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Returns from Income Strategies in Rural Poland

ABSTRACT

In order to stabilise and improve their income situation, rural households are strongly encouraged to diversify their activities both within and outside the agricultural sector. Often, however, this advice is only moderately pursued. This paper addresses issues of rural household income diversification in the case of Poland. It investigates returns from rural household income strategies using propensity score matching methods and extensive datasets spanning 1998-2008. Results suggest that returns from combining farm and off-farm activities were lower than returns from concentrating on farming or on self-employment outside agriculture. This differential is stable over time although returns from diversification have relatively improved after Poland's accession to the EU. This is also visible in the fact that since 2006 returns from combining farm and off-farm activities have evened with returns from relying solely on hired off-farm labour, thus smoothing the difference observed before the accession. Further, over the analysed period, households pursuing the diversification strategy performed better than those relying solely on unearned income. Finally, in general, the income in households combining farm and off-farm activities was higher than in those combining two off-farm income sources.

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

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1. Introduction

While important differences across countries can be observed, many rural areas in the European Union (EU) face significant challenges. Most importantly, compared to urban regions, rural areas show a lower degree of socio-economic development.[1] This translates, inter alia, into lower levels of income, lower employment rates or lower attainment of tertiary education (European Commission, 2011). These problems seem to be particularly prevalent in the Central and Eastern European countries (CEECs) (Macours & Swinnen, 2008). In comparison to the situation in the old EU member states, rural areas in the CEECs are characterised by a greater share of people at risk of poverty, higher dependence on agriculture or a wider gap between rural and urban GDP per capita (European Commission, 2011).

In response to this, one of the main objectives of the rural development policy in the EU in general, and in many of the CEECs in particular, is to improve the quality of life in rural areas by encouraging diversification of the rural economy.[2] This mainly focuses on creating non-agricultural job opportunities both for farmers as well as the landless rural population. In the former case, multifunctional agriculture is often encouraged. In the latter case, on the other hand, off-farm activities totally unrelated to farming are supported. The policy measures to this end 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' or 'support for village renewal and development'.

It is believed that these measures will help to unlock the potential of rural areas and boost their development. Thanks to this, a more coherent and more sustainable framework for growth at national level is expected. Moreover, expanding the non-agricultural sector in rural areas is often associated with structural changes that occur with economic development (Winters et al., 2010). Consequently, diversification is often advocated from a macroeconomic perspective. In addition, a number of micro-level motives for diversification could be mentioned. From this view, diversification is presented as a natural response to various market failures, an important tool to manage risk or a way to cope with adverse shocks (e.g. Haggblade et al., 2010). Thus, diversification is believed to contribute to stabilisation of income flows and consumption at the household level. In case of the CEECs,

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[1] The very same problem could also be observed outside the EU, especially in developing countries.

[2] "Improving the quality of life in rural areas and encouraging diversification of economic activity" is one of the three aims of the EU rural development policy. As far as the programming period 2007-13 is concerned, at EU-27 level, this objective represents 13.3% of the total rural development spending (€12.8 billion in nominal terms). For the EU-12 (i.e. CEECs plus Malta and Cyprus) this share is higher and accounts for 19.3% (€7.2 billion in nominal terms; see Annex E in European Commission, 2011). For more on the orientation of rural development spending among CEECs, see also Ramniceanu & Ackrill (2007).

diversification has been additionally advocated since 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 to absorb some of the surplus of farm labour.

At the same time however, 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 that forcing them to diversify outside agriculture will distort rural and agricultural markets away from their optimal levels. Furthermore, financial encouragement to diversify may lead to overdependence of rural inhabitants on governmental support. Last but certainly not least, the correlation between the share of non-farm income and total household income is far from obvious and it may be positive, negative or zero. This in turn raises the question whether encouraging diversification is rational from the efficiency of public spending point of view.

Having said that, it seems important to gain a better understanding of the returns to various income strategies in rural areas and to evaluate these two contrasting views using evidence from the data. This paper aims to provide such evidence. We focus on Poland, which seems to be a very interesting case for analysing how income diversification compares to other income-generating strategies in rural areas. This is because of both the scope and scale that diversification measures may potentially achieve. Rural areas in Poland contain over 38% of the total population and cover roughly 93% of the territory (RDP, 2010).[3] Average disposable income per capita of rural households is close to 70% of the average income in urban areas and has remained at this level for the last decade (Table 1). The dependence on agriculture is one of the highest in the European Union, while the service sector is less developed. Moreover, most remote areas are being depopulated due to a lack of economic and social opportunities. As a consequence, an unfavourable demographic situation is likely to limit their growth opportunities and sustainability.

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

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Rural areas	483.03	512.34	526.85	539.98	555.70	592.83	659.29	744.44	835.85
Farm	455.99	497.54	571.83	474.31	541.00	606.17	689.75	846.76	887.35
Farm/rural	94%	97%	109%	89%	97%	102%	105%	114%	106%
Urban areas	695.00	731.55	754.73	819.27	847.58	866.46	943.90	1,043.71	1,176.11
Rural/urban	69%	70%	70%	66%	66%	68%	69%	71%	71%
Whole Poland	610.51	644.48	664.21	680.50	735.40	761.46	834.68	928.87	1,045.52

* PLN stands for the Polish złoty, the currency in Poland. In 2008 (2000) 1 EUR= 3.51 (4.01) PLN.

Source: CSO (2013) and own calculations based on the Household Budget Surveys.

These challenges have been reflected in the composition of the Polish rural development policy, in which various diversification measures have played an important role both before and after Poland joined the EU and have been embraced by the Common Agricultural Policy (see, for example, SAPARD, 2007; SPO 2008; RDP, 2010). As a meaningful illustration, one could cite the fact that in the current financial perspective (2007-13), funds allocated to promote diversification in Poland account for roughly 20% of the total rural development

[3] In Poland, rural areas are defined as those located outside the administrative boundaries of towns and cities. Note that this definition is different from that used by the OECD or Eurostat, where rural areas are delimited based on the population density criteria. According to the latter approaches, rural areas in Poland cover 91% or 86% of the territory respectively (RDP, 2010). For a related discussion, see also Henningsen (2009).

spending, which is one of the highest shares in the EU member states (European Commission, 2011).[4]

Interestingly, notwithstanding these efforts, there is evidence that some households resist diversification strategies due to a preference for agriculture (Chaplin et al., 2004). Moreover, according to official statistics, starting from 2005 the average farmer's income is constantly above the average observed in rural areas (Table 1). This in turn questions the legitimacy of encouraging farmers to look for income outside agriculture from the profit-maximisation perspective.

