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Returns from income strategies in rural Poland

Abstract

Rural households are strongly encouraged to diversify their activities both in and outside the agricultural sector, in order to stabilize and improve their income situation. Moreover, it is commonly believed that diversification measures have a potential to speed up structural changes in rural areas. Most often, however, this phenomenon takes on only moderate proportions. This paper addressed issues of rural households' income diversification in the case of Poland. With the help of propensity score matching method returns from various income strategies undertaken by local rural households were investigated based on extensive data set spanning 1998-2004. It was found that strategies relying on diversified income sources and off-farm employment were more beneficial than strategies relying solely on farming. Explanations were given why financial incentives were not enough to encourage farmers to part with their land. Results suggest that direct subsidies, pensions and other sources of unearned income have acted against leaving farming undermining policies facilitating income diversification. While off-farm activities or self-employment seem to be the most beneficial it was emphasized that without micro-credit or human capital and infrastructural development programmes projected specifically to rural areas it is dubious that those strategies will be chosen more often.

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

INTRODUCTION

Transition process has brought about radical changes in rural areas in Poland. One of them is surely decreasing dependence on agriculture. To illustrate this one may recall the fact that in 2006 income from farming constituted the only source of income for 40% of farmers and 11% of rural inhabitants. In 2004 these numbers accounted for 51% and 16% respectively. Additionally, in 2006 roughly 33% of farmers combined income coming from both off-farm and on-farm activities (PENTOR, 2006). These developments obviously have affected financial situation of farmers. Consecutive surveys conducted by the Polish Central Statistical Office indicate clearly that recent years brought about significant increase in real income of farmers' households in Poland. Despite this fact, however, in terms of disposable incomes farmers still compare unfavourably with other occupations. In 2006 their monthly income *per capita* accounted only for roughly 82% of national average (GUS, 2007). [1] As a consequence, agricultural households remain among the most vulnerable to structural exclusion (Czapiński and Panek (eds.), 2006). This calls for strategies to increase farmers' incomes. Moreover, dependence on climatic conditions makes farm incomes particularly prone to fluctuations over time, which suggests a need to develop measures that would stabilise their financial situation. In response to this, farmers are strongly encouraged to diversify their activities, both in, and outside, agriculture. Income diversification in Polish rural areas is the more desirable since it has not only potential to mitigate rural poverty but also significantly contribute to farm restructuring. As pointed by many authors (e.g. Bojnec *et al*, 2003; Weiss, 1999) gradual limitations of time devoted to farming is likely to free some agricultural resources, thus providing scope for efficiency improving reallocation. Therefore, in the context of problems of excessive holding fragmentation and agrarian overpopulation, efficacy of policies stimulating income diversification in Poland has taken on new dimension.

The importance of non-farm employment in rural areas has recently won wide recognition among researchers (e.g. Lanjouw and Lanjouw, 2001; Reardon *et al*., 2001; Reardon *et al*., 1992). Numerous studies dealt with relationship between the share of non-farm income and total wealth levels. However, their evidence is not explicit. A strong positive relationship was found for African countries as well as China (Reardon, 1997; Rozelle *et al*., 1999). Latin American countries and India provide evidence for U-shaped relationship indicating that obtaining the highest share of non-agricultural employment is a common facet of both poorest and wealthiest households (Reardon, 2000; Hazell and Haggblade, 1990). Deininger and Olinto (2001), on the other hand, found that a strong positive association between total income and 'specialization', i.e. relying only on one main source, either on- or off-farm, held true in the case of households in Colombia. As far as studies concerning Europe are concerned, McInerney and Turner (1991) have pointed to unequal distribution of benefits coming from income diversification in rural areas. According to their study, diversification has taken place predominantly in more developed areas. In regions where it would be the most desirable, on the other hand, it has been at most moderate.

With regard to Poland, studies which have examined the issue of diversification have mainly concentrated on assessing determinants encouraging or discouraging off-farm employment (Wilkin, 2003; Chaplin et al. 2004; Chaplin H. et al., 2005). Low skills, insufficient physical capital as well as old age and remoteness were found to be the most important constraints to diversification.

