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Abstract

In Poland, rural households are encouraged to diversify their activities both in and outside the agricultural sector in order to stabilize and improve their income. However, relatively few households appear to do this. This paper addresses this issue, investigating the returns from the income strategies of rural households using propensity score matching methods and extensive data sets for 1998–2008. The results suggest that returns from combining farm and off-farm activities are lower than returns from specialization, namely, concentrating on either farming or off-farm activities. The income difference between farmers and those who combine farming and off-farm activities increased after Poland joined the European Union.

Keywords:
Income diversification, rural areas, propensity score matching, Poland

JEL:
D31; O15; Q12

1. Introduction

Rural areas in Poland face significant challenges. The average per capita income of rural households is close to 80 percent of the average income in urban areas (CSO, 2007), whereas the service sector is less developed. The dependence on agriculture is one of the highest in the European Union (EU). Most remote areas are being depopulated due to a lack of economic and social opportunities and this unfavourable demographic situation is likely to limit their growth opportunities and sustainability.

In response, one of the main objectives of Polish rural development policy is to improve the quality of life in rural areas by encouraging diversification of the rural economy. It is believed that promoting diversification of economic activities in rural areas may indirectly contribute to a decrease in hidden unemployment, reduce fragmentation of land holdings, stimulate modernisation, and improve competitiveness and commercialisation (RDP, 2010). Thus, advocacy of diversification often rests on two premises. First, it is likely to improve the efficiency of resource allocation. Second, it should help to reduce poverty.[1] For transition countries, diversification also has been advocated because farms in these countries have been expected to achieve a post-EU-accession increase in productivity with a net decline in agricultural employment (Chaplin et al., 2004). In this context, diversification has been promoted as a measure for absorbing some surplus farm labour. The policy measures aimed at achieving this include support for diversification into non-agricultural activities, support for the creation and development of micro-enterprises, provision of basic services for the economy and rural population, and support for village renewal and development. These measures have been implemented both during the pre-accession period as well as after Poland joined the EU, and have been embraced by the Common Agricultural Policy (CAP; see, for example, SAPARD, 2007; RDP, 2010).

While support for income diversification in rural areas has gained remarkable popularity, especially in political circles, these programmes have been only moderately successful (Wilkin, 2003; Błąd, 2006). For example, in 2002–2006, the income diversification measures implemented within the pre-accession SAPARD programme and the post-accession SPO programme provided funds for roughly 5,600 applicants (SAPARD, 2007; SPO, 2008).[2] For comparison, it was expected that the two programmes would have 13,000 beneficiaries.[3] Although this relatively low participation rate (42 percent) was mainly explained by problems with administrative implementation (SAPARD, 2007; SPO, 2008), there is also evidence that some households are resistant to diversification strategies due to a preference for agriculture (Chaplin et al., 2004).

Moreover, the benefits of programmes encouraging farms to undertake non-agricultural activities are often questioned. Some experts argue that rural inhabitants are rational profit-maximisers and nudging them to diversify outside agriculture will distort rural and agricultural markets away from their optimal levels. Furthermore, it may lead to the overdependence of rural inhabitants on governmental support. Finally, according to official statistics, beginning in 2005, farmers' incomes

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[1] See Reardon et al. (2000) and Lanjouw and Lanjouw (2001) for background discussion.

[2] SAPARD: Special pre-accession assistance to agriculture and rural development implemented in Poland in 2002–2004. SPO: Sectoral operational programme, Restructuring and Modernisation of the Food Sector and Rural Development, implemented in Poland in 2004–2006.

[3] It should also be noted that the estimated number of farms that should withdraw from farming, because they are not fit to survive for economic reasons, far exceeds one million (Kolarska-Bobińska et al., 2001; Ziętara, 2001).The farm structure in Poland is extremely fragmented. In 2007, 2 million farms were in the 0–6 ESU band. A European Size Unit (ESU) is a measure of the economic size of a farm business. For each farm enterprise, a standard gross margin is estimated based on the area or heads of livestock and a regional coefficient. The sum of these standard gross margins in a farm represents its economic size expressed in ESU. One ESU is equal to 1,200 Euros. For more information, see http://ec.europa.eu/agriculture/rica.

were consistently above the average observed in rural areas (Table 1). This calls into question the legitimacy of encouraging farmers to look for income outside agriculture from the profit-maximisation perspective.

Given that Poland's rural areas contain more than 38 percent of the country's population, it seems important to gain a better understanding of the returns from various income strategies and to empirically evaluate these two contrasting views. Interestingly, although some work has investigated barriers to diversification in rural Poland (see, for example, Wilkin, 2003; Chaplin et al., 2004; Chaplin et al., 2005), there have been few attempts to compare returns from the income strategies of rural households. This paper is an attempt to fill this gap and provides a comparison of the returns from various income strategies that were adopted by Polish rural households during the transition. More specifically, the paper examines which of the five basic income strategies—relying solely on farm income, combining farm and off-farm employment (that is, relying on diversified income), relying solely on off-farm income, self-employment, and living off pensions and state allowances (in other words, relying on unearned income)—may have been the most profitable during the last decade. Such information is needed to evaluate the rationale of governmental programmes aimed at stimulating farmers to diversify outside agriculture and should help to explain the labour adjustments in rural areas that were observed in Poland during the transition period (Dries and Swinnen, 2002; Swinnen et al., 2005). Finally, by highlighting the most profitable rural income sources, we aim to contribute to the ongoing discussion about the design of new rural development policy, both in Poland and at the broader EU level.

To reach this goal, we use Household Budget Surveys (HBS) conducted by the Polish Central Statistical Office (CSO), covering the period between 1998 and 2008. Taking into account that Poland joined the EU in May 2004, we not only cover an important part of the transition process, but also the pre- and the post-accession period. Thus, the time coverage of our data allows us to highlight the impact of the introduction of CAP on rural/agricultural incomes. Importantly, we evaluate not only the impact of CAP on farm incomes alone, but also the relative positions of farmers toward other income-earning opportunities in rural areas. To address concerns about differences in the background characteristics of rural households undertaking different income strategies, we use propensity score matching methods. These methods allow us to balance these characteristics before comparing outcomes. In other words, our estimates take into account differences in rural households in terms of their composition and physical and human capital, and compare income after adjusting for these differences. To our knowledge, this is the first study concerned with rural areas in Central and Eastern Europe that uses such an approach to balance background characteristics before comparing incomes. As in most cases, these background characteristics are not amenable to policy decisions, but they should be taken into account when assessing how policies could affect the choices of rural households.

The paper is organised as follows: Section 2 presents some background discussion of the relevant literature; Section 3 describes methodology; Section 4 discusses data; Section 5 presents the obtained results on returns from various income strategies; and Section 6 summarizes our findings and conclusions.

2. Literature review

The economic literature addresses a wide range of questions concerned with the decisions underlying the income strategies of rural households. Four topics in the literature are of particular importance to this study. As already noted, the diversification of rural economies toward non-agricultural income sources is often suggested to help alleviate rural poverty in developing and transition countries. The first research thread that is relevant to our work focuses on whether increasing rural non-farm employment acts as a catalyst for a broader and inclusive pattern of development (see, for instance, Lanjouw and Lanjouw, 2001; Reardon et al., 2001). To our

knowledge, no study has addressed these issues for transition countries. Thus, we briefly review here the evidence from developing countries. Reardon (1997) and Rozelle et al. (1990) found a strong positive relationship between the share of non-farm income and the total wealth levels of African countries and China. Latin American countries and India provide evidence for a U-shaped relationship in which obtaining the highest share of non-agricultural employment is a common facet of both the poorest and wealthiest households (Reardon, 2000; Hazell and Haggblade, 1990). However, Deininger and Olinto (2001) found a strong positive association between total income and 'specialization'—that is, relying on one main income source (either on- or off-farm income) —in the case of Colombia.

The second relevant research thread focuses on examining factors that stimulate or discourage off-farm activities. The existing studies provide evidence that both endogenous and exogenous factors are relevant to the diversification decision. Research identifying these factors in transition countries produces mixed conclusions. For Poland, the level of diversification was negatively related to the level of unearned income, the degree of specialisation within agriculture, and remote localisation (Chaplin et al., 2004). However, the propensity to diversify was positively influenced by the level of education and the frequency of public transport. This finding corroborates the assertion by Dries and Swinnen (2002) that the reallocation of rural labour in Poland was limited by low human agricultural labour capital, which constrained intersectoral mobility. Although it is interesting, much of this literature is based on binomial models and thus neglects the heterogeneity of occupational choices. In consequence, the results obtained from these models are likely to disregard important differences between off-farm income strategies and their outcomes.

This line of reasoning is related to the third research focus, which examines the off-farm labour supplied by farmers (for instance, Huffman, 1980; Tokle and Huffman, 1991; Kimhi, 2000). The existing evidence links a household's choice of its income strategy with two broad sets of factors; the first includes personal characteristics and household attributes and the second refers to external factors that are most often reflected by regional characteristics. Much of the existing evidence concerns either developed or developing countries. In contrast, the evidence on transition countries is very scarce. Among the limited number of examples are Goodwin and Holt (2002) examining Bulgaria and Juvancic and Erjavec (2005) studying Slovenia. In general, however, the results from all these studies are quite unanimous. Ample empirical evidence indicates that decisions about labour allocation highly depend on the human capital endowment of a household (see, for example, Lass et al., 1991). More specifically, off-farm work first increases and later decreases as the age of the head of a household increases, and is also closely related to the level of education of household members (Benjamin, 1994).[4] Further, patterns of labour allocation are highly dependent on the number of household members of working and non-working age (Ahituv and Kimhi, 2006; Kimhi, 1996).[5] The specific demographic composition of the household (paying special attention to the number of young and elderly dependents) is crucial because of the differential income effects that result from the budget constraints of the entire household and the costs imposed by different household members (Kimhi, 2004; Phimister et al., 2004).[6] The impact of access to unearned income sources should also

[4] Important to mention are findings provided by Ahituv and Kimhi (2006) and Jolliffe (2004) suggesting that schooling contributes to higher productivity in off-farm employment rather than in farm work. In addition, Deininger and Olinto (2001) found that more-educated households are more likely to adopt specialised income-generation strategies.

[5] It could also be noted that a larger family workforce might equip the household with higher social capital. The latter point is of particular importance from the point of view of overcoming constraints on information acquisition and transmission. It should be noted, however, that the relationship between income level and social capital is not certain. The positive impact of social capital on household performance and/or household income was stressed, among others, by Dwyer and Findeis (2008), Narayan and Pritchett (1999), and Grootaert (1998). However, Knack and Keefer (1997) and the citations therein provide examples in which the investigated relationship was negative.

[6] Substitutability or complementarity between the farm labour inputs of different household members should also be taken into account here. For instance, Kimhi (1996) indicates the importance of the time costs imposed on the household by small

be recognised here, because this income is likely to decrease the need for additional income-earning activities, either on or off-farm, by affecting the level of the reservation wage.

The fourth relevant thread in the literature investigates adjustments in agricultural labour during transition. It has been argued that central planning systems left huge agricultural surpluses in their wake (Brada, 1989; Jackman, 1994). Therefore, it has been predicted that market-oriented economic reforms such as price liberalisation and cuts in subsidies should lead to the outflow of labour from agriculture and thus be a natural factor encouraging income diversification in rural areas. However, it has been emphasised that agriculture has played a buffer role during transition by absorbing the excess labour from other sectors and providing food and social security (Seeth et al., 1998; Lerman et al., 2004; Macours and Swinnen, 2005). The empirical evidence is inconclusive and shows a substantial heterogeneity in labour adjustment patterns across transition countries (Swinnen et al., 2005). In Poland, remarkable regional differentiation could be observed. Dries and Swinnen (2002) show that in the 1990s, agricultural labour increased in the southern and eastern parts of the country, whereas it significantly declined in the northern and western areas. This seems to suggest that small family farms (which prevailed in the former regions) played a buffer role, whereas large-scale farms (formerly state owned and mainly present in the northern and western regions of Poland) laid off agricultural workers during the transition. Although this literature provides an interesting picture of the agricultural labour adjustment pattern, it lacks a micro-foundation and thus is not conducive to the study of individual incomes and the decisions underlying these income strategies.

