmland price movements. This is the case, for example, of the Just and Miranowski's study. Others, although not including explicitly this explanatory factor in their estimated farmland price equation, used however their estimation results for deriving some insights on the extent of these farm programs on farmland prices. Traill (1979) is an example of such an approach. But there is a number of additional studies which have been specifically devoted to address the issue of the impact of farm support as a whole or of different farm support programs (such as price support policy or direct government payments for example) on farmland prices.

Most of these studies rely on standard capitalisation formulas where the net returns to farmland (i.e., R_t in previous equations [1] to [3]) are decomposed into those derived from the market and those derived from government programs. Then, studies differ mainly along four directions:

- the level of disaggregation of farm programs that is considered, some studies considering aggregate farm support (e.g., Goodwin and Ortalo-Magné, 1992), others one (e.g., aggregate US government program payments in Just and Miranowski, 1993) or several types of farm programs (e.g., the different types of US direct government payments in Goodwin et al., 2003);
- the possibility for the discount rate to vary depending upon the source of net returns, allowing to test the existence of some differences in the perceived uncertainty associ-

ated with different sources of future net returns (e.g., Schmitz, 1995; Weersink et al., 1999; Goodwin et al., 2003);

- the adopted stochastic process followed by each source of net returns and expectations schemes; the way they are empirically implemented in estimated equations;
- the type of data used: time series (e.g., Weersink et al., 1999), cross-section (e.g., Goodwin et al., 2003) or time series/cross section (e.g., Just and Miranowski, 1993) implying different empirical implementations of the specified farmland price equations (in particular, different assumptions regarding the properties and specifications of the error terms).

Generally, all studies conclude that farm support programs do affect farmland prices. However there is still no consensus on the extent to which farm support programs are capitalised into farmland prices. Although difficult to compare because of different nature, the following mixed results were obtained:

- Regarding the UK, Traill (1979) found that a 1% increase in support prices would raise land prices by about 10%.
- For Canada, Veeman and al. (1993) found that the removal of direct government transfer payments would lead to a decline in land prices of 5% in the short-run and 18.5% in the long-run. Weersink et al. (1999) determined that a 1% increase in government payments would have nearly no effect on farmland prices in Ontario in the short-run and would increase these farmland prices by about 0.6% in the long-run. In addition, Weersink et al.'s results suggested that farmland prices respond differently to anticipated changes in market-based and policy-generated returns. The estimated discount rate for government payments was found to be greater than the estimated discount rate for market-based returns, suggesting that farmers in Ontario consider government payments as a more stable source of returns. This last result contradicts the suggestion by Schmitz (1995) that Saskatchewan farmers discount government payments more heavily than farm income when valuing land. Finally, using a co-integration approach, Clark, Klein and Thompson (1993) also found that subsidies and market-based income were capitalised in land prices in Saskatchewan.
- For the US, Featherstone and Baker (1988) estimated that a move toward freer agricultural markets from the 1985 farm program would reduce land prices in the US by about 13% in 5 years. Just and Miranowski (1993) found that government payments account roughly for 15-25% of the capitalised value of farmland in the US, but for

only a small part of their fluctuations.[8] Considering separately four main types of US farm programs (i.e., loan deficiency payments, disaster payments, Agricultural Market Transition Act payments and Conservation Reserve Program payments), Goodwin et al. (2003) found that the effect of each program on land values differs significantly. Loan deficiency payments appeared to have the largest effect on land values (an additional dollar of payments raising land values by $6.55 per acre), followed by disaster payments ($4.69 per acre per additional dollar of payments) and AMTA payments ($4.94 per acre per additional dollar of payments). CRP payments were found to have a negative impact on land values. Goodwin et al. (2003) however concluded that they have many reasons to question their results. As advocated drawbacks concern not only their own study but also most of other existing studies, they are detailed below.

Goodwin et al. (2003) identified a number of problems that arise in any attempt to implement the standard present value model in an empirical assessment of the capitalisation of market-based and policy-derived returns in land prices. While the standard model assumes that land prices are determined by long-run expected returns to land, these expected returns are unobservable. What one does observe are the market and the government payments realisations. Therefore, one often attempts to relate these realisations to observed land prices. However to what extent these realisations reflect the long-run expected returns to land? As noted by Goodwin et al. this suggests that "a fundamental issue associated with the empirical models that have been used to evaluate policy impacts on land values is a standard errors-in-variables problem" (p. 746). Such a problem may be quite damaging to any empirical analysis relating policy benefits to land values and calls for further research.

Land rental rates do not encapsulate such intangible beliefs about the future that are difficult to measure and raise important problems in empirical analyses, as mentioned above. Hence, some studies have focused on the impact of farm support programs on land rental rates instead of land prices or values. As cash rental rates are representative of the price of land as an input in the production process, such studies use the standard approach of a farmer maximising profit under given technology and output and input prices. First-order conditions allow to derive supply and input demand functions. The inverse land demand function constitutes the rental rate equation, which is then estimated.