The present paper is different in several respects. The aim of the study is to investigate what are the returns from diversification (combining off- and on-farm activities) in comparison to specialization, i.e. relying mainly on on- or off-farm employment in rural Poland. Moreover, the paper attempts also to contribute to the literature by exploring the importance of unearned income in determining households' income strategies.

The paper is organised into 4 parts. Section 2 provides description of methodology applied in the present analysis and data used for computations. Part 3 presents the main results on returns from various income strategies. Section 4 draws out the main conclusions.

METHODOLOGY

In order to estimate returns from distinct income strategies propensity score matching methods were used. This section aims to briefly present the main assumptions behind these techniques. To start with, let us assume, that population is divided into two separate groups. One consisting subjects that are influenced by a specific factor or treatment, whereas the other consists subjects who remain unaffected. Using experimental studies nomenclature we call the first group the treatment group, and the latter the control group. Alternatively we will refer to participants and non-participants, respectively. The goal is to estimate the effect of treatment or, putting it differently, to compute the average difference in outcomes between the treated and the control group.

As in standard econometric model Y denotes the outcome variable. Let Y_1 be the outcome if the subject is treated and Y_0 is the outcome otherwise. Treatment status is denoted by letter D with D=1 for subjects being treated, and D=0 for subjects not being treated (belonging to control group). X stands for a matrix of covariates containing subjects' characteristics.

There are at least two ways to measure the impact of the treatment. Firstly, one can measure the average treatment effect (ATE), which is the average impact calculated over all population. Secondly, one may look for the average treatment effect on the treated (ATT) measuring the impact of treatment on the treated group only[2]. In other words, it focuses on

capturing the influence wielded on the subjects that were actually affected by the treatment. As such ATT can be written as follows:

$$ATT = Y_1 - Y_0 = E(Y_1 \mid X, D = 1) - E(Y_0 \mid X, D = 1) \quad (1)$$

The main evaluation problem is that $(Y_0 \mid X, D = 1)$ is never observed. The solution is to construct the counterfactual to replace the unobserved values. Matching method, which is framed within context of nonparametric estimation, is one way to do so. Its main role is to mimic conditions similar to the controlled experiment so that the assessment of impacts of the treatment can be based on the comparison of outcomes for different groups of participants. In other words, matching helps in making subjects in two groups comparable in terms of observable characteristics. Consequently, the outcome for the treated (D=1) may be compared with an outcome observed among the controls (D=0).

Let the μ(X) be a particular measure derived from observed characteristics which can be used to find for every observation in the treatment group, their counterpart in control group. The two matched observations should be as close as possible in terms of μ(X), which usually is a proximity measure bounded by 0 from below and by 1 from above.

To yield consistent estimates of a given factor's impact, matching methods rely on a fundamental assumption described as 'conditional independence' or 'selection on observables'. This assumption states that the potential outcomes (Y_0, Y_1) are orthogonal to the treatment status, given observable covariates. This assumption assures that there is no selection bias, implying at the same time that there are no unobservable differences between the treatment and the control groups after conditioning on X. If one is only interested in the mean impact of treatment on the treated then this assumption can be weakened by focusing on potential outcomes in the non-participation (control) state (Imbens, 2004). Then it is called Conditional Independence Assumption (CIA) and can be written as follows:

$$Y_0 \perp D|X$$

It states that outcome in counterfactual state is independent from participation status, given observable characteristics. Therefore any systematic difference in outcome between participants and non participants can be attributed to participation status.

Another important assumption staying behind matching methods is that both groups consists of individuals with the same covariates values. This requires the so called overlapping in the distribution of observables and could be stated as:

$$0 < \mu(D = 1|X) < 1 \qquad \text{(A2)}$$

This assumption assures that there exists at least one non-participant that could be used as a reference for each treated individual. If there is no overlap, it means that for some observations from the treatment group there is no counterpart in the control group and it could be impossible to use matching methods (Heckman, Ichimura, Todd 1997). In this paper observations that had values of characteristics not found in the other group were excluded. Thus, the common support requirement was imposed. This seems reasonable in our case because in several comparisons, e.g. farmers versus workers, it is possible that some individuals have distinct characteristics that can not be found among individuals in the other group.