In summary, the existing literature shows that diversifying outside agriculture does not necessarily lead to an increase in income. Several patterns characterising this relationship have been identified, and our goal is to document returns from various activities in rural Poland to determine which patterns are found there. In contrast to many existing studies, we not only distinguish between farm and off-farm income but also control for different off-farm strategies.

3. Methodology

Our aim is to quantify the average impact of a given income strategy on rural household income. The decision to follow an income strategy is possibly non-random. Rather, one should assume that household characteristics determine the selection of a given strategy. Thus, unadjusted differences in average income across various groups will produce a biased estimate of the returns to income strategies. To make meaningful comparisons, characteristics should be balanced across the groups in which financial returns are compared (see, for example, Lee, 2005). Building on the microeconometric evaluation literature, we estimate income differentials across rural households using the propensity score matching method, which adjusts for observable differences in household characteristics and endowments (see, for instance, Blundell and Costa-Dias, 2008).

This method is widely used in empirical economics and other social sciences. The basic idea is to mimic a randomised experiment. In our context, receiving the 'treatment' is equal to pursuing a given income strategy. We distinguish between five different income strategies: relying solely on farming; combining off- and on-farm activities (diversification); relying solely on off-farm employment; relying on self-employment; and relying on unearned income (pensions and social allowances). The treatment group may, for example, consist of households that rely solely on farming. In this case, a counterfactual control group would consist of otherwise similar households

children. However, having elderly dependents in the household may increase adults' labour mobility. Further, Kimhi (2004) finds that the off-farm participation of adults decreases as the number of older children rises.

that pursue one of the remaining four income strategies, for example, a combination of farm and off-farm income.[7]

More formally, we are interested in estimating $E(Y_{1i} - Y_{0i}|X_i, T_i = 1)$, where Y_{1i} is a potential outcome measure of household *i* that adopts a given income strategy; Y_{0i} is the counterfactual performance of a household with different income strategy; X_i is a set of observable covariates; and T_i is an indicator for a given income strategy. This is the 'average treatment on the treated' (ATT), which measures the effect of a given income strategy on the income levels of the treated households compared to the outcomes that would have resulted had the income strategy not been adopted (in other words, if the households had relied on a different strategy). The ATT can be further decomposed to ATT = $E(Y_{1i}|X_i, T_i = 1) - E(Y_{0i}|X_i, T_i = 1)$. The fundamental problem is that, in contrast to the first term, the second term on the right side is not observed. Therefore, we need to construct a counterfactual. The solution proposed by Rosenbaum and Rubin (1983) is based on the assumption that, conditional on the vector X_i, the expected income in the absence of the pursued strategy is the same for treated and untreated households. This is the so-called *conditional independence assumption*, which states that the set of observables contains all of the information about the potential outcome (in our case, income) in the absence of treatment. In other words, the selection of a treatment is not dependent on unobserved covariates. Hence, after adjusting for observable characteristics, $E(Y_{0i}|X_i, T_i = 1) = E(Y_{0i}|X_i, T_i = 0)$. Accordingly, in the treated households we can replace unobserved incomes with the observed incomes of those control households that have a similar covariate X_i. To reduce the large dimension of X_i, we follow Rosenbaum and Rubin (1983): instead of conditioning on X_i we condition on $p(X_i)$, the *propensity score*, which is the estimated probability of being treated. Here we take advantage of the second assumption accompanying the matching procedure (the so-called *common-support assumption*) and assume that the propensity score is bounded away from 0 and 1, assuring that each treated observation would have its counterpart among the untreated.

It should be noted that this procedure assumes that, after conditioning on observable characteristics, there are no systematic differences between the households pursuing different income strategies. However, as noted by Heckman et al. (1997), this might not be true, and the treated and untreated groups may differ in unobserved covariates. A potential solution is a difference-in-difference matching estimator. In our case, however, this strategy is not feasible because longitudinal information on households is not available in the data. Nevertheless, our set of covariates includes characteristics that are crucial for determining income strategies (see Section 2). Therefore, we assume that by balancing these characteristics across income groups, we control for selection in the majority of cases.

Our applied empirical strategy consists of two steps. First, using a probit regression, we calculate the propensity score. Second, we use these propensity scores to find good matches for treated subjects in the pool of untreated. From several different matching algorithms used in applied research, we employ two that are commonly used by economists, namely, nearest neighbour one-to-one matching and local linear regression matching (Heckman et al., 1997). Comparing results from both methods serves as a robustness check. To improve matching quality, we use a caliper with a rather restrictive value of 0.005. This means that observations that differ in propensity score by more than 0.005 are not considered in matching.

To assure the representativeness of our calculations, we adjust differences in incomes between treated and untreated using household probability survey weights. Thus, the results are representative to the population of households. We obtain standard errors through a clustered

[7] When comparing the outcomes of two groups in cross-sectional data, one can flexibly define 'treated' and 'untreated'. However, in practice, propensity score matching works better if the treated group is smaller than the control group. In this case, a search for good matches in the larger pool of subjects is easier and increases the matching quality, as more options are available. Accordingly, in the reported comparisons, we always refer to treated and controls to denote strategies adopted by fewer and more households respectively. We perform matching in the opposite direction as a robustness check.

bootstrap with primary sampling units re-sampled for each bootstrap sample.[8] Finally, to control for potential outliers in income data, we estimate average income differences using the trimmed mean of outcomes in the treated and the control groups, excluding 1 percent of extreme observations in each income group.[9] Trimming provides more robust and more precise results; in general, the results hold for calculations based on whole samples.

4. Data

Our analysis uses data from HBS conducted annually by the CSO in Poland. This extensive survey includes information on household characteristics as well as details of their income, expenditures, and assets. The HBS is a cross-sectional sample with ca. 32,000 households interviewed each year. For the purposes of our study, only rural households are taken into account, leaving slightly more than 10,000 observations for each year. The time span of the analysis ranges from 1998 to 2008 and is dictated by the availability, coherency, and comparability of the data.[10]

As noted earlier, throughout our analysis we distinguish between five different income strategies (farming, combing farm and off-farm activities, off-farm employment, self-employment, and unearned income/pensions or social allowances). This classification is similar to the one used by the CSO that is based on the household's main source of income (CSO, 1999). However, since 2005, the CSO no longer distinguishes those who 'combine farm and off-farm income' (that is, diversified households). Therefore, the data for 2005–2008 are rearranged to include all relevant income categories and to be comparable to the 1998–2004 data. To do so, we use information about household income sources. Households are classified based on their declared sources of income; households are classified as diversified if off-farm employment is the most important source of income and the farm-income contribution is at least 5 percent.[11] For the period from 1998 to 2004, the correlation between our reconstructed classification and that used by CSO is more than 95 percent. Thus, our classification reproduces the original classification prior to 2004 fairly well and we believe that it provides consistent categories over the entire period that is analysed, that is, 1998–2008.

Tables 2 and 3 provide basic statistics. Table 2 reports the distribution of households according to their main source of income. Table 3 reports the average equivalent income per person for different household types. All statistics are presented separately for each year of the analysed period. Household equivalent income is determined by dividing the total revenues by the weighted number of household members according to the OECD scale.

As mentioned earlier, a crucial choice for any application of propensity score matching is the selection of an appropriate set of covariates for which the distributions among compared groups must be balanced. We carefully establish our set of covariates in accordance with the theoretical and empirical findings discussed in Section 2. Because our goal is to analyse returns from farming and

[8] As noted by Abadie and Imbens (2008), in the case of the nearest-neighbour estimator, the bootstrapping does not necessarily deliver consistent estimates. Bootstrap, however, provides a valid inference for all asymptotically linear estimators, including the local linear regression estimator. Therefore, again, the results based on the local linear regression estimator provide a useful robustness check for the results based on nearest-neighbour matching.

[9] Koenker and Basset (1978) argue that trimming is greatly superior in case of non-Gaussian distribution. Income distributions are usually highly skewed with numerous outliers affecting statistics like mean (see also Koenker and Portnoy (1987) for additional discussion).

[10] Individual level data concerning earlier periods are not comparable due to a different sampling scheme. The more recent surveys are also designed differently in accordance with the EUROSTAT methodology. The methodology and the main results of the HBS are described in the annual publications of the CSO. More details on the methodology can be found in CSO (1999).

[11] We have tested several thresholds for farming income; the 5-percent threshold makes our classification of households as close as possible to the original CSO data from 1998–2004.

from off-farm activities, we are particularly interested in characteristics that are shared by all rural households. Therefore, we focus on the following issues: household human capital endowments, household demographic composition, and regional specificities. To capture differences in human capital, we include four dummy variables describing the education level of the head of the household: secondary general education, secondary vocational education, vocational education, and lower levels of education (lower secondary, primary, or none). Those with higher education serve as a baseline category. Because the decision about income strategy might be strongly related to age and gender, we condition on the household head's age and a dummy variable that is equal to one (for males) or zero (for females). Moreover, because the literature shows that income strategy depends on household composition, we include three count variables that measure the number of persons under the age of 16, the number of persons who are older than 16 but younger than 65 years old, and the number of persons who are 65 years or older. These variables also control for the total number of individuals in a household. Finally, to capture potential regional differences, we include a set of dummies denoting each of the 16 Polish regions (NUTS 2).

5. Results

5.1 Diagnostics

Before reporting our main results—namely, the actual estimates of the returns from different income strategies—we begin by showing some diagnostics. Table 4 provides an example of a propensity score model that predicts the probability difference between an income strategy that solely relies on farming and a strategy that relies exclusively on off-farm employment.[12] Clearly, explanatory variables included in probit regressions are good predictors of income strategy choices. The probability of relying solely on farm income is positively related to older age, lower human capital, and a higher number of people of unproductive age. Given that these variables are also likely to affect household income, this result is consistent with non-random selection and motivates our empirical strategy.

As a second step, we check whether the estimated propensity score is a balancing function. Table 12 in the Annex provides evidence related to how well our matching approach balances the distributions of household characteristics across treated and controlled groups.[13] As the Table shows, without matching, the null hypothesis of equal means is rejected for almost all of the cases considered. After matching, differences in means are reduced in most cases and remain significant in only a few cases. This indicates that our matching strategy successfully balances important household characteristics across comparison groups. It is a useful tool for identifying comparable observations, thus allowing us to design appropriate control groups so that each treated household can be matched with a similar 'control'.

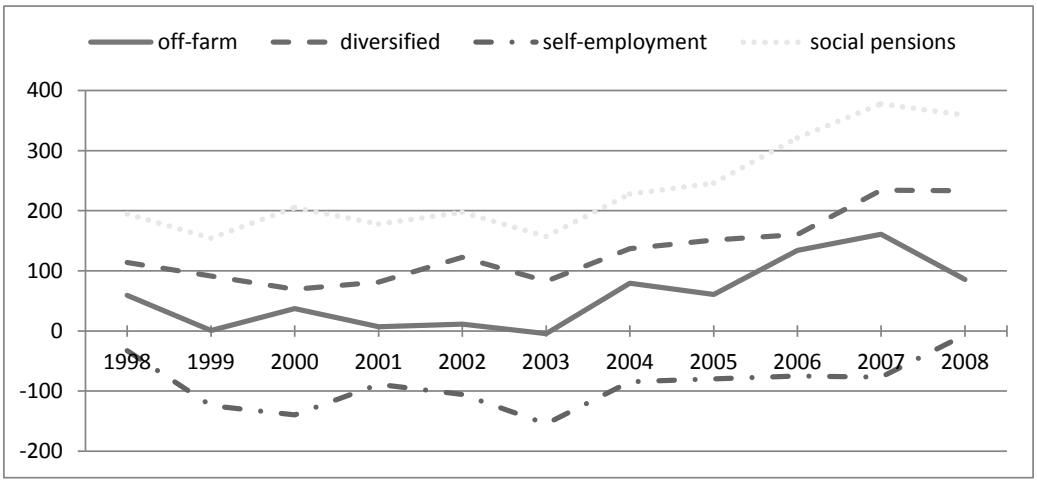
[12] For brevity, only probit regressions for a comparison between farm and off-farm employment are presented. Household characteristics included in these regressions were also strong predictors for other comparisons. Additional results for other comparisons are available upon request.