While some studies have investigated the barriers to diversification in rural Poland (see, for example, Wilkin, 2003; Chaplin et al., 2004; Błąd, 2006; Chaplin et al., 2007), there have been hardly any attempts to compare returns to income strategies of rural households. This paper is an attempt to fill this gap and provides a comparison of returns to various income strategies adopted by Polish rural households during the transition. More specifically, the paper examines how combining farm and off-farm employment (that is relying on diversified income) has compared with other income strategies adopted by rural households in Poland. Such information is needed to evaluate the rationale of governmental programmes aimed at stimulating farmers to diversify outside agriculture. It should also help in explaining labour adjustments in rural areas that were observed in Poland during transition period (Dries & Swinnen, 2002; Swinnen et al., 2005). Finally, by highlighting the most profitable rural income sources, we aim to contribute to the ongoing discussions 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 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 the Common Agricultural Policy (CAP) on rural/agricultural incomes. Importantly, we evaluate not only the impact of the CAP on farm incomes alone, but also the relative position of farmers towards other income-earning opportunities in rural areas. To address the concerns about differences in background characteristics of rural household undertaking different income strategies, propensity score matching methods are used. These methods allow us to balance these characteristics before comparing outcomes. In other words, our estimates take into account that rural households differ in their composition, physical and human capital, and compare income after adjusting for these differences. As in most cases these background characteristics are not policy amenable, they should be taken into account when assessing how policies could affect choices of rural households. 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.

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

2. Literature review

2.1 Theoretical explanations for income diversification

Economic literature addresses a wide range of questions concerned with the underlying decisions of rural households' income strategy. As far as income diversification is concerned, economic theory provides multiple explanations that could be used to account for this

[4] With this share Poland ranks third among the EU member states only after Bulgaria and Romania. In nominal terms, Poland has decided to support diversification of rural areas to the tune of €2.7 billion, which is the highest amount in the whole EU (Annex E in European Commission, 2011).

phenomenon (see Barrett et al., 2001; or Ellis, 2000 for an excellent survey of this field). Below we briefly review them.

To start with, households may want to diversify their incomes in the presence of insurance market failures. In this case, income diversification is used as a risk reduction strategy as under uncertainty, risk-averse decision-makers have incentives to spread the risk over many activities (e.g. Samuelson, 1967). From this perspective, merging agricultural and non-agricultural incomes provides two kinds of benefits. First, it helps to manage risks *ex ante*. Second, it helps to cope with adverse shocks *ex post*.

Further, income diversification could be seen as a response to credit market failures. Note that rural credit markets are often severely underdeveloped as compared to credit markets in urban centres. As a result, a number of rural households are credit constrained (e.g. Barry & Robinson, 2001). In this context, complementing agricultural income with non-agricultural earnings may either help to acquire long-term investment capital or provide liquidity for financing the purchase of production inputs.

Moreover, a household's decision to diversify income could be seen from the perspective of land market failures. Note that in the presence of barriers on land markets (e.g. Deininger & Feder, 2001), agricultural households will have limited opportunities to expand and develop. In this situation, they will face the problem of diminishing returns to various production inputs, including labour. In such a setting, they will send part of their labour force into non-agricultural activity.

In addition, income diversification may result from product markets failures. Given the fact that rural areas have limited transport and communication infrastructure, the transaction costs of supplying them with non-farm goods are high. Consequently, rural households may want to diversify outside agriculture in order to satisfy own demand for diversity in consumption. This factor is likely to play an important role, especially in the setting with growing farm households' income. This is because, with growing incomes, demand for non-food items will increase (the so-called Engel's law).

While the above-mentioned factors seem to force rural households to diversify their incomes so as to overcome various problems or shortcomings, economic theory provides us also with arguments that present income diversification not only as a must but as an opportunity. Most importantly, income diversification is a normal course of events in the presence of economies of scope, i.e. in the situation when the same inputs produce greater per-unit profits when spread across multiple outputs than when dedicated to any one output. Multifunctional agriculture such as combining milk production with agro-tourism based on cheese production could serve here as an example. Moreover, we would expect households to diversify their income to benefit from the fact that various household members may have a comparative advantage in different occupations. This should result in various household members specialising in different activities depending on their skills and available technologies. In such a setting, diversifying income again maximises household profits and could be seen as a first-best solution.

It should additionally be noted that, except for these micro-founded motives for income diversification, economic theory also suggests a number of reasons for looking at diversification from a macro perspective. Most importantly, it has been observed that economic growth is accompanied by the change in the sectoral composition of the economy, with non-agricultural activities gaining importance at the expense of agricultural ones. In what follows income diversification is often presented as part and parcel of economic development (Winters et al., 2010).

2.2 Empirical evidence

As mentioned above, a number of theoretical explanations for income diversification could be offered. Which of these theories holds in practice is an empirical matter. Thus, below we briefly review the existing empirical evidence on both determinants and effects of income

diversification. Given that our focus is on Poland, we mainly concentrate on the evidence from transition countries. Where the latter is only scanty or non-existent, we refer to findings from other countries.

Four strands of the empirical literature seem to be of particular importance to this study. The first strand focuses on examining factors stimulating or discouraging off-farm activities. The existing studies provide evidence that both endogenous and exogenous factors matter in the diversification decision. Research identifying these factors in transition countries brings mixed conclusions (see for instance Buchenrieder et al., 2004; Chaplin et al., 2004; Lerman et al., 2008; Möllers et al., 2008). 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). On the other hand, the propensity to diversify was positively influenced by the level of education and frequency of public transport. This finding corroborates the statement that reallocation of rural labour in Poland was limited by low human capital of agricultural labour that constrained intersectoral mobility (Dries & Swinnen, 2002). While interesting, much of this literature is based on binomial models and thus neglects the whole heterogeneity of occupational choices. As a consequence, the results obtained from these models are likely to overlook important differences between off-farm income strategies and their outcomes.