Under assumptions (A1) and (A2) the matched sample is equivalent to the random sample (Heckman et al. 1997). Conditioning on the measure μ(X), each individual has the same probability of assignment to the treatment, just as it would be in randomized experiment. As a result individuals with the same value of μ(X), but different treatment status, can act as counterparts for each other (Blundell et al. 2001). The common candidate for μ(X) is a measure called *propensity score*. The *propensity score* is just a probability that a given subject with characteristic X have been treated or participated in the programme:

$$0 < \Pr(D = 1|X) < 1$$

There are several different methods of calculating the propensity score, however, the most convenient one is to rely on logit model[3].

In practice matching may become cumbersome as the number of observable characteristics, that matching procedure relies on, grows. The use of propensity score was motivated by Rosenbaum and Rubin (1985), who showed that dimensionality problem can be resolved by utilizing this concept. The simplicity of solutions results from the fact that n-dimensional random variable is replaced by the scalar ranged in zero-one interval. The same authors also proved that CIA assumption remains valid if one controls for propensity score p(X) instead of X, thus:

$$Y_0 \perp D|P(X)$$

The propensity score matching procedure uses several different algorithms. The most commonly used is the nearest neighbour matching where each participant is matched to one non-participant based on the closeness of propensity score value. Thus, the set N_i of nearest neighbours for observation *i* could be defined as:

$$N_i = \left\{ j | \min_{j \in (1\mathrm{K}\ n)} \left\| p_i - p_j \right\| \right\}$$

Extended version, which is called the nearest neighbour 1-to-n match, search for several closest observations from the comparison group. Matched "observation" is an average of those *n* observations. This method can be used with or without replacement. Allowing for replacement improves the quality of match on average, but on the other hand increases the variance of the measured impact (Smith and Todd, 2005). Additional device called caliper is also often in use, preventing from poorly matched pairs. The closest neighbour is selected

within range of δ. If there is no observation in δ neighbourhood the observation is discarded from further analysis:

$$N = \left\{ j \middle| \min_{j \in (1\mathrm{K}\ n)} \left\| p_i - p_j \right\| < \delta \right\}$$

The nearest neighbour match, especially when used without a caliper, is exposed to the problem of possible existence of outliers in the dataset. In this paper the caliper was employed in all matching methods, however, it had negligible impact on estimates obtained.

More advanced techniques utilise kernel approach. This method associates the outcome of the participant from the treated group (p_i) with outcome of all non-participants (p_j). The weight assigned to non-participants is proportional to the distance between observations and is computed by formulae

$$w_{ij} = \frac{K\left(\frac{p_i - p_j}{h}\right)}{\sum_j K\left(\frac{p_i - p_j}{h}\right)}$$

where *h* stands for bandwidth. The shape of the kernel distribution relies on the bandwidth, thus, several values of this parameter were tried in this research to find no significant impact on final estimates.

Central issue in the matching method is choosing the appropriate matching variables and evaluate matching success (Blundell, Costa Dias 2002). There are generally two ways to determine the validity of matching. One is to see how close, in terms of X, subjects from treated group are with respect to their matched comparisons. This is a microscopic way of evaluation. Rosenbaum (2002) describes criterion of average absolute imbalance after matching, so called easy-to-check conditions, by employing the Hotteling test and compare then mean values of the chosen characteristics in treated and control group. The other

approach is to see how X is balanced across the two groups at the aggregate level. This approach is an extension of Rosenbaum and Rubin (1985) idea of sample stratification, and is called macroscopic test. To perform this test one has to estimate the propensity score for the treatment and control group, and then divide the distributions into quintiles or deciles, depending on the number on available observations. The final step is to compare the mean of propensity score distribution in the treatment group with that one for the control group.

The microscopic test is a standard for checking the balance. Macroscopic test is rarely used, however, could be useful in detecting observations having no close counterpart in other sample. Thus, we used both approaches to test validity of obtained results.