[13] Again, due to the large number of possible comparisons (for subsequent years and subsequent income strategies), only the test results for a sample of comparisons are presented. Additional results may be obtained upon request.

5.2 Main results

We now turn to our main contribution and report our estimates of the effect choosing a given income strategy has on treated households. Table 5 presents the earnings premium of households that rely on farming in comparison to the other four types of rural households. The estimates of the earning differentials obtained from local linear matching are depicted in Figure 1.[14]

Figure 1. Earning premium of rural households relying solely on farming, compared to other income strategies (1998 to 2008, in PLN per capita).

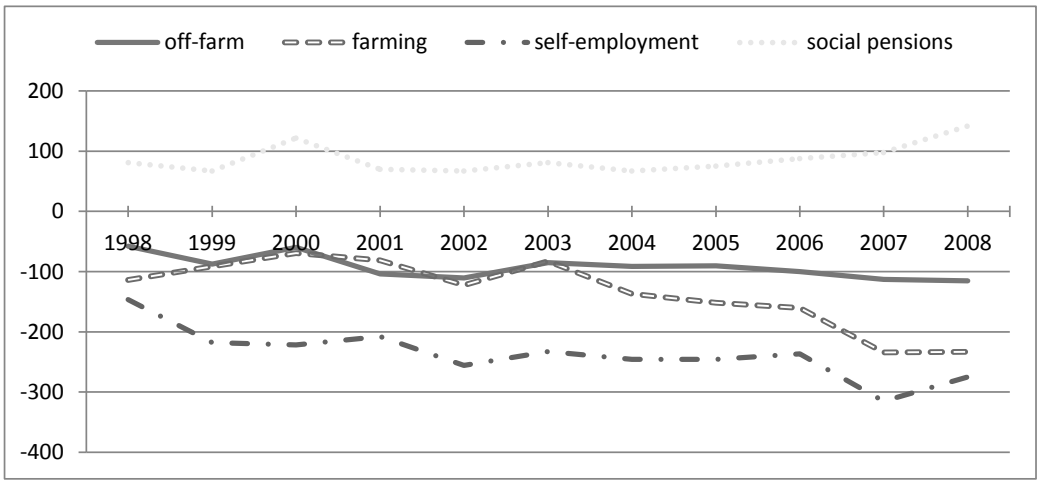


Clearly, over the entire analysed period, farming was more beneficial than relying on unearned income (pensions and social allowances) or combining farm income with off-farm employment (diversification strategy). In addition, although farming and off-farm employment provided similar incomes during the period from 1998 to 2003, farming seems to be more profitable since 2004. Over the analysed period, only self-employment was generally more beneficial than farming, but even this advantage seems to diminish in more recent years (see Table 5 for more detailed results).

Further interesting insights can be obtained by looking more closely at the relative remuneration provided by the diversification strategy. The relevant estimates are provided in Table 6 and summarised in Figure 2. As shown, the diversification strategy seems to only be more profitable than a strategy based on unearned income sources. However, over the entire period of analysis, this strategy provided lower remuneration than all other strategies (that is, self-employment, farming, or off-farm).

[14] All results are reported in monthly per capita income in PLN. 4 PLN roughly equals 1 EUR, whereas 3 PLN roughly equals 1 USD.

Figure 2. Earning premium of diversified-income households - combining farming with off-farm employment-, compared to other income strategies (1998 to 2008, in PLN per capita).



There are two key points to note from these data. First, our results contrast with the reforms applied to the CAP, which significantly intensified governmental efforts to promote diversification. As discussed in the introduction, several policies were implemented in Poland to encourage farmers to part with agriculture. However, we find that farmers faced strong financial incentives to do the opposite. Over the entire analysed period, farming was more profitable than the diversification strategy. However, especially starting from 2004, off-farm employment also could not be considered an attractive alternative. Moreover, our results suggest that although diversified households could have been attracted by off-farm employment, they also have strong incentives to move back to farming. All of these findings could explain why the programmes in Poland encouraging farmers to diversify their activities have been only moderately successful, notwithstanding the high hopes pinned on them.

Secondly, although it is widely acknowledged that Polish farmers benefited from the CAP, we show that joining the EU in May 2004 not only improved farm incomes in absolute terms, but also contributed to a significant improvement in farmers' position relative to other rural occupations. After 2004, the income of households that solely rely on farming increased in comparison to all other households; this effect is quantitatively large. For example, although there was no difference between off-farm employment and farming in 1998–2003, in the years since, the latter strategy has produced higher remuneration (9–23 percent, depending on the year). A similar tendency is observed when farming is compared to a diversification strategy. Before the accession to the EU, the difference in returns from these two strategies favoured farmers by 7–22 percent, depending on the year. After the EU accession, however, this difference increased to 25–50 percent.[15]

Interestingly, in contrast to what is observed for farm households, the year 2004 is not a 'dividing line' for diversified households. As clearly depicted in Figure 2, the income difference between diversified households and those relying on off-farm employment is very similar across the analysed period. This suggests that the former did not profit from the higher returns from farming that obviously improved the situation of households living only off agricultural income.

[15] To confirm the robustness of our results, we re-estimate earning differentials between farmers and the diversified households with land endowments that we include in the set of control variables in the propensity score model. Although the estimates are slightly smaller for 2001–2006 and slightly higher for 1998–1999 and 2007–2008 than those in Panel B of Table 5, they lead to the same conclusions. For brevity, we do not report these results here; they are available upon request from the authors.

Although these results are interesting, they are based only on reported household income. It is often argued that publicly collected data do not cover all income sources because of the still-large shadow economy, especially in rural areas. In our case, the data do not contain any information about illegal sources of income. Therefore, respondents may have tried to hide income sources that are not officially declared, thus biasing our estimates. To check the robustness of our results, we repeat the matching exercise, but his time using monthly expenditures (instead of monthly income) as our outcome variable. Our data contain very precise information on household total spending, which is difficult to manipulate because it is tabulated by summing up daily expenditures. The results of this robustness check are reported in Table 7. Obviously, these results cannot be identical to those based on earnings because households might differ in their saving and investment behaviour and experience different prices, and because farmers might consume some of their own products. Nevertheless, they show that on average farmers spend more than households that rely on off-farm employment and that diversifying households spend much less than farmers do. This gap is especially notable after 2004 and increases over time. Overall, this leads us to conclude that our earlier findings are quite robust.

Although these results already form an interesting picture, a more detailed investigation may also be necessary to further exploit the important sources of heterogeneity across rural households. As noted in Section 2, a household income strategy may strongly be influenced by access to unearned income and human capital. The former is likely to affect the reservation wage, whereas the latter determines the set of available strategies and the level of earning possibilities. Land endowments are another crucial factor that may determine income strategies in rural areas. Therefore, we next look at these three issues in a more detailed way. We also use these additional investigations as a further check of the robustness of our earlier results.

5.3 The role of unearned income

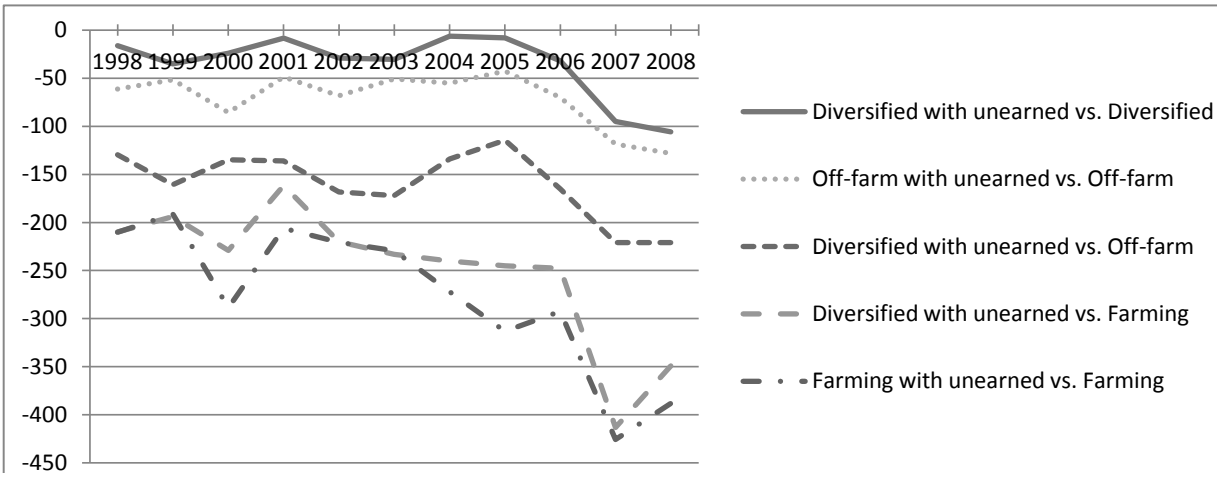
Whether an unearned income affects household choices is an important question from a policy perspective, as in most cases unearned income comes from government transfers to households in the form of pensions, social or family allowances, and unemployment subsidies, for example. To study this issue, we complement our earlier findings (see Table 5, Panel D, and Table 6, Panel C) by investigating earning differentials between households that rely solely on labour income and those that combine labour income with government transfers.[16] Our analysis is based on comparisons between households in which unearned income constitutes more than 25 percent of the total income and households in which income from labour constitutes more than 75 percent of the total income. The relevant results are reported in Table 8, which compares income for six different strategies. In three strategies, unearned income does not constitute an important share of total income from farming, diversification, and off-farm employment. In another three strategies, unearned income is an important addition (constituting more than 25 percent of total income) to the income from labour/farming, diversification, and off-farm employment.

Figure 3 summarises these results by depicting the estimates from local linear matching. Clearly, in all comparisons, households with income coming mainly from labour are better off than households that rely on more than 25 percent unearned income. Diversifying households generally have smaller incomes than other households do, and their situation does not get better with additional unearned income. However, except for the last two years, we find no statistically significant difference between households that diversify their income sources but do not rely on additional unearned income and those that receive substantial transfers from the government (see also Table 8, Panel A).

[16] Note that in earlier comparisons, we used households that rely solely on unearned transfers. Here, we instead investigate the income situation of households that combine these transfers with labour income.

This suggests that during the analysed period, diversified households might have had reduced incentives to look for productive activities, as this would not have improved their financial situation.

Figure 3. Income differences between households that rely solely on earned income and those who add unearned income sources.



5.4 The role of human capital

As argued above, the results discussed previously may mask important differences between household assets that pursue similar strategies. Although matching assures that similar households are compared, the results are based on averages across all households in each group. The result is that matching estimates allow for heterogeneity in a very general way. However, income differentials might vary with household characteristics and lead to large income variation within a particular group of households. The following section tries to address these issues by further decomposing earning differentials based on the level of household human capital.

Human capital is probably the most important characteristic that affects not only household choices but also how successfully households pursue different income strategies. Therefore, we re-analyse per capita income for households that rely solely on farming and compare it to that of households with different income strategies, this time looking at earning differences between households that differ according to the education level of the head of the household. In the previous analysis, education level was coded into five categories; here, to have a sufficient number of observations for these additional investigations, we re-code it into three categories: (i) those with higher or secondary education; (ii) those with vocational secondary education; and (iii) those with lower secondary, primary, or no education.[17] The relevant results are presented in Table 9 and summarised in Figures 4, 5, and 6.