This line of reasoning ties into the second strand of the large body of literature that studies off-farm labour supply of farmers (for example Huffman, 1980; Tokle & Huffman, 1991; Kimhi, 2000). The existing evidence links household's choice of its income strategy with two broad set of factors. The first set includes personal characteristics and household attributes. The second set 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. The few examples include Goodwin & Holt (2002) for Bulgaria and Juvancic & Erjavec (2005) for Slovenia. In general however, the results from all these studies are quite unanimous. Numerous empirical evidences indicate that decisions about labour allocation highly depend on a household's human capital endowments (see, for example, Lass et al., 1991). More specifically, off-farm work is first increasing and later decreasing with the age of the head of a household. It is also closely related to the level of education of household members (Benjamin, 1994).[5] Further, patterns of labour allocation are highly dependent on the number of household members in working and non-working age (Ahituv & Kimhi, 2006; Kimhi, 1996).[6] 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 resulting from the household's joint budget constraint and costs imposed by different household members (Kimhi, 2004; Phimister et al., 2004).[7] The impact of access to unearned income sources

[5] It is important to mention the findings provided by Ahituv & Kimhi (2006) and Jolliffe (2004), which suggest that schooling contributes to higher productivity in off-farm employment rather than in farm work. It should also be recalled that Deininger & Olinto (2001) found that more educated households are more likely to adopt specialised income-generation strategies.

[6] It could also be noted that a larger family workforce might provide 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 level of income and social capital is not certain. Positive impact of social capital on household performance and/or household income was stressed, among others, by Dwyer & Findeis (2008); Narayan & Pritchett (1999) and Grootaert (1998). On the other hand, Knack & Keefer (1997) and references therein, provide examples where the investigated relationship was negative.

[7] 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 time costs imposed on the household by small children. On the other hand, having elderly dependents in the household may increase adults' labour mobility. Further, Kimhi (2004) finds that off-farm participation of adults decreases as the number of elderly children rises.

should also be recognised here since these are likely to decrease the need for undertaking additional activities, either on- or off-farm, by affecting the level of reservation wage.

The third strand of literature that is relevant to us focuses on the question whether increasing rural non-farm employment acts as a catalyst for a broader and inclusive pattern of development (see, for example, Lanjouw & Lanjouw, 2001; Reardon et al., 2001). To our knowledge, there is no study that addresses these issues for transition countries. Thus, we briefly review here the evidence from developing countries. A strong positive relationship between the share of non-farm income and total wealth levels was found for African countries as well as China (Reardon, 1997; Rozelle et al., 1999). Latin American countries and India provide evidence for a U-shaped relationship, indicating that obtaining the highest share of non-agricultural employment is a common facet of both poorest and wealthiest households (Reardon et al., 2000; Hazell & Haggblade, 1990). On the other hand, Deininger & Olinto (2001) found a strong positive association between total income and 'specialisation', that is, relying only on one main source, either on- or off-farm, in the case of households in Colombia.

Finally, the fourth strand of literature has investigated adjustments in agricultural labour during transition. On the one hand, it has been argued that the central planning system left in its aftermath a huge surplus in agriculture (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 an outflow of labour from agriculture and thus be a natural factor encouraging income diversification in rural areas. On the other hand, it has been emphasised that agriculture played a buffer role during the transition by absorbing the excess labour from other sectors and providing food and social security (Seeth et al., 1998; Lerman et al., 2004; Macours & 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 & Swinnen (2002) show that agricultural labour increased in the 1990s in southern and eastern parts, whereas in northern and western parts it significantly declined. 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, mainly present in the north and west of Poland) laid off agricultural workers during the transition.[8] While this literature provides an interesting picture of the agricultural labour-adjustment pattern, it lacks micro-foundations and thus does not allow us to study individual incomes and the underlying decisions of their income strategies.

To sum up, the existing literature shows that diversifying outside agriculture does not necessarily lead to an increase in income. In fact, several patterns characterising this relationship have been identified. We aim at documenting returns from various activities in rural Poland so as to see which pattern could be found there. In contrast to much of 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. A decision to follow an income strategy is possibly non-random. One should rather assume that selection into a given strategy depends on household characteristics. Thus, unadjusted differences in average income across various groups will give a biased estimate of

[8] It should be clearly noted though that agriculture in Poland, in contrast to most other post-communist countries, has always remained mostly in private hands. Notwithstanding the state's efforts to pursue the Soviet model of farming, the share of collectivised or state-owned land has never exceeded 20-25% (Lerman et al., 2004; Lerman & Schreinemachers, 2005). Therefore, although better than in the rest of the country, the farm structure in the north and west of Poland remains highly fragmented by European standards.

the returns to income strategies. To make meaningful comparisons, characteristics should be balanced across groups for which financial returns are compared (see, for example, Lee, 2005). Motivated by the nature of our data and 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 example, Blundell & Costa-Dias, 2008).

This method is widely used in empirical economics and other social sciences. The basic idea is to mimic a randomised experiment.[9] In our context, receiving the 'treatment' is equal to pursuing a given income strategy. Households in our sample utilise, to various degrees, incomes from farming, hired off-farm labour, self-employment outside agriculture and unearned income except pensions. We limit our sample to households without pensioners (i.e. men over 65 years and women over 60 years) to reduce selection based on labour force participation.[10] Consequently, we can distinguish between different income strategies. On the one hand, we distinguish single-income source households, i.e. those pursuing the *specialisation strategy* in one of the above-mentioned activities. On the other hand, we distinguish households with two income sources, i.e. those pursuing the *diversification strategy*, combining two of the activities mentioned above.[11] Our focus is on comparing returns to diversification strategy that includes income from farming (*diversified_farm*) with returns to any other income strategies, that is, either specialised or diversified but not relying on farm income (*diversified_non-farm*). In other words, our treatment group consists of households that have two income sources and one of them is farming. A counterfactual control group would consist of otherwise similar households but pursuing one of the remaining income strategies, for example, relying solely on farm income or combining hired off-farm labour with self-employment.[12] To draw a more detailed picture, we also decompose the treated group and run separate specifications in which we focus on the relative performance only of households combining farming and hired off-farm labour, or only of households combining farming and unearned income, or only of households combining farming and income from self-employment outside agriculture.

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[9] Potentially there exist other methods that could be used to mimic randomised experiments. Given the nature of our data, however, we could not use them here. More specifically, as we do not use a panel of observations we cannot use difference-in-difference techniques. We also do not have any arbitrary rules that would be decisive for households' selection into different income strategies. Thus, we cannot rely here on regression discontinuity identification.