Measures presented above are based on the averages and could suffer from the presence of extreme observations. In this research we used the whole sample as well as the trimmed sample where we excluded 5% of observations with the lowest and the highest income in each group of households considered. This way we made our results more robust to outliers which are often present in the household budgets survey data, especially in the case of farmers. Koenker and Basset (1978) stated that trimming while making a small sacrifice of efficiency to the mean at Gaussian distribution, is greatly superior in case of non-Gaussian distribution. It is therefore less susceptible to sampling fluctuation than the mean for extremely skewed distributions, which is exactly the case of income distribution. More detailed discussion can be found also in related works by Basset and Koenker (1982) and Koenker and Portnoy (1987).

Data

The analysis is based on an extensive dataset containing information collected in seven Household Budget Surveys waves conducted annually in the period 1998-2004 by the Polish Central Statistical Office. The data have been gathered with accordance to monthly rotation method following the stratified two-stage sampling procedure. The main part of the questionnaire has remained the same over the years and included, among others, information on households' characteristics as well as details on their income and expenditures regarding the month the survey was done. On average 32.400 households were questioned each year. For the purposes of present analysis, however, only rural households were taken into account. As a result, smaller sample has been used containing slightly more than 10000 rural households each year. Tables 1 and 2 below describes the percentage of different kinds of households found in the HBS dataset in each year as well as the average equivalent income per person (using the OECD scale) which is the outcome or dependent variable in our analyses.

TABLE 1 about HERE

TABLE 2 about HERE

RESULTS

Tables 3-5 given below present the estimates of income differences between particular types of rural households. Estimates presented in those tables were based on the trimmed sample. While similar numbers obtained for the whole sample were substantially the same, they were less precise and suffered from heavy fluctuations between years. Thus, trimmed sample

estimates were preferred because they gave more valid basis to assessment of trends in earning differentials. Additional results can be obtained from authors on request.

Numbers in subsequent rows report the average differences in monthly income *per capita* in PLN calculated using equivalence scale of OECD[4] (ATT11 for 1-1 matching and ATTker for kernel matching), standard errors (SE), bootstrapped standard errors (BSE), bootstrapped bias corrected confidence intervals (BiasCI) and number of households in each of the groups that were compared (n_treat, n_control). Comparisons were made for six types of households which were classified according to the main source of their income. These were: hired off-farm work (*workers*), diversified activities (*workers-farmers*), farming, self-employment, pensions and allowances, and, finally, other unearned income.

TABLE 3 about HERE

TABLE 4 about HERE

Figures presented in tables allow for making several interesting statements. First, combining on- and off-farm activities have offered higher remuneration than strategy of relying solely on farming (see estimates for *farmers versus farmers-workers* category). This result applies to the whole period under examination apart from the year 2002 where households with farmers and workers had almost the same income as households living only from farming. Second, income coming from diversified activities was lower than that obtained from off-farm jobs, however, it is hard to see any trend here (*workers-farmers versus workers* category). Third, especially in 2003 and 2004, working outside agriculture was more profitable than farming (*farmers versus workers* or *workers-farmers*). These three observations indicate that during

the examined period returns from various income strategies differed from each other. Direction of these differences inclines towards statement that there existed economic incentives for people to part with agriculture. In this context, the former two observations may be treated as describing a gradual path of moving towards non-agricultural sector. This path includes two stages: 1) starting off-farm activities while still being partly involved in agricultural enterprise, and 2) completely giving up farming in favour of working outside the farm. The latter observation on the other hand, shows that also deciding for more radical shift, i.e. switching directly from farming to off-farm employment was on average profitable.

It is still not clear, however, whether these incentives were high enough to attract agricultural workforce (either part-time or full-time) to other sectors. The fact that notwithstanding problems of land fragmentation and agrarian overpopulation, rate of decrease in the number of agricultural households in the years 2000-2005, equalled to 4,4%, suggests that potential benefits coming from diversification or complete shifting to off-farm employment are likely not to offset the costs associated with such changes. It seems that at least two reasons contribute to such state of affairs. On the one hand, this is surely the risk associated with switching to new income source under uncertain conditions, where off-farm jobs are perceived as being less stable than working on the farm. On the other hand, it seems that economic incentives facing rural households are not accompanied by appropriate incentives for potential employers. This fact stems mainly from inadequate skills of rural workforce with respect to employers' expectations. In effect, off-farm job opportunities are not only scanty but also confined practically speaking only to low-skilled activities. This in turn, determines relatively low level of wages that are being offered.