As shown in Figure 4, among households whose head finished higher or secondary education, farming produces returns that are comparable to those of off-farm employment and self-employment, whereas relying on pensions and social allowances as well as relying on diversified income provides lower remuneration. In other words, for households with relatively high human capital endowments, off-farm employment seems to be a financially attractive alternative to farming. However, any other strategy that relies on government transfers or on the mixing of farm and off-farm income sources is far less beneficial. One possible explanation is that for households that have high levels of human capital, focusing on a single income source is more beneficial due to higher

[17] Using international standards, this is equivalent to an ISCED level of 3A/B or higher for the first group, 3C for the second, and 2 or lower for the last group.

returns from specialisation (Deininger and Olinto, 2001). It is easier for highly educated farmers to invest in larger farms and new technologies that open new possibilities and provide stable income. Similarly, for those with higher or secondary education, opportunities for off-farm employment are usually much larger than for those with lesser education.

Figure 4. Returns to farming compared to other income strategies for households whose head completed at least secondary education.

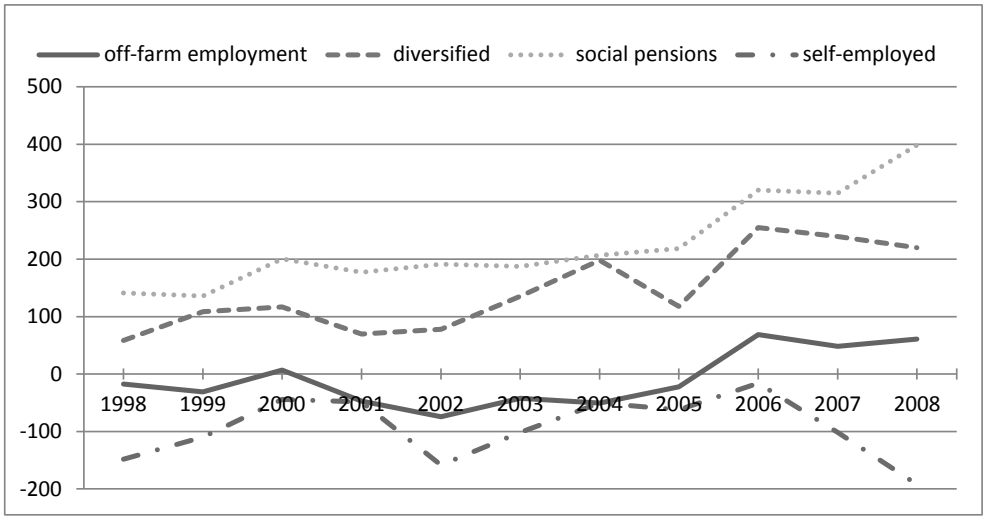
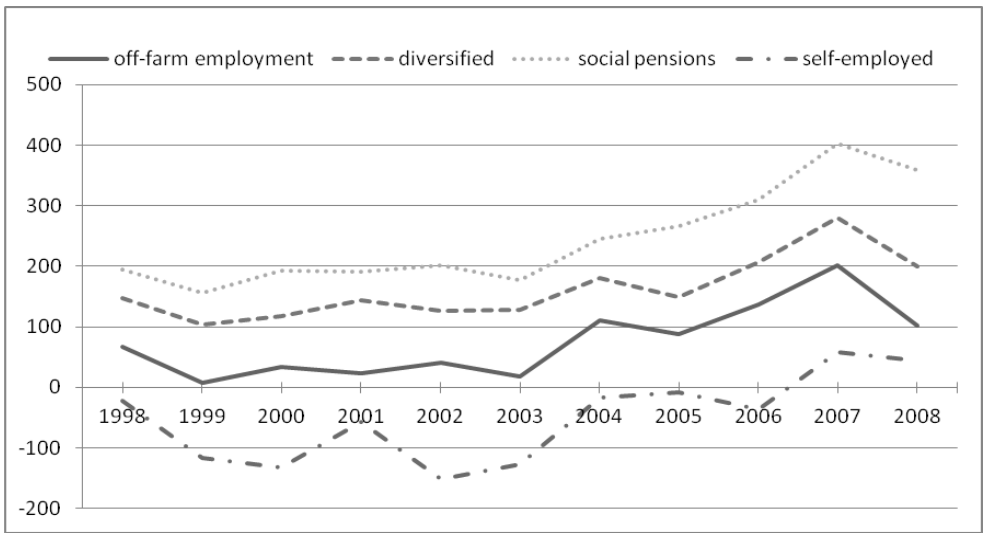


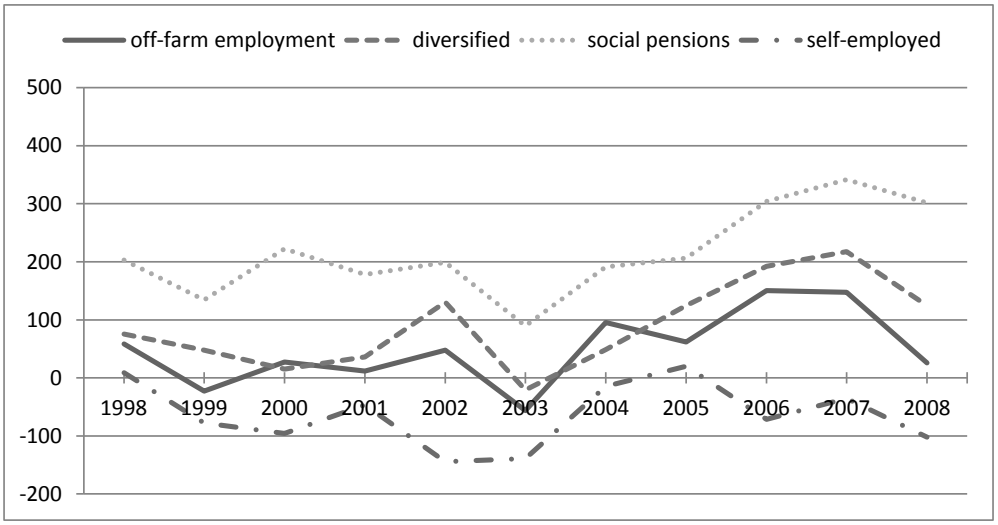
Figure 5 provides similar information as Figure 4 but instead examines households whose heads have vocational education (secondary education that gives vocational training but not direct access to higher education). The Figure compares how the income of farmers differs from the remuneration enjoyed by other households. As discussed previously, diversification and relying on unearned income provide much smaller benefits; off-farm employment also seems to be less beneficial since 2004. Moreover, although farming provided slightly lower returns than self-employment before 2004, in more recent years, these two strategies produced more similar financial returns. In sum, it seems that among households in which the head has vocational education, farming is more attractive than other strategies, especially since 2004; this, once again, highlights the importance of the EU accession.

Figure 5. Returns to farming compared to other income strategies for households whose head completed vocational secondary education.



Finally, Figure 6 provides similar comparisons for households in which the household head has the lowest level of education. As noted previously, the income of households relying solely on farming is compared with income of households that pursue different income strategies. However, this time the results are clearly different from those obtained for households with higher levels of human capital. Before 2004, off-farm employment and diversification provided returns similar to farming. This is notable, as diversification was significantly less beneficial than farming or off-farm employment for other levels of educational attainment. After 2004, farming provided higher income than these two strategies. Although relying on government transfers (social allowances and pensions) seem again to be the least favourable option, differences in income among the different income strategies are much smaller in this case than for better-educated households. Finally, over the analysed period, self-employment provided either similar or only slightly higher returns than farming.

Figure 6. Returns to farming compared to other income strategies for households whose head completed lower secondary, primary or has no formal education.



Overall, we conclude that there are important differences in relative returns to education in rural areas. Not surprisingly, parting with agriculture seems to be feasible strategy for those with the highest education level, because working off-farm can provide such individuals with remuneration that is comparable to working in agriculture. For those with lower levels of education, however, farming seems to be the most profitable strategy, not counting self-employment, especially after 2004. Again, our results point to the importance of the EU accession, which seems to have brought the highest relative benefits to farms with household heads having either intermediary or lower education.

5.5 The role of land endowments

As mentioned earlier, it is reasonable to assume that the income strategies of rural households are highly dependent on their land endowments, which are likely to affect not only choices of income sources but also levels of returns. In theory, households can freely acquire or sell land assets. One can convincingly argue that households that want to diversify their income source can sell their land assets and completely leave agriculture, whereas households that prefer farming to other kinds of employment might acquire new land to increase their efficiency and returns. Thus, comparing households that have more or fewer land assets can be more useful for understanding the transition

process in rural areas than a comparison of the opportunities and returns to households based on their inherent characteristics.[18] However, land acquisition might be constrained by limited access to credit or uncertainty related to high fluctuations in agricultural markets. Thus, especially in transition countries where markets are imperfect and information is more costly, households may keep their assets or make no attempt to acquire new land even when that might be profitable.

Using the results of the previous sub-section, we analyse how income returns to different strategies differ in terms of land assets and human capital level. This addresses the well-known argument that, in transition economies, some households—particularly those with low or outdated human capital assets—might retain their agricultural activities simply because they lack other opportunities. We again classify households by the education level of the head of the household, producing three groups, but then combine that with land assets lower than 5 ha and equal to or higher than 5 ha. Five hectares can be considered as the lower limit of land assets that can be used for agricultural production in Poland.[19] To have a sufficient number of observations for meaningful comparisons, we grouped observations into three periods: 1998–2000, 2001–2004, and 2005–2008. The relevant results are presented in Table 10 and summarised in Figures 7 and 8.[20]

Figure 7. Earning differentials (monthly disposable income per capita in PLN) for households that have no or limited land assets (less than 5ha), by level of education of household's head.

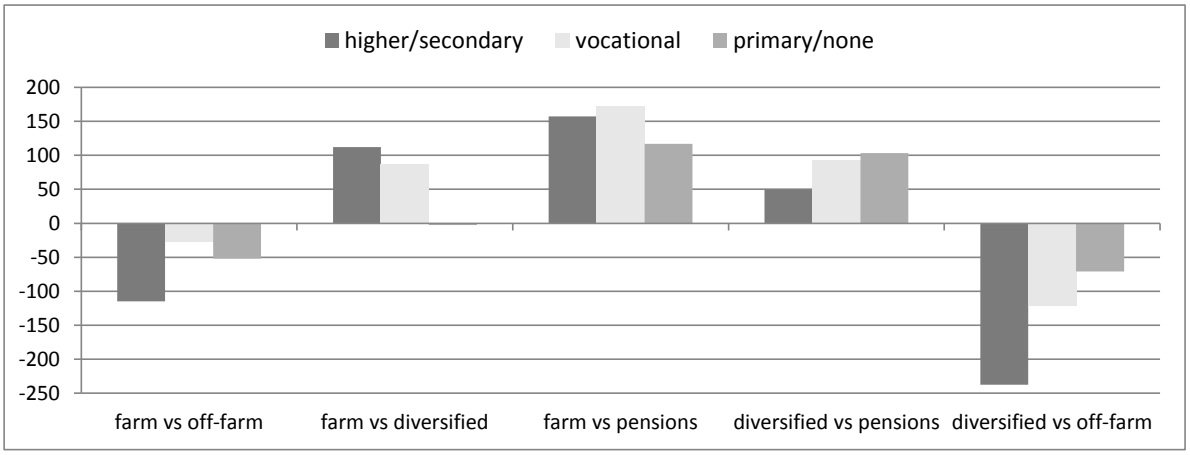


Figure 7 depicts results for households that have no or limited land assets using results for the most recent period, namely, 2005–2008. These households are probably in the process of leaving agricultural production, although not all of them are able to find profitable off-farm employment. Clearly, off-farm employment provides much higher returns for all households regardless of the education level; however, the difference is much smaller, on the border of significance, for households with lower human capital levels (see also Table 10). However, both farming and

[18] Similar arguments are sometimes made regarding educational attainment, for example, that households with lower human capital assets can invest in better education, which, over the long term, could affect their income. However, although human capital assets can be acquired like other types of capital, including land, not all individuals can be equally successful in this process because of differences in their inherit capabilities. Thus, for some individuals further investments into human capital can be impossible or very costly, whereas the price of land is the same for all households.