[10] We decided not to include pensions, as this income source is not fully comparable to the others. This is because pensions are guaranteed on account of advanced years. As such, it is not available to households without men/women over 65/60 years. This in turn makes households eligible for pensions not fully comparable with households that do not have such a guarantee. Moreover, beneficiaries of many pensions and social allowances may not be physically able to engage in profitable activities, which makes comparing them with non-pensioners even more problematic. We thank an anonymous referee for drawing our attention to this point.

[11] While we could potentially also include households with more than two income sources, we decided to restrict our sample to households with either a single source or two sources of income. This is done to simplify the analysis. Accounting for households with more than two income sources would greatly enlarge the number of comparison groups. Moreover, as these households are not numerous (they account for only 6 to 8% of the sample, depending on a year), including them in the analysis would carry the risk of relaying on too few treated/control observations in our matching procedure. That said, this obviously has to be kept in mind when interpreting the results.

[12] When comparing outcomes of two groups in cross-sectional data, one can define treated and untreated flexibly. However, in practice the propensity score matching works better if the group of treated is smaller than the control group. In such a 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 the matching in the opposite direction as a robustness check (not reported).

An obvious challenge to such an exercise is that classifying as diversified all households with two income sources would result in treating households where each income source contributes 50% to the total budget in the same way as households where the contribution of each income source is less balanced (e.g. 25% and 75%) or totally unbalanced (e.g. 5% and 95%). Especially in this latter case talking about diversification strategy might be inappropriate, notwithstanding the number of income sources. To ensure that our diversified households have more-or-less balanced contributions from each of their two sources of income, we adopt the following strategy.[13] For each household with two income sources, we compute a Herfindahl index (HHI), calculated as the sum of squared shares of these two income sources. As a diversified household we define a household with HHI smaller or equal to 0.58, which corresponds to a situation where the less important income source accounts for at least 30% of the total. Whenever it is possible, i.e. whenever we have enough observations, we test the robustness of our results to HHI thresholds equal to 0.545 or 0.52, which correspond to situations in which the share of the less important income source accounts for at least 35% and 40%, respectively. In some cases we additionally control for the fact whether farming is a dominant income source or not.

More formally, we are interested in estimating $E(Y_{1i} - Y_{oi}|X_i,T_i = 1)$, where Y_{1i} is a potential outcome measure of household *i* that adopted a given income strategy, Y_{oi} a 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). It measures the effect of a given income strategy on income levels for the treated households compared to what would have happened if they would not have adopted a given income strategy (that is, they would have relied on different strategy). The ATT can be further decomposed to: $ATT = E(Y_{1i}|X_i,T_i = 1) - E(Y_{oi}|X_i,T_i = 1)$. The fundamental problem is that, in contrast to the first term, the second term on the right-hand side is not observed. Therefore, a counterfactual needs to be constructed. The solution proposed by Rosenbaum & 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 the information about the potential outcome (income in our case) in the absence of treatment. In other words, the selection into treatment is not dependent on unobservables. Hence, after adjusting for observable characteristics $E(Y_{oi}|X_i,T_i = 1) = E(Y_{oi}|X_i,T_i = 0)$. Accordingly, we can replace unobserved incomes in the treated households, had they not been treated, with observed incomes in those control households that have similar covariates X_i. In order to reduce the large dimension of X_i, we follow Rosenbaum & Rubin (1983) and instead of conditioning on X_i we condition on $p(X_i)$, which is the estimated probability of being treated and is called *propensity score*. 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 households pursuing different income strategies. However, as noted by Heckman et al. (1997), this might not be true and treated and untreated may differ in unobserved covariates. A potential solution is a difference-in-difference matching estimator. In our case, however, this strategy is not feasible since longitudinal information on households is not available in our data. This obviously should be kept in mind when interpreting the results. That said, it should be noted that our set of covariates includes crucial characteristics that are decisive for income strategies (in accordance with arguments presented in section 2). Therefore we assume that by balancing these characteristics across income groups we control for selection in a majority of the cases.

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[13] We thank an anonymous referee for suggesting this to us.

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 is, nearest neighbour one-to-one matching and local linear regression matching (Heckman et al., 1997). The choice of these two estimators could be motivated as follows. As noted in the literature (e.g. Smith & Todd, 2005; Caliendo & Kopeinig, 2008), the nearest neighbour 1-to-1 matching is said to be the right choice if there are significant differences between the distribution of the propensity score in treated and control groups. What should be noted is that for a majority of comparisons that we perform, the distributions of propensity score vector for the treated and control groups differ in both mean and variance. An obvious shortcoming with using the 1-to-1 matching is that it takes advantage of only a part of the non-treated group as the reference group. Therefore, to exploit all information available in the data, we additionally use the LLR matching algorithm. This algorithm is much better suited to our data than matching estimators based on the mahalanobis distance. It also allows us to avoid arbitrary decisions with respect to selecting the "n" in 1-to-n matching algorithm. Last but not least, using LLR matching in addition to 1-to-1 matching could be motivated by the fact that the former are much more suitable if one uses bootstrapping to calculate standard errors, which is our case. As noted by Abadie & Imbens (2008), bootstrapping does not necessarily deliver consistent estimates in the case of the nearest neighbour estimator. Bootstrapping, however, provides valid inference for all asymptotically linear estimators, including the local linear regression estimator. Therefore, the results based on the local linear regression estimator provide a useful robustness check for the results based on nearest-neighbour matching. To improve matching quality we use a calliper with a rather restrictive value of 0.005. This means that observations that differ in propensity score by more than 0.005 were not considered in matching.[14]

To assure the representativeness of our calculations, differences in incomes between treated and untreated were adjusted by household probability survey weights. Thus, the results are representative to the population of households. To increase comparability across years, we adjust each year's income data so that they are expressed in 2005 prices.[15] Standard errors were obtained through a clustered bootstrap with primary sampling units re-sampled for each bootstrap sample. 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% of extreme observations in each income group.[16] Trimming provides more robust and more precise results, while the results hold in general for calculations based on whole samples.

4. Data

Our analysis uses the data from the Household Budget Survey (HBS) conducted annually by the Central Statistical Office (CSO) in Poland. This extensive survey includes information on household characteristics as well as details of their income, expenditure 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 were taken into account. Moreover, as mentioned earlier, our sample is limited to households with one or two income sources and to households without people eligible for pensions. In total, depending on a year, we have

[14] This is done to assure that we compare similar objects. This calliper is applied to all our estimations. Around 10% of observations are dropped as a consequence, although this share decreases with the size of treated and control groups.

[15] The deflators are the European Union's harmonised indices of consumer prices (HICP).