The abovementioned results call also the attention to two additional aspects. One of them relates to the issue of households' heterogeneity. The income distribution of farmers' households was strongly skewed. Without trimming the sample the results were upward

biased due to a presence of relatively few farms with very high incomes. This obviously may have important implications for policy concerns, especially direction of subsidies for farmers. Additionally, it shows that caution should be exercised when drawing conclusions from simple comparisons of averages between different groups of rural households which seem to be heterogeneous.

The other aspect which calls for one's attention relates to the relative improvement in financial situation of farmers' households that could be observed in 2004. This observation may suggest positive impact of Poland's accession to the EU, and subsequent inflow of direct payments, on farmers' wealth. Such interpretation is in line with findings coming from other studies that have identified direct payments as an important factor contributing to increase in farmers' incomes.[5] However, it seems that relative situation of farmers did not improve in the whole investigated period which shows that regardless public programmes they are still the most vulnerable group on the labour market.

Estimates of earning differentials provide also interesting insights on remuneration coming from self-employment. Compared to strategies basing at least to some extent on farming, running own enterprise appeared to be the most profitable one. Surely, successful self-employment requires high skills and initiative and is certainly one of the most challenging for rural population. Notwithstanding this fact, it is reasonable to expect that self-employment have the great potential with regard to stimulating pace and scope of rural development. This seems to be the more true the larger the backwardness of rural areas. It is simply because the more these areas are lagging behind the lower chance they have to attract potential employers. Provided that in the examined period self-employment offered the highest incomes from all strategies taken into consideration, the obtained results strongly support provision of rural micro-credit that could be used for establishing small businesses. As such, they are fully in line with experiences gained during implementation and evaluation of micro-credit

programmes initiated in recent years by the World Bank or the Polish Rural Development Foundation.[6]

Finally, the obtained results allow for making statements on the role of unearned income in determining household income strategy. On the one hand, presented statistics show that households of farmers and people combining off- and on-farm activities are better off than households of pensioners and people relaying on unearned income (see *farmers or farmer-workers versus pensioners or unearned* in tables above). On the other hand though, figures reported in the Table 5 below incline towards general conclusion that unearned income, when being a supplement to farming or earning from diversified enterprise, may be regarded as a perfect substitute for at least part of earned income. This fact has two important implications. First, under such circumstances less efficient households have the same incentives to remain in farming as more efficient ones. As a consequence, having access to unearned income may seriously impede efficiency stimulating resource reallocation. Second, since combining farming (diversified activities) with unearned income offers in general the same remuneration as relying only on the former strategy alone, farms (diversifying households) are provided with artificial incentives to improve their financial situation not necessarily through productive activities. This, in turn, is obviously very likely to have a negative impact on efficiency of their labour endowments engaged in any kind of productive activities. There are weak signs of relative improvement in the last years of households having income only from farming without unearned income comparing to those benefiting from such additional sources. If this is true trend then one can conclude that recent years made incentives to rely on income from labour became stronger. However, it seems to be too early to give such conclusions without great caution.

TABLE 5 about HERE

CONCLUSIONS

Transition has brought about enormous and rapid changes in rural areas in Poland which started the process of thorough restructuring. Notwithstanding these developments, further restructuring is desired and often diversification of income sources is advised as a tool to achieve it. The present paper has been aimed at investigating potential for income diversification and complete outflow from farming to speed up restructuring process in the period 1998-2004. Moreover, attempts have been made to assess the role of unearned income in determining the choice of income strategy in rural households. Using propensity score matching methods following results were obtained. First, strategies relying on diversified income sources and off-farm employment could provide farmers with economic incentives to part with their land. However, due to insufficient developments in off-farm environment in rural areas these incentives appeared to be too low to boost an outflow of people from agriculture. Consequently, policies supporting income diversification implemented without measures addressing other labour market imperfections could lead to at most moderate results. Second, in the investigated period direct payments from the Common Agricultural Policy as well as sources of unearned income such as pensions, allowances or social benefits have acted against leaving farming. In effect, efficacy of policies facilitating income diversification has been further undermined. Finally, the obtained results provided strong support for provision of micro-credit programmes to rural areas. It should be noted however, that setting own enterprise is likely to require providing farmers with appropriate assistance. Financial education, focusing on efficient household budget management, is certainly one of the examples.