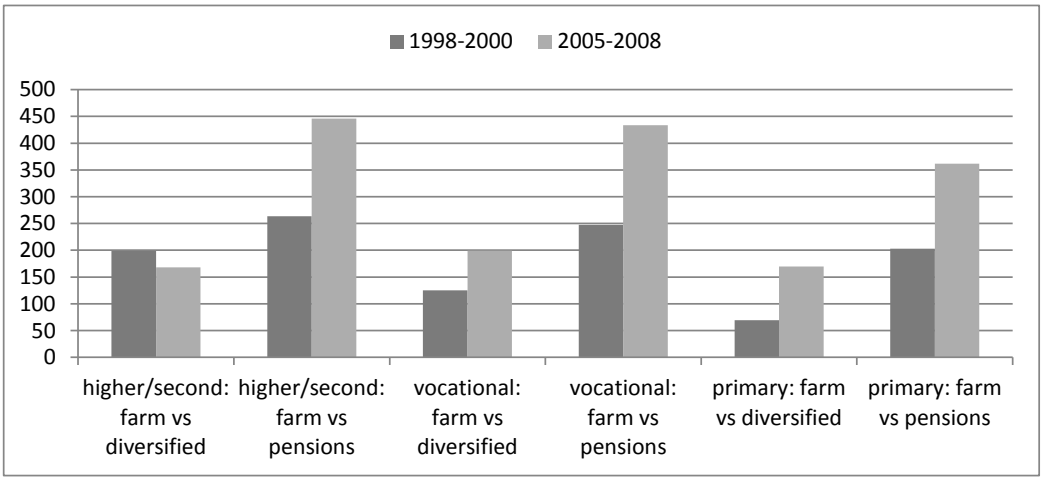
[19] In practice, larger land endowments are needed for agricultural production to be profitable, although the results for a 10 ha-threshold were almost identical. However, the sample size limited most comparisons.

[20] Obviously, some comparisons cannot be made because only a few households rely on off-farm employment but keep high land assets. Comparisons with fewer than 50 observations per category were omitted.

diversified households have higher returns than households relying mainly on unearned income. In this case, there is no clear difference between education levels. Finally, farming provides higher returns than diversification only for educated households, whereas there is little difference for those with lower education levels. Results for other periods are similar, showing some evidence of increasing returns from off-farm employment among highly educated households (see Table 10).

Figure 8 is analogous to Figure 7 but compares the income of households that have more than 5 ha of land assets. Two periods, 1998–2000 and 2005–2008, are compared. Changes over time show how financial returns were influencing rural household to combine agricultural activities with off-farm employment or to leave the labour market and rely on unearned income. Clearly, the income of farmers increased in relative terms from 1998–2000 to 2005–2008. There is only one exception: households with higher or secondary education had similarly higher returns over the analysed period in comparison to diversifying households. For less-educated households, returns from farming increased in relative terms; however, they were relatively low in 1998–2008. Thus, in recent years farming was more beneficial than diversification in relative terms for all households. Similarly, unearned income became even less attractive across time for all households, regardless of education levels.

Figure 8. Earning differentials (monthly disposable income per capita in PLN) for households that have land assets (more than 5ha), by level of education of household's head.



In summary, these results support our earlier findings that households with the highest human capital assets are more attracted by off-farm employment, whereas all households should prefer employment to relying on state transfers. Importantly, in addition to the level of education, access to land assets also substantially affects the relative profitability of different income strategies. On average, farming provided higher remuneration than diversification, but this difference is quantitatively small and statistically insignificant for households with the lowest education level and few land assets.

Overall, we conclude that during 1998–2008, financial incentives did not encourage farms to diversify outside agriculture, except for households with the highest human capital assets, which can benefit from off-farm employment. Income diversification is the least profitable employment strategy, whereas unearned income produces less income than employment. This may provide an explanation for the relatively modest success of measures aimed at promoting income diversification in rural areas in Poland. Note that these results may also serve as an explanation for the more general pattern of agricultural labour adjustment produced from a macroeconomic perspective (Dries and Swinnen, 2002; Swinnen et al., 2005). We provide evidence that shifting toward family farms during

transition, a phenomenon observed at a macrolevel, had a strong micro-foundation in terms of financial returns. Our results also complement earlier studies on barriers to off-farm diversification (Chaplin et al., 2004). Although these studies show that moving outside agriculture was hampered by low human capital and remote location, we argue that there were no financial incentives for this shift to happen, especially for households that do possess land and have limited human capital assets. Notably, these financial incentives discouraging farmers to part with agriculture seem to be strongly affected by the EU accession. Our results support the view that joining the EU in 2004 improved the situation of Polish farmers not only in absolute terms but also in comparison to other rural occupations.

6. Conclusions

It is generally believed that the economic diversification of rural areas may contribute to more efficient resource allocation and help reduce poverty. In this paper, we took a closer look at this issue by examining an extensive data set from Poland spanning 1998–2008. In theory, diversification could provide an attractive alternative to other income strategies, as rural households may still use their agricultural assets while also taking profitable off-farm employment. Using the propensity score matching method, we demonstrate, however, that returns from diversification are lower than those from farming or off-farm employment in rural Poland. Diversification is only preferable in comparison to relying on government transfers (pensions or social allowances). Moreover, our estimates suggest that after Poland joined the European Union, rural households relying on farm income were better off than those relying on off-farm employment. The latter strategy is more profitable only for households with the highest levels of human capital and few land assets. On average, the highest remuneration was provided by self-employment, but this strategy is only rarely employed.

Overall, our results suggest that in 1998–2008, farmers lacked financial incentives to (partly) quit agriculture. Since 2004, when Poland joined the EU, returns from farming have been significantly higher than earnings from other income sources. Hence, it is rather unlikely that there will be a radical shift in this trend in the near future. We explain this phenomenon by considering the direct benefit that Polish farmers gain from the CAP. The exact transmission mechanism of this effect is an interesting area for future research.

References

Abadie, A., Imbens, G.W. (2008), On the failure of the bootstrap for matching estimators, *Econometrica* 76(6), pp. 1537-1557.

Ahituv, A., Kimhi, A. (2006). Simultaneous estimation of works choices and the level of farm activity using panel data, *European Review of Agricultural Economics* 33, pp. 49-71.

Benjamin, C. (1994), The Growing Importance of Diversification Activities for French Farm Households, *Journal of Rural Studies* 10(4), pp. 31-342.

Blundell R., Costa Dias M. (2008), Alternative Approaches to Evaluation in Empirical Microeconomics, IZA Discussion Paper, no 3800.

Błąd, M. (2006), Dywersyfikacja ekonomiczna wsi, in: Wilkin, J., Nurzyńska, I. (eds.) Polska Wieś 2006, FDPA, Warszawa, pp. 75-86.

Brada, J. C. (1989), Technical Progress and Factor Utilization in Eastern European Economic Growth, *Economica* 56, pp. 433– 448.

Chaplin H., Davidova S., Gorton M. (2004), Agricultural Adjustment and the Diversification of Farm Households and Corporate Farms in Central Europe, *Journal of Rural Studies* 20, pp. 61-77.

Chaplin H., Davidova S., Gorton M. (2005), Impediments to Employment and Enterprise Diversification: Evidence from Small-Scale Farms in Poland, Paper prepared for presentation at the 99th seminar of the European Association of Agricultural Economists, Copenhagen, 24-27 August.

CSO (1999), Metodyka badania budżetów gospodarstw domowych, Warszawa, GUS.

CSO (2007), Budżety gospodarstw domowych w Polsce w 2006 r., Warszawa, GUS.

Deininger K. and Olinto P., 2001, Rural Nonfarm Employment and Income Diversification in Colombia, *World Development* 29(3), pp. 455-465.

Dries L., and Swinnen, J.F.M. (2002), Institutional Reform and Labor Reallocation During Transition: Theory and Evidence from Polish Agriculture, *World Development* 30(3), pp. 457-474.

Dwyer, J. and Findeis, J. (2008), Human and Social Capital in Rural Development –EU and US Perspectives, *EuroChoices* 7(1).

Goodwin, B.K., Holt, M.T. (2002), Parametric and Semiparametric Modeling of the Off-Farm Labour Supply of Agrarian Households in Transition Bulgaria, *American Journal of Agricultural Economics* 84(1), pp. 184-209.

Grootaert, C. (1998). Social capital: The missing link? *Social Capital Initiative Working Paper* 3/1998, Washington DC, USA: The World Bank.

Hazell P. and Haggblade S., 1990, Rural-urban growth linkages in India, PRE Working Paper Series No. 430, Agriculture and Rural Development Department, World Bank.

Heckman J. J., Ichimura H., Todd P. (1997) ”Matching as an Econometric Evaluation Estimator: Evidence From Evaluating a Job Training Program”, The Reviev of Economic Studies, vol 64/4. pp. 605-654.

Huffman, W.E. (1980), Farm and off-farm work decisions: the role of human capital, *The Review of Economics and Statistics* 62, pp. 14–23.

Jackman, R. (1994), Economic Policy and Employment in the Transition Economies of Central and Eastern Europe: What Have We Learned? *International Labor Review* 133, (3), pp. 327– 345.

Jolliffe, D. (2004). The impact of education in rural Ghana: examining household labour allocation and returns on and off the farm. *Journal of Development Economics* 73, pp. 287–314.

Juvancic, L., Erjavec, E. (2005), Intertemporal analysis of employment decisions on agricultural holdings in Slovenia, *Agricultural Economics* 33, pp. 153-161.

Kimhi, A. (2004). Family Composition and Off-Farm Participation Decisions in Israeli Farm Households, *American Journal of Agricultural Economics* 86(2), pp. 502-512.

Kimhi, A. (2000). Is part-time farming really a step in the way out of agriculture? *American Journal of Agricultural Economics* Vol. 82, pp. 38–48.

Kimhi, A. (1996). Demographic Composition of Farm Households and its Effects on Time Allocation, *J. Pop. Econ.* 9, pp. 429-429.

Knack, S., Keefer, P. (1997). Does social capital have an economic payoff? A cross country investigation. *Quarterly Journal of Economics* 112 (4), pp. 1251-1288.

Koenker R., Basset G. (1978), Regression Quantiles, Econometrica vol 46/1 pp. 33-50.

Koenker R., Portnoy S. (1987), L-Estimation for Linear Models, *Journal of American Statistical Association* Vol. 82, pp. 851-857.

Kolarska-Bobińska, L., Rosner, A., Wilkin, J. (2001): Przyszłość wsi polskiej, in: Kolarska-Bobińska L., Rosner A., Wilkin J. (red.), *Przyszłość wsi polskiej. Wizje, strategie, koncepcje,* Instytut Spraw Publicznych, Warszawa

Lanjouw J.O., Lanjouw P. (2001), The rural non-farm sector: issues and evidence from developing countries, *Agricultural Economics* 26, pp. 1-23.

Lass, D.A., Findeis, J.L., Hallberg, M.C. (1991). Factors Affecting the Supply of Off-farm Labor: A Review of Empirical Evidence, in: Hallberg, M.C., Findeis, J.L., Lass, D.A. (eds.) Multiple Job-holding among Farm Families, Ames IA: Iowa State University Press.

Lee, M-J. (2005). *Micro-Econometric for Policy, Program, and Treatment Effects*, Oxford University Press.

Lerman, Z, Csaki, C., Feder, G. (2004). *Agriculture in Transition: Land Policies and Evolving Farm Structures in Post-Soviet Countries*, Lanham, MD: Lexington Books.

Macours, K., Swinnen, J.F.M. (2005). Agricultural Labour Adjustments in Transition Countries: The Role of Migration and Impact on Poverty, *Review of Agricultural Economics*, 27(3), 405-11.

Narayan, D., Pritchett, L. (1999). Cents and sociability: Household income and social capital in rural Tanzania. *Economic Development and Cultural Change* 47 (4), pp. 871-897.

Phimister, E., Roberts, D., Gilbert, A. (2004), The Dynamics of Farm Incomes: Panel data analysis using the Farm Accounts Survey, *Journal of Agricultural Economics* 55(2), pp. 197-220.