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

from 5,300 to 8,200 observations at our disposal. The time span of the analysis ranges from 1998 to 2008 and is dictated by availability, coherency and comparability of the data.[17]

Since we are interested in comparing returns from different income strategies in Polish rural areas, our dependent variable is the monthly disposable equivalent income per capita in PLN deflated to 2005 prices.[18] Household equivalent income is based on the total revenues divided by the weighted number of household members according to the OECD scale. Throughout our analysis we distinguish between the following income strategies. The single-income source strategies include: relying solely on farming, relying solely on hired off-farm employment, relying solely on self-employment outside agriculture and relying solely on unearned income other than pensions. The diversified income strategies on the other hand include combining two of the above-mentioned earning alternatives. Our focus is on returns from diversified strategies where one source of income is farming. As already noted, to define diversified households we use the information on the contribution of each income source to the total income and assume that the contribution of the less-important income source should be at least 30%.

Tables 2 and 3 report basic statistics, presented separately for each year over the analysed period. Table 2 provide some details on the composition of our sample and reports shares of households according to their income category. As reported, the most numerous groups of households are those specialising in hired off-farm labour and those combining hired off-farm labour with unearned income. Together they account for 60 to 70% of our sample, depending on the year. In contrast, households combining farming and self-employment outside agriculture account for less than 1% of our sample.

Table 2. Sample characteristics: Percentage of rural households with respect to income category

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Specialised households											
Hired off-farm labour	21.8	22.2	20.6	19.1	19.1	20.2	21.5	24.9	28.7	30.9	34.5
Farming	8.9	8.9	11.4	12.5	13.2	13.1	12.1	11.5	10.1	7.5	6.6
Self-employment outside agriculture	3.0	3.0	2.5	3.1	3.0	2.8	2.5	3.2	3.3	3.3	3.8
Unearned income except pensions	10.1	9.5	8.0	7.3	6.6	6.1	6.2	6.3	5.9	4.7	4.5
Diversified households											
Farming + off-farm labour	7.2	5.9	4.7	4.8	4.2	4.6	4.9	4.5	4.7	4.9	4.9
Farming + self-employment	0.9	0.7	0.5	0.6	0.7	0.4	0.4	0.5	0.5	0.7	0.6
Farming + unearned	6.8	6.9	7.2	7.5	7.4	7.5	6.5	6.0	5.2	5.0	4.3
Off-farm labour + self-employment	2.1	2.2	2.3	2.4	2.5	2.2	2.5	2.5	2.9	3.4	4.0
Off-farm labour + unearned	37.1	38.7	40.0	39.3	40.0	40.0	40.4	38.2	36.3	37.5	34.7
Self-employment + unearned	2.0	2.0	2.7	3.4	3.1	3.0	3.0	2.3	2.5	2.0	2.0
No. of observations	5,372	5,384	6,284	5,309	5,337	5,334	5,394	6,868	8,205	8,129	8,134

Source: Own computations based on Household Budget Surveys. Unearned income excludes pensions. Only households with one or two income sources were taken into account. Households with persons eligible for pensions on account of advanced years were not included.

[17] Individual-level data concerning earlier periods are not comparable due to the 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 Household Budget Surveys are described in annual publications of the Central Statistical Office. More details on the methodology can be found in CSO (1999).

[18] PLN stands for the Polish złoty, the currency in Poland. In 2008 (2000) 1 EUR= 3,51 (4,01) PLN.

Table 3. Rural household mean equivalent monthly income per person by main source (in PLN deflated to 2005 by HCPI)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Specialised households											
Hired off-farm labour	899,96	901,54	881,03	912,04	871,44	919,22	894,44	931,41	982,49	1078,64	1190,90
Farm income	763,54	737,94	781,69	799,71	828,50	738,58	760,06	894,51	971,27	1153,00	1190,44
Self-employment outside agriculture	906,87	931,56	958,75	962,43	946,42	972,95	988,19	973,86	1061,46	1197,39	1263,23
Unearned income except pensions	458,47	468,27	459,14	478,58	479,77	504,87	491,11	505,75	543,80	581,88	580,75
Diversified households											
Farming + off-farm labour	861,26	835,95	841,96	828,02	871,35	891,34	866,07	954,80	1045,83	1156,99	1229,42
Farming + self-employment	911,92	833,54	813,89	903,80	896,61	951,89	1003,39	1032,43	1156,28	1174,36	1248,30
Farming + unearned[a]	657,06	589,05	599,37	610,58	603,20	594,13	633,14	669,57	703,69	881,66	828,74
Off-farm labour + self-employment	1063,44	1145,52	1023,76	1111,53	1106,72	1123,84	1090,83	1247,46	1280,68	1424,09	1554,87
Off-farm labour + unearned	700,17	695,19	696,94	702,56	692,30	693,31	702,38	702,24	756,03	817,38	902,03
Self-employment + unearned	736,05	748,03	704,63	745,14	816,87	834,22	714,87	733,80	816,19	842,90	899,42

* Unearned income does not include pensions.

Source: Own computations based on the annual Household Budget Survey conducted by Poland's Central Statistical Office (CSO).

Table 3, on the other hand, reports an average equivalent income per person in PLN for different household types. These averages indicate that over the period under investigation the highest returns (1,554 PLN in 2008) could have been obtained from combining off-farm hired labour and self-employment outside agriculture. The five following strategies provided somewhat lower remuneration (roughly 1,200 PLN in 2008): specialising in self-employment, combining farming and off-farm labour; combining farming and self-employment; specialising in farming; and specialising in hired off-farm labour. The least profitable strategies in turn appear to be those based at least to some extent on unearned income (from 580 to 902 PLN in 2008). These statistics suggest that, compared to other strategies, a diversification strategy (i.e. combining two income sources including farming) is the best approach to maximise a household's income. In fact, since 2005, combining farming and self-employment or hired off-farm labour ranked in the top four strategies with highest remuneration. That said, it has to be kept in mind that this picture is based only on simple averages and thus may be misleading. This is because it neglects households' background characteristics and the fact that households may self-select into different income strategies. That is why below we present some more systematic evidence based on propensity score matching to explore and compare differences in returns from various income strategies adopted by Polish rural households.