[8] Mixed results were obtained by other studies using quite different approaches. In line with Just and Miranowski's results, Shoemaker et al. (1990) estimated that US farmland values would be 15-20% lower in the absence of farm program benefits. However, Shertz and Johnson (1997) suggested that the elimination of government farm programs would decrease land values from about 30% in the Corn Belt to nearly 70% in the Northern Great Plains. Considering 8 US land resource regions, Barnard et al. (1997) bracketed the effects of the elimination of government payments on cropland values ranging between 12% and 69%.

Using data from the 1992 and 1997 US Census of Agriculture, Roberts et al. (2003) found that each government payment dollar (mainly in the form of Production Flexibility Contract payments) raise land rents by 0.34 to 0.41 dollar per acre. By proposing different estimation strategies in order to control for potential expectation errors and unobserved regional heterogeneity, Roberts et al. showed that estimated incidences of government payments on land rental rates are very sensitive (from 1.55 per acre without any control to 0.34 per acre with several controls for each government payment dollar), the greater the number of controls, the less the estimated incidence.

Using county-level annual panel data for the State of Iowa, Lence and Mishra (2003) estimated the impact of four main types of US farm programs (i.e., loan deficiency payments, market loss assistance, production flexibility contracts and conservation reserve program), on land cash rental rates. As the data were found to exhibit strong geographic dependency, Lence and Mishra accounted for spatial autocorrelation in their econometric estimations and showed that this is crucial to avoid misleading inferences. Cash rental rates were found to increase by almost 1 dollar per acre for each dollar paid for market loss assistance and production flexibility contracts. Conservation reserve program payments were found to exert no effect on cash rental rates. Lence and Mishra also reached the counterintuitive finding that deficiency payments would have a negative impact on cash rental rates. They concluded that this result requires further examination.

4. Concluding comments

What are the main insights that can be drawn from this literature review as regards the modelling work carried out within the IDEMA project on the one hand and for the second step of workpackage 8?

First of all, this literature review has shown how complex are the issues of land market functioning and land price formation. As a result, one may already guess that modelling land markets is a very difficult matter.

Secondly, our literature review suggests that modelling land rental markets is likely to be easier than modelling land sale markets, the former being less concerned with difficult issues such as expectation of the future or dynamic process.

Thirdly, as suggested by section 2, land demand and land supply depend on farm production technology, farm output and input prices, but also on many other factors that relate to the presence or the absence of imperfections on labour, credit and insurance markets. Although such market imperfections are often actually present in most econo-

mies, global models of agricultural sectors as well as a lot of general equilibrium models most often rely on the perfect market assumption. This assumption probably leads to misrepresent the impact of shocks, in particular policy shocks, on the distribution of factors (i.e., land, labour, capital) within the agricultural sector (i.e., between agricultural activities) and between this sector and other sectors in the economy. A number of studies have shown that factor markets in CEECs are functioning imperfectly. As a result, modelling work in workpackage 9 should carefully address the issue of factor mobility in these countries. To this regards, the paper by Swinnen and Vranken (2003), which proposes a formal model of land rental markets accounting for land, labour and credit market imperfections could be helpful.

Fourthly, section 3 has shown that all farm support programs affect land rental and sale prices. However there is still no consensus on the extent of the impact of these programs on land prices. This raises the critical question of how to represent the effects of farm programs deemed to be decoupled and which are more or less explicitly related to farmland (such as the new single payment in the EU or the Production Flexibility Contract payments in the US, for example) in global models. More specifically are the commonly used representations, which consist either to assume that such programs are effectively decoupled and have no market effect or to figure out their effects through appropriate land supply-demand price gaps, able to provide realistic simulations of their actual impact? Hence, modelling work in workpackages 4 and 9 should pay particular attention to this issue.

Finally, what does this literature review suggest to us regarding the information (legal aspects and basic statistics) that should be compiled as the second stage-work in workpackage 8? The following list may serve as a first basis for further work and discussions:

- Information is needed about the level of activity of land (sale and rental) markets: number of transactions, average size of transferred (sold or rented) plots, at the national and regional levels.
- Information regarding the potential legal obstacles to the development of land transactions would be helpful, especially for the new EU Member States: remaining problems relating to property rights privatisation, main provisions in national land policies limiting market participation and/or land transactions.

- Information about eventual legal restrictions on farmland use possibilities is required in order to assess the extent of land mobility from the agricultural sector to other sectors in the economy. Such restrictions do exist in most EU Member States.
- Information on farm structure in all Member States and on their evolution over the last decade would certainly be useful during the calibration process of the models (such structural aspects underlying main models' parameters, especially price elasticities).
- Basic statistics on land quantities and prices are essential: farmland area (total area and distribution across the various uses), proportion of rented land, land sale and rental prices, etc. Long time-series would help to analyse how these variables has evolved over time. But cross-section/time series regional data would be interesting too for assessing the extent to which national land markets are segmented.

Obviously the above list is preliminary and further work must be undertaken in order to define more precisely our own needs as regards to the modelling work in the IDEMA project.

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