RDP, (2010). Polish rural development plan 2007-2013, (version from march 2010). www.minrol.gov.pl

Reardon T., Berdegue J., Escobar G. (2001), Rural nonfarm employment and incomes in Latin America: overview and policy implications, *World Development* 29(3), pp. 395-409.

Reardon T., Taylor J.E., Stamoulis K., Lanjouw P., Baliscan A. (2000), Effects of non-farm employment on rural income inequality in developing countries: an investment perspective, *Journal of Agricultural Economics* 51 (2), pp. 266-288.

Reardon T. (1997), Using evidence of household income diversification to inform study of the rural nonfarm labor market in Africa, *World Development* 25 (5), pp. 735-748.

Rosenbaum P. A., Rubin D. B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects, *Biometrika* 70(1), pp. 41-55.

Rozelle S., Taylor J. E., DeBrauw A. (1999), Migration remittances and agricultural productivity in China, *American Economic Review* 89(2), pp.287-291.

SAPARD (2007), Analiza wyników realizacji poszczególnych działań Programu SAPARD w świetle celów Programu oraz wpływ zmian społeczno-ekonomicznych na realizację Programu w latach 2002-2006, http://www.funduszestrukturalne.gov.pl/NR/rdonlyres/4E41CBAE-F849-48BE-BAC9-0614753930AA/37605/analizasapard.pdf (accessed in October 2010)

Seeth, H. T., Chachnov, S., Surinov, A., von Braun, J. (1998), Russian Poverty: Muddling through Economic Transition with Garden Plots, *World Development* 26(9), pp. 1611– 1623.

SPO (2008), Wykorzystanie środków Sektorowego Programu Operacyjnego „Restrukturyzacja i modernizacja sektora żywnościowego oraz rozwój obszarów wiejskich" w województwach. (accessed in October 2010)

Swinnen J.F.M., Dries, L., and Macours, K. (2005), Transition and agricultural labor, *Agricultural Economics* 32, pp. 15-34.

Tokle, J.G., Huffman, W.E. (1991), Local economic conditions and wage labour decisions of farm and rural nonfarm couples, *American Journal of Agricultural Economics* 73, pp. 652–670.

Wilkin J. (ed.) (2003), Podstawy Strategii Zintegrowanego Rozwoju Rolnictwa i Obszarów Wiejskich w Polsce, WNE UW, Warszawa.

Ziętara, W. (2001): Rynek Ziemi w Polsce w okresie powojennym, in: *Rynki wiejskie: ziemia, kapitał, praca*, IRWiR, Warszawa.

Annex with tables.

Table 1. Average nominal disposable monthly income per capita (PLN) in rural areas and farm households

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Rural areas	440,95	482,57	511,96	526,46	530,3	555,29	592,82	659,29	744,44	835,85
Farm	411,37	455,99	497,54	571,83	474,31	541,00	606,17	689,75	846,76	887,35
Farm/rural	93%	94%	97%	109%	89%	97%	102%	105%	114%	106%

Source: CSO var. vol. and own calculations based on the Household Budget Surveys.

Table 2. Sample characteristics: percentage of rural households with respect to their main source of income

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Off-farm employment	7,6%	7,5%	7,1%	7,3%	7,2%	7,9%	8,6%	9,3%	10,1%	11,2%	12,3%
Combining off- and on-farm income	4,5%	3,9%	3,8%	3,4%	3,3%	3,2%	2,9%	2,8%	2,8%	2,8%	2,9%
Farm income	6,7%	6,1%	5,8%	5,3%	5,1%	4,6%	5,0%	4,9%	4,8%	4,7%	4,4%
Self-Employment	1,8%	2,0%	1,9%	2,2%	2,1%	2,1%	2,1%	2,1%	2,2%	2,3%	2,7%
Budget transfers	19,6%	20,5%	21,8%	22,4%	22,9%	23,2%	22,3%	22,1%	21,3%	20,1%	18,7%
Other transfers	2,3%	2,4%	2,6%	2,3%	2,2%	2,1%	2,1%	2,0%	2,0%	2,0%	2,1%
Off-farm employment + transfers	2,9%	3,3%	3,2%	3,5%	3,7%	3,4%	3,7%	3,9%	4,0%	4,2%	4,6%
Combining off- and on-farm + transfers	2,1%	2,1%	1,8%	1,6%	1,7%	1,6%	1,5%	1,3%	1,3%	1,5%	1,2%
Farm income + transfers	2,5%	2,3%	2,0%	2,0%	1,9%	1,9%	1,8%	1,6%	1,6%	1,3%	1,1%
No. of rural household	10 716	10 664	12 562	10 789	10 801	10 641	10 508	13 184	15 812	15 758	15 739

Source: Own computations based on Household Budget Surveys.

Table 3. Rural households' mean equivalent monthly income per person, by main source of income (in PLN deflated to 2005 using Harmonised Index of Consumer Prices)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Off-farm employment	610,12	614,02	667,57	636,88	619,99	631,71	629,61	646,84	703,63	767,21	847,12
Combining off- and on-farm income	481,75	482,62	492,74	477,16	463,62	486,55	466,62	481,00	524,70	606,39	676,79
Farm income	678,27	673,93	653,60	671,44	736,28	634,97	716,63	790,47	841,90	1055,99	1104,57
Self-Employment	659,29	679,76	659,45	683,71	738,73	728,79	713,88	739,91	830,49	879,10	972,74
Budget transfers	557,59	542,08	521,67	533,19	529,91	545,00	550,56	570,49	607,35	653,51	694,13
Other transfers	311,90	311,49	356,81	340,88	312,74	375,26	204,25	264,30	400,81	469,51	360,62
Off-farm employment + transfers	553,10	573,23	557,73	570,70	582,48	573,20	580,46	572,74	595,09	642,76	712,04
Combining off- and on-farm + transfers	480,65	475,57	493,86	484,29	492,99	486,68	485,62	490,25	512,41	543,28	604,49
Farm income + transfers	477,55	451,07	451,57	450,62	429,39	451,50	477,43	467,03	508,38	544,56	535,75

Source: Own computations based on the Household Budget Survey.

Table 4. Propensity score estimates: probit regressions.

Dependent variable: 1 for households relying solely on farm income; 0 for households relying solely on off-farm income											
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Age	0.04	0.05	0.04	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02
	(6.98)	(9.22)	(7.56)	(9.97)	(8.88)	(7.97)	(8.50)	(5.86)	(5.11)	(4.97)	(5.56)
gender (1=woman)	-0.64	-0.83	-0.89	-0.99	-0.83	-0.81	-0.89	-0.62	-0.60	-0.71	-0.72
	(5.30)	(7.04)	(7.35)	(8.04)	(6.55)	(6.43)	(6.63)	(7.13)	(7.68)	(8.98)	(9.15)
secondary general education	1.81	1.40	0.95	0.37	0.88	1.15	1.37	0.61	0.72	0.54	1.13
	(3.95)	(3.18)	(2.09)	(0.84)	(1.91)	(2.23)	(2.80)	(1.78)	(2.54)	(2.06)	(4.48)
secondary vocational education	2.24	1.99	1.70	1.59	1.49	1.84	1.94	1.62	1.38	1.21	1.30
	(5.47)	(5.36)	(5.05)	(4.75)	(3.68)	(4.16)	(4.52)	(5.94)	(6.19)	(6.01)	(6.14)
vocational education	2.69	2.43	2.15	2.02	2.02	2.61	2.40	1.84	1.69	1.39	1.52
	(6.72)	(6.68)	(6.59)	(6.20)	(5.10)	(6.01)	(5.65)	(6.81)	(7.77)	(7.09)	(7.36)
lower secondary education	3.32	2.89	2.83	2.38	2.55	3.27	2.88	2.27	2.10	1.72	1.69
	(8.26)	(7.90)	(8.58)	(7.24)	(6.36)	(7.47)	(6.69)	(8.27)	(9.43)	(8.51)	(7.96)
No of persons under 16	0.05	0.08	0.15	0.16	0.18	0.19	0.16	0.05	0.11	0.08	0.11
	(1.55)	(2.28)	(4.09)	(4.29)	(4.67)	(4.45)	(4.07)	(1.75)	(4.00)	(2.88)	(4.18)
No of persons 16-65	0.05	-0.02	0.02	-0.00	0.04	0.10	0.08	0.07	0.08	0.10	0.08
	(1.12)	(0.45)	(0.50)	(0.11)	(0.94)	(2.53)	(1.73)	(2.18)	(2.88)	(3.49)	(3.02)
No of persons 65+	1.69	1.67	1.50	1.63	1.41	1.66	1.76	0.89	0.83	0.77	0.75
	(14.54)	(14.70)	(14.55)	(14.06)	(13.62)	(14.22)	(14.57)	(12.84)	(13.73)	(12.74)	(12.79)
Constant	-3.73	-5.64	-5.03	-5.05	-5.18	-6.24	-6.87	-4.42	-4.00	-3.86	-4.46
	(7.19)	(10.66)	(10.36)	(10.13)	(9.45)	(10.39)	(11.12)	(11.88)	(13.43)	(13.18)	(13.84)
Observations	3 764	3 761	4 248	3 459	3 427	3 497	3 542	6 980	8 562	8 814	9 083

Source: Own computations based on the Household Budget Survey. Note: All regressions include regional dummies (NUTS 2 level). Robust z statistics in parentheses,

Table 5. Estimates of earning differentials (monthly disposable income per capita in PLN): Farm income vs. other income strategies

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel A: **Farm income vs. off-farm income**											
ATT11	40,3	1,0	44,2	24,5	-0,5	-18,6	82,8	68,8	116,6	177,6	79,1
	[15,2]	*[15,0]*	*[17,4]*	*[15,9]*	*[20,9]*	*[20,6]*	*[17,8]*	*[20,2]*	*[22,5]*	*[27,1]*	*[25,5]*
	(22,1)	*(22,6)*	*(21,1)*	*(20,3)*	*(29,1)*	*(27,2)*	*(25,1)*	*(24,9)*	*(25,0)*	*(28,9)*	*(30,4)*
ATTllr	59,1	0,9	37,2	6,9	11,2	-4,5	79,2	60,7	133,9	160,8	85,9
	[12,2]	*[13,8]*	*[15,9]*	*[14,7]*	*[20,8]*	*[18,4]*	*[14,6]*	*[17,3]*	*[19,8]*	*[27,0]*	*[23,7]*
	(20,0)	*(23,9)*	*(20,3)*	*(17,1)*	*(27,2)*	*(22,7)*	*(21,3)*	*(24,8)*	*(24,9)*	*(31,9)*	*(25,8)*
Panel B: **Farm income vs. diversified income**											
ATT11	95,1	81,6	83,1	81,3	99,7	34,8	172,4	139,9	132,8	304,4	237,9
	[17,4]	*[18,1]*	*[16,9]*	*[21,3]*	*[23,7]*	*[16,8]*	*[22,7]*	*[22,4]*	*[21,8]*	*[25,8]*	*[30,2]*
	(24,1)	*(27,7)*	*(23,9)*	*(27,8)*	*(36,1)*	*(34,2)*	*(35,9)*	*(37,6)*	*(31,7)*	*(42,1)*	*(42,0)*
ATTllr	114,0	91,3	69,5	81,4	122,5	82,9	136,9	151,5	160,5	234,4	233,3
	[9,7]	*[10,8]*	*[10,1]*	*[9,7]*	*[12,3]*	*[11,5]*	*[12,7]*	*[13,8]*	*[12,1]*	*[14,2]*	*[18,2]*
	(19,5)	*(19,3)*	*(18,4)*	*(20,0)*	*(27,1)*	*(29,6)*	*(26,5)*	*(25, 5)*	*(25,3)*	*(28,3)*	*(27,6)*
Panel C: **Farm income vs. self-employment**											
ATT11	-50,7	-122,6	-122,6	-146,9	-116,7	-192,4	-129,7	-58,6	-136,8	-50,8	68,1
	[36,3]	*[37,7]*	*[36,7]*	*[36,7]*	*[41,2]*	*[45,6]*	*[31,3]*	*[38,3]*	*[37,8]*	*[41,8]*	*[52,3]*
	(48,0)	*(46,2)*	*(38,7)*	*(46,9)*	*(58,3)*	*(49,8)*	*(42,4)*	*(50,4)*	*(55,4)*	*(60,2)*	*(67,6)*
ATTllr	-32,7	-124,1	-139,4	-88,9	-105,8	-154,7	-84,5	-79,6	-75,1	-77,0	-6,4
	[23,6]	*[26,0]*	*[22,4]*	*[27,0]*	*[35,1]*	*[35,5]*	*[26,2]*	*[29,3]*	*[23,2]*	*[28,8]*	*[36,3]*
	(35,1)	*(34,3)*	*(26,8)*	*(26,4)*	*(37,8)*	*(40,1)*	*(39,2)*	*(35,3)*	*(37,3)*	*(46,7)*	*(46,2)*
Panel D: **Farm income vs. pensions and social allowances**											
ATT11	201,9	157,3	199,1	190,0	195,2	158,5	236,2	238,3	325,3	399,7	362,3
	[14,2]	*[16,2]*	*[15,7]*	*[16,9]*	*[21,9]*	*[18,9]*	*[18,4]*	*[22,2]*	*[21,6]*	*[29,8]*	*[27,6]*
	(18,8)	*(20,7)*	*(18,8)*	*(21,2)*	*(22,8)*	*(21,2)*	*(21,2)*	*(23,1)*	*(22,9)*	*(30,5)*	*(28,3)*
ATTllr	194,7	154,5	205,3	177,9	197,6	157,5	227,8	246,0	321,3	378,2	359,5
	[12,0]	*[13,7]*	*[15,3]*	*[15,0]*	*[20,2]*	*[18,2]*	*[16,2]*	*[19,0]*	*[20,5]*	*[27,3]*	*[25,9]*
	(16,3)	*(16,7)*	*(16,0)*	*(18,7)*	*(19,3)*	*(19,5)*	*(18,8)*	*(19,4)*	*(22,3)*	*(25,8)*	*(23,7)*