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TABLES

Table 1. Rural households with respect to their main source of income

Main source of income	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Employment	6.23 %	6.36 %	6.87 %	6.45 %	7.21 %	7.90 %	9.06 %
Employment+farming	4.98 %	4.34 %	4.31 %	4.33 %	4.32 %	4.46 %	4.82 %
Farming	5.25 %	5.13 %	3.76 %	3.60 %	3.38 %	3.11 %	3.41 %
Self-employment	3.77 %	4.24 %	4.27 %	4.83 %	4.65 %	4.60 %	4.16 %
Retirement	21.07 %	20.55 %	22.04 %	22.18 %	22.56 %	22.83 %	24.74 %
Pensioners	14.45 %	14.71 %	16.10 %	16.46 %	16.19 %	15.38 %	15.36 %
Other non-labour	2.33 %	3.07 %	4.00 %	4.37 %	5.47 %	5.36 %	5.47 %
Employment + pensions	14.72 %	14.86 %	14.84 %	14.54 %	14.00 %	14.51 %	13.60 %
Employment+farming+pensions	16.46 %	16.93 %	15.06 %	15.45 %	14.54 %	14.07 %	12.70 %
Farming + pensions	10.73 %	9.81 %	8.75 %	7.79%	7.68 %	7.79 %	6.67 %

Source: Own computations based on HBS.

Table 2. Rural households means of equivalent income per person by it's source (in 2005 PLN)

Income main source	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Employment	997.07	1009.62	1110.28	972.68	969.69	987.25	1001.00
Employment+farming	882.84	841.26	837.07	841.32	811.06	901.84	891.95
Farming	830.04	828.95	825.96	795.60	940.22	636.25	692.39
Self-employment	992.76	997.35	967.71	995.77	1061.00	1082.63	1060.62
Retirement	834.01	852.79	816.63	859.51	871.85	868.49	879.68
Pensioners	692.94	693.79	664.18	671.97	686.19	713.89	707.05
Other non-labour	423.51	447.77	480.31	455.42	472.53	527.85	514.23
Employment + pensions	767.82	765.74	781.88	797.90	766.01	789.53	763.44
Employment+farming+pensions	766.24	777.26	769.39	772.34	756.28	760.67	748.38
Farming + pensions	792.32	738.35	741.65	768.67	868.77	734.80	783.53
Average	797.07	794.39	787.63	792.27	803.65	802.93	806.97

Source: Own computations based on HBS

Table 3. Estimates of earning differentials: farmers and other rural households.