A few words are necessary about the specific regressors that we use when calculating the propensity score. For any application of propensity score matching, a crucial choice is the selection of the appropriate set of covariates for which distributions among compared groups have to be balanced. Our set of covariates was carefully established in accordance with the theoretical and empirical findings discussed in section 2. Since we aim at analysing returns from farming and from off-farm activities, we are particularly interested in characteristics shared by all rural households. Therefore, we focus on the following issues: a household's human capital endowments, a household's demographic composition and regional specificities. To capture differences in human capital, we include four dummy variables denoting education level of the household's head: higher education, secondary general education, secondary vocational education and vocational education. Those with the lowest level of education (lower secondary, primary or none) serve as a baseline category. In addition, we control for the level of education among household members other than the household head. More specifically, we include two dummies that distinguish households with at least one member having the same or higher level of education than the household head, respectively. Households where all household members have a lower level of education than the household head serve as a reference point. Next, to take into account that 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 being equal to one for males and equal to zero for females. Further, we also include a variable capturing the household's gender ratio, which is defined as the ratio of the number of men to the number of women older than 15 years. Moreover, in accordance with the literature showing that income strategy depends on household composition, we include two count variables that measure the number of persons under the age of 16 and the number of persons who are older than 16 but younger than 65. As noted earlier, we consider only households without people eligible for pensions. Taken together, 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 six Polish macro-regions (NUTS 1). To test the robustness of our results and reduce the probability of violating the *conditional independence assumption*, in some specifications we also include in our set of covariates the interactions between age, gender and other independent variables mentioned above.[19]

[19] We thank an anonymous referee for suggesting this to us.

5. Results

5.1 Diagnostics

Before reporting our main results, that is, the actual estimates of the returns to different income strategies, we begin by showing some diagnostics. Table 4 provides examples of a propensity score model that predicts the probability difference between various income strategies. Here we report the models predicting the probability difference between a diversification strategy that combines two income sources including farming and the alternatives of relying solely on a single income source (either farming, hired off-farm employment, self-employment outside agriculture or unearned income except pensions).[20] Clearly, explanatory variables included in probit regressions are good predictors of income strategy choices. This concerns especially age of the head of the household, his/her gender and the level of his/her education. In addition, the choice of income strategy seems to strongly depend on a household's composition both in terms of number of people of different ages and the level of education of household members. Given that these variables are also likely to affect household income, this result is consistent with non-random selection and motivates our empirical strategy.

[20] For reasons of brevity, only probit regressions for these comparisons are presented here. Household characteristics included in these regressions were also strong predictors for other comparisons. Additional results for other comparisons are available upon request.

Table 4. Propensity score estimates: Probit regressions

	Diversified vs. farming			***Diversified vs. off-farm***			***Diversified vs. self-employed***			***Diversified vs. unearned***		
	1998	**2003**	**2008**	**1998**	**2003**	**2008**	**1998**	**2003**	**2008**	**1998**	**2003**	**2008**
Age	-0.23	-0.01	0.00	0.03	0.01	0.03	0.00	0.00	0.02	-0.02	-0.02	-0.04
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Gender (1=woman)	0.83	0.86	0.49	0.22	0.16	-0.20	0.56	0.24	0.64	-0.48	-0.83	-0.78
	(0.21)	(0.25)	(0.21)	(0.18)	(0.18)	(0.16)	(0.30)	(0.29)	(0.27)	(0.21)	(0.19)	(0.20)
Gender ratio	0.05	-0.25	-0.07	-0.05	-0.04	0.05	-0.14	-0.35	0.18	0.27	0.08	0.11
	(0.12)	(0.13)	(0.12)	(0.10)	(0.11)	(0.09)	(0.20)	(0.19)	(0.16)	(0.16)	(0.13)	(0.13)
Higher education	2.04	-	2.33	-2.01	-2.53	-0.99	-2.14	-2.34	-2.10	2.71	2.15	2.68
	(0.75)	-	(0.64)	(0.44)	(0.46)	(0.32)	(0.68)	(0.63)	(0.51)	(0.83)	(0.54)	(0.53)
Secondary general education	0.61	1.96	-0.29	-0.99	-0.76	-1.01	-2.36	-1.80	-2.60	0.84	1.34	1.07
	(0.49)	(0.66)	(0.57)	(0.43)	(0.39)	(0.38)	(0.61)	(0.59)	(0.54)	(0.56)	(0.44)	(0.58)
Secondary vocational education	0.62	0.60	0.19	-1.26	-1.40	-0.58	-2.32	-2.13	-1.95	1.21	0.73	1.18
	(0.30)	(0.37)	(0.26)	(0.25)	(0.29)	(0.22)	(0.48)	(0.45)	(0.41)	(0.33)	(0.30)	(0.28)
Vocational education	0.11	0.32	0.03	-0.71	-0.43	-0.23	-1.56	-0.83	-1.10	0.58	0.69	0.83
	(0.19)	(0.23)	(0.21)	(0.18)	(0.21)	(0.18)	(0.39)	(0.36)	(0.37)	(0.22)	(0.20)	(0.22)
Education of other hh member as high as the hh head	-0.27	0.06	-0.70	0.22	0.09	-0.15	0.63	0.18	-0.08	-0.66	-0.52	-0.79
	(0.19)	(0.21)	(0.19)	(0.17)	(0.19)	(0.15)	(0.31)	(0.28)	(0.24)	(0.21)	(0.20)	(0.21)
Education of other hh member higher than that of hh head	-0.78	0.13	-0.86	0.31	0.76	-0.27	0.85	1.19	0.01	-1.27	-0.81	-1.69
	(0.28)	(0.32)	(0.29)	(0.25)	(0.26)	(0.22)	(0.39)	(0.38)	(0.30)	(0.29)	(0.27)	(0.29)
No of persons under 16 years of age	0.14	0.17	0.25	0.62	0.58	0.44	0.32	0.17	0.40	-0.15	-0.03	0.01
	(0.07)	(0.08)	(0.09)	(0.07)	(0.08)	(0.07)	(0.11)	(0.11)	(0.10)	(0.07)	(0.06)	(0.08)
No of persons 16-65 years of age	0.37	0.59	0.26	0.26	0.45	0.29	0.63	0.60	0.74	0.48	0.44	0.61
	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.07)	(0.15)	(0.14)	(0.12)	(0.11)	(0.08)	(0.11)
Constant	-1.83	-2.70	-1.42	-4.38	-3.75	-4.25	-1.42	-0.91	-3.13	-0.52	-0.91	0.46
	(0.68)	(0.71)	(0.74)	(0.62)	(0.61)	(0.53)	(1.03)	(0.98)	(0.90)	(0.70)	(0.58)	(0.74)
Pseudo R-squared	0.08	0.10	0.07	0.19	0.15	0.12	0.22	0.16	0.25	0.20	0.16	0.25
Observations	817	572	699	1,444	1,326	3,115	435	403	638	752	950	860

Notes: All regressions include regional dummies (NUTS 1 level). Robust standard errors are given in parentheses. The dependent variable in a probit model is equal to one if a given household pursues a diversification strategy and is equal to zero if it pursues a relevant specialised strategy.