Notes: ATT11 – average treatment on the treated nearest neighbour estimator; ATTllr – average treatment on the treated local linear regression estimator; Analytical robust standard errors for clusters at primary sampling unit in brackets; Bootstrapped standard errors (500 replications) in parentheses.

Table 6. Estimates of earning differentials (monthly disposable income per capita in PLN): Diversified income vs. other income strategies

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Panel A: **Diversified income hh vs. off-farm income**										
ATT11	-41,7	-76,1	-70,0	-119,0	-93,0	-64,5	-109,0	-79,2	-111,8	-108,1	-144,3
	[12,4]	*[14,5]*	*[14,6]*	*[14,6]*	*[13,3]*	*[17,7]*	*[18,8]*	*[18,3]*	*[18,0]*	*[16,2]*	*[20,3]*
	(15,3)	*(17,5)*	*(16,1)*	*(18,7)*	*(18,9)*	*(20,6)*	*(21,0)*	*(21,6)*	*(23,1)*	*(22,1)*	*(25,9)*
ATTllr	-57,8	-87,6	-59,9	-103,7	-110,5	-84,9	-91,1	-90,3	-99,8	-112,9	-115,3
	[9,2]	*[10,6]*	*[10,5]*	*[11,3]*	*[12,0]*	*[12,7]*	*[15,1]*	*[14,6]*	*[12,6]*	*[13,5]*	*[15,8]*
	(11,3)	*(14,6)*	*(11,3)*	*(13,2)*	*(12,5)*	*(15,9)*	*(13,8)*	*(14,7)*	*(15,4)*	*(15,0)*	*(19,0)*
	Panel B: **Diversified income hh vs. self-employment**										
ATT11	-134,9	-237,3	-226,6	-208,0	-265,1	-219,2	-245,1	-249,6	-248,6	-323,5	-293,7
	[31,1]	*[30,0]*	*[28,4]*	*[36,0]*	*[35,6]*	*[38,6]*	*[33,1]*	*[32,3]*	*[26,5]*	*[33,7]*	*[33,8]*
	(32,8)	*(34,5)*	*(29,1)*	*(36,2)*	*(37,3)*	*(42,5)*	*(35,0)*	*(36,8)*	*(34,0)*	*(39,0)*	*(42,1)*
ATTllr	-146,6	-217,7	-221,8	-207,8	-255,5	-232,7	-245,6	-245,8	-236,4	-315,0	-275,1
	[25,9]	*[24,8]*	*[22,2]*	*[27,0]*	*[32,0]*	*[33,5]*	*[25,2]*	*[27,1]*	*[22,3]*	*[29,5]*	*[30,2]*
	(25,7)	*(29,7)*	*(23,5)*	*(29,5)*	*(31,3)*	*(30,6)*	*(30,4)*	*(32,2)*	*(28,5)*	*(34,5)*	*(32,4)*
	Panel C: **Diversified income hh vs. pensions and social allowances**										
ATT11	60,4	64,6	102,9	73,9	80,0	55,4	89,1	85,4	71,5	91,6	162,0
	[12,8]	*[15,1]*	*[13,6]*	*[14,0]*	*[16,5]*	*[16,4]*	*[15,8]*	*[18,1]*	*[17,8]*	*[17,3]*	*[19,5]*
	(18,0)	*(18,4)*	*(16,5)*	*(21,5)*	*(19,5)*	*(20,3)*	*(18,4)*	*(19,5)*	*(19,8)*	*(24,8)*	*(24,8)*
ATTllr	81,2	68,4	122,0	70,3	68,3	81,1	67,3	75,4	87,7	97,9	142,3
	[9,4]	*[10,4]*	*[9,6]*	*[9,9]*	*[11,4]*	*[11,6]*	*[13,0]*	*[14,1]*	*[11,9]*	*[12,7]*	*[16,6]*
	(14,5)	*(12,1)*	*(11,3)*	*(17,0)*	*(14,4)*	*(14,5)*	*(14,4)*	*(16,2)*	*(14,8)*	*(15,5)*	*(21,3)*

Note: Diversified hh – households combining off- and on-farm activities. ATT11 – average treatment on the treated nearest neighbor estimator; ATTllr – average treatment on the treated local linear regression estimator; Analytical robust standard errors for clusters at primary sampling unit in brackets; Bootstrapped standard errors (500 replications) in parentheses.

Table 7. Estimates of spending differentials.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
					Panel A: **Farm households versus off-farm households**						
ATT11	48,58	20,53	24,21	16,94	30,77	43,26	44,55	38,68	76,43	36,94	-6,00
	(8,43)	(10,55)	(11,99)	(13,47)	(14,84)	(15,37)	(15,94)	(15,02)	(17,60)	(18,46)	(19,27)
ATTllr	40,08	15,41	29,93	31,74	33,46	30,29	31,17	56,98	80,16	37,93	29,14
	(6,67)	(8,47)	(9,60)	(10,07)	(16,14)	(15,28)	(12,44)	(14,53)	(15,12)	(17,70)	(15,19)
					Panel B: **Farm households versus diversified households**						
ATT11	69,55	59,66	28,63	65,27	69,61	70,05	84,03	78,75	95,22	80,90	105,89
	(14,44)	(15,90)	(14,98)	(20,65)	(26,92)	(29,34)	(24,81)	(26,06)	(24,94)	(26,76)	(26,96)
ATTllr	46,75	58,03	44,77	54,19	77,01	58,89	72,01	73,94	87,71	97,90	106,14
	(11,63)	(12,15)	(12,51)	(15,11)	(21,47)	(24,69)	(17,32)	(16,36)	(18,30)	(18,69)	(22,18)

Note: Diversified hh – households combining off- and on-farm activities. ATT11 – average treatment on the treated nearest neighbour estimator; ATTllr – average treatment on the treated local linear regression estimator; Bootstrapped standard errors (500 replications) in parentheses

Table 8. Estimates of earning differentials: diversified income, farm income and off-farm income with and without additional unearned income

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel A: **Diversified income with additional unearned income versus diversified income**											
ATT11	-33,2	-49,8	-21,6	3,6	8,7	-55,5	-15,8	-22,2	-24,7	-83,9	-90,5
	(25,5)	*(28,3)*	*(27,7)*	*(29,6)*	*(29,5)*	*(34,7)*	*(28,1)*	*(30,2)*	*(29,3)*	*(35,8)*	*(34,9)*
ATTllr	-16,1	-35,2	-24,0	-8,5	-29,1	-30,6	-6,4	-8,1	-32,0	-95,1	-105,8
	(18,3)	*(19,4)*	*(19,7)*	*(22,0)*	*(23,1)*	*(27,8)*	*(19,4)*	*(20,6)*	*(21,9)*	*(24,0)*	*(21,6)*
Panel B: **Farm income with additional unearned transfers versus farm income**											
ATT11	-217,2	-178,4	-238,8	-207,9	-238,0	-213,1	-261,9	-352,3	-261,6	-387,8	-368,4
	(40,9)	*(36,8)*	*(38,8)*	*(38,0)*	*(42,0)*	*(41,0)*	*(62,3)*	*(51,2)*	*(47,8)*	*(50,9)*	*(60,8)*
ATTllr	-210,1	-191,3	-288,8	-206,0	-220,6	-229,3	-272,1	-313,1	-292,5	-425,7	-388,1
	(28,3)	*(27,5)*	*(26,1)*	*(23,4)*	*(32,3)*	*(29,6)*	*(38,9)*	*(31,9)*	*(32,3)*	*(32,8)*	*(37,1)*
Panel C: **Off-farm employment with additional unearned transfers versus off-farm employment**											
ATT11	-61,9	-44,5	-69,7	-27,8	-60,9	-69,7	-70,2	-28,4	-59,1	-123,1	-122,7
	(24,9)	*(25,1)*	*(26,0)*	*(27,1)*	*(30,5)*	*(25,1)*	*(26,7)*	*(24,1)*	*(23,4)*	*(23,3)*	*(22,8)*
ATTllr	-61,3	-51,7	-85,8	-48,9	-68,4	-50,8	-55,3	-42,6	-69,9	-118,5	-128,2
	(18,0)	*(18,9)*	*(19,2)*	*(22,5)*	*(23,0)*	*(17,1)*	*(17,6)*	*(18,7)*	*(15,6)*	*(16,0)*	*(19,6)*
Panel D: **Diversified income with additional unearned income versus off-farm employment**											
ATT11	-101,1	-165,6	-147,0	-110,0	-167,1	-169,5	-128,6	-90,0	-143,1	-203,9	-196,4
	(29,6)	*(34,5)*	*(31,3)*	*(29,6)*	*(35,1)*	*(37,5)*	*(35,0)*	*(42,3)*	*(34,6)*	*(36,1)*	*(38,5)*
ATTllr	-129,6	-160,8	-134,9	-136,1	-168,4	-172,1	-134,1	-114,5	-165,1	-220,8	-220,9
	(21,4)	*(24,7)*	*(21,9)*	*(23,9)*	*(26,9)*	*(28,7)*	*(19,3)*	*(23,5)*	*(23,5)*	*(24,0)*	*(23,9)*
Panel E: **Diversified income with additional unearned income versus farm income**											
ATT11	-251,7	-184,4	-222,1	-202,2	-176,0	-240,8	-165,8	-207,2	-245,6	-401,4	-291,7
	(44,5)	*(44,8)*	*(42,0)*	*(42,1)*	*(50,0)*	*(49,0)*	*(47,7)*	*(58,7)*	*(47,6)*	*(50,5)*	*(60,4)*
ATTllr	-209,8	-193,8	-229,2	-161,6	-220,0	-233,2	-240,0	-245,1	-247,8	-413,2	-349,3
	(28,3)	*(32,5)*	*(30,3)*	*(27,2)*	*(41,1)*	*(41,4)*	*(35,0)*	*(39,4)*	*(37,1)*	*(35,9)*	*(35,7)*

Note: Diversified hh – households combining off- and on-farm activities. ATT11 – average treatment on the treated nearest neighbour estimator; ATTllr – average treatment on the treated local linear regression estimator; Bootstrapped standard errors (500 replications) in parentheses.