	1998	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
Farmers versus **workers**							
ATT11	-97.5	-179.2	-14.7	-78.8	-63.2	-267.6	-102.2
BSE	(48.6)	(48.2)	(44.4)	(51.5)	(59.0)	(50.3)	(55.5)
BiasCI	(-8.8;-111.4)	(-79.2;-215.9)	(-55.7;74.4)	(35.7;-96.3)	(58.3;-69.2)	(-218.8;-221.3)	(62.3;-133.7)
ATTker	-111.4	-215.9	-47.1	-96.3	-69.2	-221.3	-133.7
SE	(46.2)	(42.0)	(42.4)	(46.6)	(45.1)	(42.6)	(46.8)
Farmers versus **workers-farmers**							
ATT11	-170.7	-161.8	-100.4	-39.1	13.5	-180.9	-122.4
BSE	(48.8)	(57.5)	(45.1)	(52.5)	(45.1)	(50.2)	(52.3)
BiasCI	(-97.8;-149.6)	(-336.9;-118.3)	(-193.8;-21.4)	(83.3;-54.1)	(119.0;20.3)	(-79.9;-206.1)	(-0.5;-132.0)
ATTker	-149.6	-118.3	-96.0	-54.1	20.3	-206.1	-132.0
SE	(36.8)	(44.4)	(35.7)	(40.6)	(39.7)	(46.5)	(40.6)
Farmers versus **Self-employees**							
ATT11	-149.0	-334.1	-248.4	-166.5	-233.3	-328.9	-211.4
BSE	(73.9)	(66.2)	(50.7)	(66.5)	(65.5)	(70.8)	(61.2)
BiasCI	(-215.3;-192.6)	(-470.5;-325.0)	(-371.0;-179.6)	(-30.7;-176.6)	(-161.5;-171.6)	(-239.5;-298.9)	(-105.5;-212.2)
ATTker	-192.6	-325.0	-236.0	-176.6	-171.6	-298.9	-212.2
SE	(68.5)	(51.7)	(39.5)	(58.4)	(55.2)	(53.2)	(57.5)
Farmers versus **Pensioners**							
ATT11	77.1	32.3	130.1	118.8	128.2	-37.0	57.9
BSE	(34.8)	(34.4)	(34.2)	(41.3)	(42.3)	(41.5)	(45.3)
BiasCI	(141.5;79.5)	(115.4;8.4)	(65.1;199.0)	(194.0;105.5)	(198.9;129.2)	(44.1;-37.9)	(150.5;36.7)
ATTker	79.5	8.4	137.6	105.5	129.2	-37.9	36.7
SE	(31.3)	(30.6)	(32.5)	(36.3)	(35.9)	(32.9)	(37.7)
Farmers versus **Unearned**							
ATT11	263.0	211.8	278.1	249.4	328.8	100.4	189.5
BSE	(44.8)	(36.9)	(37.5)	(43.9)	(40.8)	(40.3)	(44.0)
BiasCI	(344.5;270.7)	(286.9;210.8)	(207.9;360.3)	(323.7;251.0)	(433.7;323.1)	(165.8;115.2)	(263.9;188.3)
ATTker	270.7	210.8	279.1	251.0	323.1	115.2	188.3
SE	(34.7)	(31.6)	(32.7)	(35.9)	(35.3)	(32.6)	(37.2)

Table 4. Estimates of earning differentials: worker-farmers and other non-farming rural households.

	1998	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
Workers-farmers versus **Workers**							
ATT11	17.9	-20.2	-81.9	-83.5	-129.1	-112.5	-21.4
BSE	(32.4)	(36.4)	(37.0)	(37.2)	(38.8)	(40.3)	(34.8)
BiasCI	(103.5;-1.0)	(33.9;-63.2)	(-170.7;-31.8)	(-25.2;-70.5)	(-73.4;-105.2)	(-91.7;-80.3)	(80.6;-53.3)
ATTker	-1.0	-63.2	-50.8	-70.5	-105.2	-80.3	-53.3
SE	(28.1)	(32.2)	(29.1)	(29.5)	(28.9)	(27.3)	(26.5)
Self-employees vs workers-farmers							
ATT11	97.4	119.2	152.7	141.7	159.6	173.7	134.8
BSE	(36.5)	(43.6)	(33.4)	(46.2)	(48.2)	(50.3)	(38.9)
BiasCI	(187.4;56.1)	(186.4;140.1)	(92.6;230.7)	(55.9;147.6)	(73.9;210.9)	(68.5;180.6)	(210.5;137.0)
ATTker	56.1	140.1	146.7	147.6	210.9	180.6	137.0
SE	(30.1)	(32.5)	(28.2)	(30.4)	(31.9)	(35.4)	(28.9)
workers-farmers vs pensioners							
ATT11	224.3	204.7	191.1	175.1	167.6	201.6	200.7
BSE	(24.6)	(29.5)	(27.4)	(29.4)	(26.0)	(31.3)	(27.5)
BiasCI	(265.3;228.4)	(267.5;175.5)	(135.4;234.8)	(230.4;181.1)	(226.5;150.0)	(281.5;189.0)	(246.5;209.8)
ATTker	228.4	175.5	194.6	181.1	150.0	189.0	209.8
SE	(21.5)	(24.2)	(21.8)	(24.0)	(21.0)	(23.9)	(22.1)
workers-farmers vs unearned							
ATT11	371.0	374.8	352.0	324.7	308.3	317.8	340.5
BSE	(33.0)	(29.9)	(26.2)	(28.1)	(25.3)	(28.0)	(27.3)
BiasCI	(426.2;379.3)	(441.4;362.2)	(293.3;397.3)	(374.2;335.9)	(355.0;310.7)	(334.3;359.6)	(396.5;337.2)
ATTker	379.3	362.2	352.1	335.9	310.7	359.6	337.2
SE	(26.7)	(26.7)	(21.7)	(23.7)	(19.3)	(22.5)	(21.7)