Source: Own computations based on the annual Household Budget Survey conducted by Poland's Central Statistical Office (CSO).

As a second step, we check whether the estimated propensity score is a balancing function. Table A1 in the Annex provides evidence on how well our matching approach balances distributions of the selected household characteristics across treated and controlled groups.[21] As shown, without matching, the null hypothesis of equal means is rejected for several cases. After matching, differences in means are reduced in most cases and remain significant in only a few cases. This shows that our matching strategy is successful in balancing important household characteristics across comparison groups. Thus, it provides a useful tool in identifying comparable observations, allowing us to design appropriate control groups so that each treated household can be matched with a similar 'control'.

5.2 Main results

Having said that, we now turn to our main contribution and report the estimates of the effect of choosing a given income strategy on the treated households. Table 5 presents the earnings premium of households that rely on diversified income (i.e. combining two income sources including farming) in comparison to four types of specialised rural households. In this table we pool all diversified households in one category and do not distinguish between different combinations of diversified income. Several points are worth mentioning. To start with, it seems that diversified households fare better only than households relying solely on unearned income and this pattern is fairly consistent over the whole period under investigation (see panel D in Table 5). In contrast, and this is the second point to observe, diversified households performed worse than households relying solely on farming (panel A) or self-employment outside agriculture (panel C). Again, these differentials have been quite persistent over time. Moreover, the effects that we document seem to be economically important. Using the averages reported in Table 3, one can calculate that, for instance, the difference between returns from farming and diversified strategy accounts for 3 to 29% of farm households' monthly disposable income per capita, depending on a year. The relative difference between returns from specialising in self-employment and combining farm and off-farm incomes is of similar magnitude. Third, an interesting pattern emerges when one compares diversified households and households specialising in off-farm hired labour (panel B). At first, that is, in the period 1998-2004, which preceded Poland's accession to the EU, we find some evidence suggesting that the latter strategy brought higher remuneration. This appears to have changed after the accession. In years 2005-07, the returns from these two strategies were statistically indistinguishable from each other. To what extent this new pattern is stable remains open, however, as in the last year of our sample specialising in hired off-farm labour again seems to be more profitable. The difference that we document for this last year accounts for 6% of the average monthly disposable per capita income of farm households and is statistically significant at 5% or 10% level, depending on the matching estimator used and the way we calculate standard errors.

To investigate the effect of the year 2005 a bit further, we take a closer look at the pattern reported in panel C (referring to the comparison between diversified households and those relying solely on self-employment outside agriculture). Similarly to what we observe in panel B, starting from 2005, the difference between these two strategies is smaller than in previous years. When we use bootstrapping to calculate standard errors, it is even statistically not distinguishable from zero. These observations are consistent with the argument that among rural households in Poland these were the people related to farming who benefited relatively the most from the country's accession to the EU. This in turn is supposed to be due to funds provided via the Common Agricultural Policy. Our findings cautiously suggest that this effect could also be observed for diversified households whose relative position is improving thanks to a considerable share of income coming from agriculture.

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

Table 5. Estimates of earning differentials (monthly disposable income per capita in PLN): Pooled diversified households (combining two income sources including farming) vs. single-source income strategies

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	Panel A: **Diversified households (combining two income sources including farming) vs. farming**										
ATT11	-31.33	-53.24	-114.41	-246.45	-233.75	-47.48	-69.09	-116.57	-120.71	-160.13	-303.20
	[47.00]	*[40.47]*	*[43.02]*	*[55.42]*	*[59.01]*	*[43.93]*	*[54.65]*	*[47.99]*	*[50.03]*	*[52.52]*	*[70.23]*
	(53.12)	*(54.23)*	*(61.55)*	*(81.91)*	*(68.93)*	*(59.96)*	*(67.56)*	*(61.90)*	*(71.79)*	*(68.44)*	*(95.86)*
ATTllr	1.19	-44.60	-125.31	-164.54	-172.74	-68.35	-52.10	-102.48	-73.08	-204.83	-215.53
	[29.08]	*[30.50]*	*[28.13]*	*[25.66]*	*[28.67]*	*[28.38]*	*[44.14]*	*[30.94]*	*[32.63]*	*[41.46]*	*[45.57]*
	(39.36)	*(39.89)*	*(38.88)*	*(52.45)*	*(45.32)*	*(45.71)*	*(50.58)*	*(40.79)*	*(46.05)*	*(65.12)*	*(67.76)*
	Panel B: **Diversified households (combining two income sources including farming) vs. off-farm income**										
ATT11	-2.64	-52.58	-114.29	-159.18	-72.78	-112.20	-125.01	-37.17	76.73	15.89	-83.50
	[35.68]	*[38.85]*	*[31.89]*	*[37.77]*	*[35.93]*	*[40.13]*	*[41.63]*	*[35.39]*	*[40.76]*	*[35.60]*	*[47.84]*
	(40.71)	*(42.42)*	*(36.46)*	*(59.14)*	*(41.24)*	*(42.44)*	*(46.01)*	*(44.01)*	*(51.56)*	*(46.90)*	*(54.84)*
ATTllr	-15.11	-76.81	-112.31	-158.65	-86.39	-112.01	-100.45	-58.44	57.80	31.67	-79.16
	[29.58]	*[29.87]*	*[27.28]*	*[24.34]*	*[29.43]*	*[29.53]*	*[34.89]*	*[30.86]*	*[34.29]*	*[40.11]*	*[44.58]*
	(32.71)	*(34.17)*	*(31.91)*	*(38.71)*	*(32.04)*	*(29.90)*	*(37.44)*	*(32.40)*	*(38.30)*	*(43.34)*	*(50.31)*
	Panel C: **Diversified households (combining two income sources including farming) vs. self-employment**										
ATT11	-58.26	-213.33	-171.80	-232.88	-300.11	-124.68	-110.82	-66.29	-84.02	-51.19	-127.35
	[43.44]	*[52.86]*	*[44.09]*	*[54.50]*	*[60.20]*	*[43.16]*	*[55.89]*	*[54.56]*	*[50.05]*	*[43.41]*	*[62.72]*
	(65.91)	*(106.86)*	*(60.78)*	*(80.99)*	*(79.34)*	*(64.41)*	*(78.28)*	*(75.47)*	*(74.65)*	*(83.81)*	*(97.86)*
ATTllr	-55.22	-275.08	-181.69	-297.95	-210.85	-153.39	-123.16	-82.41	-98.96	-80.72	-46.44
	[33.56]	*[36.69]*	*[31.39]*	*[37.36]*	*[38.00]*	*[37.51]*	*[39.16]*	*[42.09]*	*[38.26]*	*[40.84]*	*[49.82]*
	(55.99)	*(111.74)*	*(56.76)*	*(73.50)*	*(69.10)*	*(61.02)*	*(73.21)*	*(68.78)*	*(64.26)*	*(77.44)*	*(71.75)*
	Panel D: **Diversified households (combining two income sources including farming) vs. unearned income**										
ATT11	258.38	247.23	216.95	178.72	189.71	172.33	255.34	262.95	414.94	512.19	495.11
	[35.23]	*[34.80]*	*[33.86]*	*[24.79]*	*[34.37]*	*[27.24]*	*[37.71]*	*[35.09]*	*[39.78]*	*[51.53]*	*[43.31]*
	(43.32)	*(40.10)*	*(39.86)*	*(37.41)*	*(37.83)*	*(43.89)*	*(41.65)*	*(39.91)*	*(44.32)*	*(58.07)*	*(56.60)*
ATTllr	268.98	246.19	210.27	181.62	191.27	185.23	232.72	254.73	394.64	488.09	483.45
	[31.80]	*[30.98]*	*[27.54]*	*[24.56]*	*[22.94]*	*[27.88]*	*[34.66]*	*[28.11]*	*[33.58]*	*[41.08]*	*[42.93]*
	(40.26)	*(36.88)*	*(33.55)*	*(30.64)*	*(24.49)*	*(34.22)*	*(39.88)*	*(28.99)*	*(36.94)*	*(47.25)*	*(50.71)*