Table 9. Estimates of earning differentials, by household head's educational attainment level (monthly disposable income per capita in PLN): Farming vs. other income strategies

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel A: **Farm hh versus off-farm hh with upper secondary or higher education**											
ATT	-17,20	-31,02	7,06	-47,23	-74,23	-42,17	-50,27	-22,43	68,85	48,39	60,70
	[42,90]	*[36,77]*	*[42,75]*	*[33,65]*	*[44,94]*	*[53,23]*	*[51,80]*	*[44,76]*	*[45,90]*	*[64,85]*	*[50,72]*
	(49,80)	*(43,22)*	*(45,24)*	*(52,04)*	*(48,61)*	*(56,13)*	*(53,22)*	*(43,46)*	*(47,62)*	*(63,00)*	*(56,47)*
Panel B: **Farm hh versus off-farm hh with vocational education**											
ATT	66,72	7,63	33,51	23,05	41,19	18,53	111,47	88,75	137,70	201,70	101,10
	[19,36]	*[20,93]*	*[21,29]*	*[20,85]*	*[26,24]*	*[23,60]*	*[19,31]*	*[20,10]*	*[23,84]*	*[26,49]*	*[24,43]*
	(27,26)	*(27,03)*	*(28,63)*	*(24,46)*	*(28,00)*	*(29,52)*	*(29,59)*	*(26,17)*	*(29,51)*	*(31,03)*	*(28,88)*
Panel C: **Farm hh versus off-farm hh with primary or lower secondary education**											
ATT	58,49	-22,83	27,31	11,89	47,79	-56,17	95,68	61,65	150,49	147,48	26,12
	[19,46]	*[21,81]*	*[20,71]*	*[21,58]*	*[24,53]*	*[22,18]*	*[22,16]*	*[29,25]*	*[30,68]*	*[37,55]*	*[38,09]*
	(33,89)	*(44,88)*	*(33,93)*	*(32,23)*	*(48,40)*	*(42,34)*	*(35,16)*	*(38,70)*	*(36,99)*	*(43,87)*	*(42,20)*
Panel D: **Farm hh versus diversified hh with upper secondary or higher education**											
ATT	58,32	108,70	117,01	69,62	78,02	135,31	197,91	118,01	254,83	239,61	220,12
	[38,82]	*[36,50]*	*[44,27]*	*[32,92]*	*[40,94]*	*[49,64]*	*[50,19]*	*[40,97]*	*[40,47]*	*[67,69]*	*[52,59]*
	(48,18)	*(46,07)*	*(47,01)*	*(41,93)*	*(59,13)*	*(67,36)*	*(57,15)*	*(46,42)*	*(49,94)*	*(62,41)*	*(67,31)*
Panel E: **Farm hh versus diversified hh with vocational education**											
ATT	147,92	103,23	117,86	143,90	126,90	128,23	180,00	148,67	206,48	280,14	200,39
	[18,21]	*[19,30]*	*[20,77]*	*[20,83]*	*[25,57]*	*[21,15]*	*[21,07]*	*[20,41]*	*[24,86]*	*[28,03]*	*[23,00]*
	(21,78)	*(24,18)*	*(25,44)*	*(20,13)*	*(31,68)*	*(27,50)*	*(28,34)*	*(26,85)*	*(30,66)*	*(30,93)*	*(31,38)*
Panel F: **Farm hh versus diversified hh with primary or lower secondary education**											
ATT	75,43	47,71	15,09	35,91	130,41	-20,85	48,69	124,46	192,24	217,46	124,44
	[19,31]	*[19,08]*	*[18,76]*	*[22,41]*	*[30,18]*	*[23,10]*	*[23,69]*	*[27,88]*	*[31,41]*	*[32,19]*	*[53,93]*
	(29,93)	*(29,09)*	*(31,03)*	*(39,98)*	*(45,01)*	*(43,62)*	*(55,79)*	*(38,21)*	*(41,54)*	*(41,65)*	*(64,97)*

Notes: Diversified hh – households combining off- and on-farm activities. ATT – average treatment on the treated local linear regression estimator; Analytical robust standard errors for clusters at primary sampling unit in brackets; Bootstrapped standard errors (500 replications) in parentheses.

Table 10. Earning differentials across occupations and education levels

	Secondary and higher under 5 hectares			Secondary and higher over 5 hectares			Vocational under 5 hectares			Vocational over 5 hectares			Primary under 5 hectares			Primary over 5 hectares		
	98-01	*02-04*	*05-08*	*98-01*	*02-04*	*05-08*	*98-01*	*02-04*	*05-08*	*98-01*	*02-04*	*05-08*	*98-01*	*02-04*	*05-08*	*98-01*	*02-04*	*05-08*
							Panel A: **Farm hh versus off-farm hh**											
ATT	-95,25	-94,18	-115,02			80,41	-0,07	-83,34	-26,89			229,86	-28,43	-58,12	-52,11			95,02
	(50,02)	(69,30)	(61,33)			(32,49)	(23,79)	(34,31)	(28,60)			(16,32)	(24,26)	(39,48)	(29,23)			(19,73)
							Panel B: **Farm hh versus diversified hh**											
ATT	21,64	116,79	112,05	198,88	149,86	168,17	74,39	26,16	86,74	124,91	158,94	199,04	37,01	-3,62	-2,55	69,48	161,88	169,72
	(48,52)	(66,14)	(58,27)	(27,73)	(58,14)	(28,48	(23,33)	(31,16)	(30,19)	(15,98)	(24,93)	(16,55)	(23,78)	(37,66)	(29,33)	(15,18)	(31,09)	(23,50)
							Panel C **Farm hh versus unearned income hh**											
ATT	95,25	145,78	157,43	263,46	281,93	445,92	118,31	55,55	172,57	247,32	204,41	433,56	127,25	58,97	116,85	203,01	286,43	361,49
	(48,04)	(70,21)	(67,78)	(27,46)	(51,33)	(30,63)	(22,57)	(37,84)	(27,91)	(15,97)	(26,40)	(15,73)	(23,62)	(33,97)	(30,05)	(14,73)	(31,64)	(23,76)

Notes: Diversified hh – households combining off- and on-farm activities. ATT – average treatment on the treated local linear regression estimator; Analytical robust standard errors for clusters at primary sampling unit in parentheses

Table 11. Distribution of land endowments among rural households in 1998 and in 2008 (in hectare per household).

	1998					2008				
	10^{th} percentile	25^{th} percentile	Median	75^{th} percentile	90^{th} percentile	10^{th} percentile	25^{th} percentile	Median	75^{th} percentile	90^{th} percentile
Off-farm employment	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	1.0
Combining off- and on-farm income	0.0	0.1	1.2	3.3	6.2	0.0	0.9	2.6	5.1	8.8
Farm income	3.0	5.1	8.5	13.3	20.5	3.3	6.1	10.0	16.5	26.0
Unearned income	0.0	0.0	0.1	0.7	3.2	0.0	0.0	0.0	0.0	2.5

Table 12. Covariates averages for one to one nearest neighbour matching and diversified versus rural household comparison.

	pscore				age				gender				secondary general				secondary vocational			
year	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc
1998	0,33	0,43	0,52	0,47	43,65	41,11	40,12	0,28	1,16	1,18	1,23	0,80	0,02	0,03	0,05	0,66	0,11	0,15	0,16	0,21
1999	0,34	0,43	0,52	0,48	43,44	41,33	39,87	0,41	1,15	1,20	1,24	0,42	0,02	0,03	0,05	0,55	0,14	0,16	0,15	0,20
2000	0,35	0,45	0,53	0,42	43,88	41,39	40,30	0,30	1,15	1,19	1,24	0,57	0,02	0,03	0,04	0,37	0,14	0,18	0,18	0,04
2001	0,35	0,44	0,52	0,44	43,80	40,77	40,14	0,17	1,15	1,17	1,22	0,68	0,02	0,02	0,05	0,80	0,14	0,16	0,20	0,60
2002	0,36	0,46	0,53	0,41	43,73	41,37	40,20	0,33	1,16	1,20	1,24	0,52	0,03	0,03	0,05	0,72	0,13	0,17	0,19	0,23
2003	0,36	0,47	0,55	0,43	43,99	41,60	40,69	0,28	1,15	1,20	1,23	0,39	0,02	0,03	0,05	0,44	0,12	0,15	0,19	0,50
2004	0,33	0,44	0,52	0,40	45,13	42,49	40,99	0,36	1,17	1,19	1,24	0,73	0,02	0,04	0,05	0,53	0,13	0,17	0,21	0,53
2005	0,33	0,42	0,50	0,46	46,04	44,92	43,94	0,47	1,16	1,20	1,24	0,45	0,02	0,03	0,05	0,58	0,17	0,17	0,18	1,10
2006	0,34	0,42	0,50	0,48	46,75	46,00	45,45	0,43	1,16	1,22	1,23	0,11	0,02	0,03	0,05	0,72	0,16	0,18	0,20	0,38
2007	0,38	0,46	0,52	0,40	47,52	46,76	46,50	0,26	1,16	1,22	1,25	0,42	0,02	0,03	0,04	0,63	0,17	0,19	0,18	0,58
2008	0,38	0,46	0,52	0,45	47,64	47,24	46,94	0,43	1,16	1,20	1,26	0,58	0,03	0,04	0,03	3,28	0,18	0,19	0,19	0,06
	vocational education				**primary education**				**#person <15**				**# person 16-65**				**# person 65+**			
year	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc	Control	Matched Control	Treated	bias reduc
1998	0,44	0,50	0,49	0,12	0,42	0,31	0,27	0,29	1,30	1,44	1,46	0,16	2,74	2,91	2,91	0,02	0,35	0,20	0,15	0,26
1999	0,47	0,55	0,53	0,38	0,37	0,23	0,22	0,10	1,35	1,39	1,40	0,12	2,77	2,89	2,98	0,45	0,30	0,20	0,17	0,23
2000	0,44	0,53	0,52	0,01	0,39	0,25	0,21	0,19	1,25	1,32	1,30	0,33	2,83	3,05	3,03	0,08	0,33	0,21	0,15	0,31
2001	0,49	0,59	0,55	0,58	0,34	0,20	0,16	0,22	1,18	1,27	1,26	0,08	2,88	3,01	3,06	0,24	0,30	0,19	0,15	0,23
2002	0,50	0,54	0,53	0,34	0,33	0,23	0,18	0,33	1,19	1,25	1,23	0,50	2,85	2,97	3,03	0,33	0,33	0,19	0,17	0,11
2003	0,51	0,55	0,54	0,14	0,34	0,24	0,17	0,37	1,18	1,24	1,24	0,04	2,92	3,09	3,16	0,32	0,34	0,20	0,17	0,18
2004	0,51	0,55	0,53	1,19	0,32	0,21	0,16	0,33	1,15	1,34	1,29	0,40	2,91	3,02	3,05	0,16	0,32	0,21	0,17	0,24
2005	0,49	0,54	0,54	0,03	0,32	0,24	0,19	0,38	1,14	1,15	1,24	0,95	2,94	3,11	3,10	0,07	0,30	0,18	0,17	0,06
2006	0,51	0,52	0,51	5,75	0,30	0,25	0,21	0,41	1,10	1,07	1,13	1,83	2,95	3,07	3,15	0,44	0,32	0,20	0,18	0,10
2007	0,52	0,56	0,53	1,63	0,28	0,21	0,20	0,01	1,03	1,01	1,03	8,24	2,94	3,05	3,12	0,42	0,35	0,22	0,21	0,05
2008	0,52	0,53	0,52	0,37	0,26	0,21	0,21	0,02	1,04	0,98	1,01	1,55	2,91	3,04	3,11	0,34	0,35	0,21	0,23	0,12

Notes: In column Control the average value of variable in the control group is presented, column Matched Control reports the average value for matched control observation whereas column Treated reports the average values of variable in treated group. Column bias reduction shows a percentage of the total bias that is reduced due to matching – for values below one bias is reduced, while for values above one bias is extended.

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