Table 5. Estimates of earning differentials: workers, workers-farmers and farmers households without and with additional unearned income.

	1998	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
workers versus **workers with additional unearned income**							
ATT11	89.9	107.7	96.8	92.7	109.8	104.7	128.2
BSE	(20.9)	(21.3)	(22.1)	(25.4)	(22.3)	(24.7)	(21.1)
BiasCI	(116.0;104.9)	(140.9;113.7)	(44.7;130.3)	(159.8;78.2)	(155.1;101.2)	(151.4;90.6)	(172.4;125.3)
ATTker	104.9	113.7	105.9	78.2	101.2	90.6	125.3
SE	(17.0)	(17.7)	(17.4)	(19.6)	(18.4)	(18.4)	(16.8)
workers-farmers versus **workers-farmers with additional unearned income**							
ATT11	47.0	34.2	28.2	44.2	-7.7	25.6	39.1
BSE	(24.1)	(27.7)	(23.7)	(28.6)	(26.3)	(26.2)	(27.6)
BiasCI	(87.5;55.5)	(78.3;37.2)	(-12.4;84.7)	(106.8;34.8)	(26.7;9.7)	(64.2;41.5)	(84.6;38.2)
ATTker	55.5	37.2	14.9	34.8	9.7	41.5	38.2
SE	(18.2)	(19.5)	(17.9)	(20.3)	(19.0)	(21.3)	(19.0)
farmers versus **farmers with additional unearned income**							
ATT11	-134.2	-6.6	10.1	75.8	37.9	-70.1	-65.9
BSE	(51.0)	(43.4)	(46.1)	(52.0)	(60.9)	(56.9)	(65.9)
BiasCI	(-85.2;-81.0)	(90.3;-14.7)	(-72.9;99.2)	(191.3;30.9)	(154.7;31.0)	(45.1;-83.4)	(-0.8;-12.1)
ATTker	-81.0	-14.7	10.7	30.9	31.0	-83.4	-12.1
SE	(37.8)	(33.7)	(35.7)	(41.3)	(41.8)	(37.2)	(47.4)

[1] In 2006 *per capita* monthly disposable income in farmers' households was roughly 689 PLN. The highest incomes were observed in households of self-employed persons (1102 PLN). Households of pensioners and workers had respectively 872 and 829 PLN. The average income was 834 PLN (GUS, 2007).

[2] Obviously, the third possibility is to compute average treatment effect on the population of non-treated, but such effects are rarely interesting.

[3] The probability of being treated is assumed to be the logit function of observed characteristic. The logit function has a closed analytical form and therefore could be easily implemented in statistical software. One of the drawback of the logit function, however, is that is has heavy tails. Another possibility is to employ linear probability model. However, this option is rarely used due to the fact that the latter model has non-desirable properties such as heteroscedasticity or fitted values outside unit interval.

[4] For the reasons of brevity we present here only the results of one-direction matching. As a robustness check, matching with rearranged order was also conducted. This, however, did not change the results. It should be also noted that in all cases both the microscopic tests as well as macroscopic tests provided support for the obtained results.

[5] According to recent surveys conducted among farmers in 2005 and 2006 direct payments improved income situation in more than a half of farms. In roughly 5% of cases this improvement was acknowledged to be very significant (PENTOR, 2005; 2006). Other estimates of direct payments' effect on farmers' income point that in 2004 direct payments accounted for roughly 30% of farmers' income growth (Józwiak**,** 2005).

[6] Information about these two projects can be found on: http://www.fapa.com.pl/jkp/context/index1.html and http://www.fww.org.pl/polski/mps/index.htm respectively.