Notes: Diversified households are all households that combine two income sources (including farming) and their HHI is <= 0.58 (see main text for details). ATT11 = average treatment on the treated nearest neighbour estimator. ATTllr = average treatment on the treated local linear regression estimator. Robust standard errors are clustered by primary sampling unit in brackets. Bootstrapped standard errors (500 replications) are shown in parentheses.

Table 6. Robustness checks to the definition of diversified households. Estimates of earning differentials (monthly disposable income per capita in PLN): Pooled diversified households (combining two income sources including farming) vs. single-source income strategies where the threshold for diversified household is HHI<=0.545

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Panel A: **Diversified households (combining two income sources including farming) vs. farming**										
ATT11	-122.09	-55.96	-189.24	-233.82	-109.59	-22.35	-51.30	-104.46	-73.07	-212.64	-194.44
	[52.92]	[43.57]	[55.22]	[46.99]	[42.31]	[45.27]	[67.51]	[52.84]	[46.92]	[65.93]	[62.64]
	(58.66)	(53.18)	(67.55)	(67.79)	(67.84)	(66.94)	(74.62)	(74.00)	(69.04)	(85.61)	(92.82)
ATTllr	-27.74	-60.36	-154.45	-205.84	-145.52	-82.23	-67.15	-121.43	-99.71	-189.19	-209.40
	[33.02]	[31.17]	[33.16]	[26.98]	[25.05]	[32.07]	[49.18]	[38.39]	[32.49]	[41.07]	[46.66]
	(41.78)	(42.02)	(40.77)	(48.03)	(51.85)	(57.07)	(53.51)	(46.81)	(50.63)	(68.66)	(69.14)
	Panel B: **Diversified households (combining two income sources including farming) vs. off-farm income**										
ATT11	-2.16	-79.72	-51.65	-201.20	-89.10	-111.31	-57.41	-56.60	12.81	15.45	-86.33
	[43.93]	[40.68]	[38.03]	[41.78]	[41.60]	[47.74]	[52.07]	[39.33]	[47.37]	[49.25]	[59.98]
	(48.95)	(45.40)	(44.71)	(52.53)	(50.03)	(53.37)	(54.73)	(38.60)	(49.19)	(59.47)	(69.57)
ATTllr	-16.17	-95.69	-90.89	-200.33	-97.44	-112.44	-99.20	-89.23	22.05	37.23	-59.29
	[32.29]	[30.70]	[34.38]	[28.33]	[32.33]	[34.40]	[43.77]	[36.08]	[32.36]	[43.62]	[49.23]
	(36.28)	(35.84)	(36.18)	(42.31)	(33.40)	(38.37)	(50.91)	(36.49)	(33.56)	(48.63)	(53.78)
	Panel C: **Diversified households (combining two income sources including farming) vs. self-employment**										
ATT11	-10.78	-175.44	-183.34	-254.92	-179.31	-234.02	-162.14	-161.78	-12.80	21.45	33.08
	[52.14]	[54.96]	[52.40]	[54.98]	[59.96]	[51.29]	[66.53]	[70.93]	[64.99]	[48.91]	[77.73]
	(74.64)	(93.95)	(82.51)	(90.33)	(89.51)	(76.80)	(89.34)	(99.32)	(81.09)	(102.51)	(97.41)
ATTllr	-5.84	-200.81	-178.81	-284.06	-175.49	-198.04	-138.47	-111.51	-74.07	-45.43	-35.21
	[40.62]	[44.94]	[40.43]	[45.60]	[40.77]	[45.90]	[49.35]	[54.31]	[40.65]	[53.47]	[62.89]
	(69.19)	(85.91)	(63.41)	(89.76)	(67.09)	(70.46)	(81.75)	(81.97)	(64.14)	(97.49)	(87.64)
	Panel D: **Diversified households (combining two income sources including farming) vs. unearned income**										
ATT11	230.23	176.95	243.25	152.80	200.32	137.99	185.38	253.79	325.11	453.47	541.37
	[44.82]	[40.94]	[42.66]	[32.64]	[35.89]	[45.12]	[46.60]	[32.52]	[34.65]	[52.47]	[60.42]
	(47.47)	(49.98)	(44.50)	(39.33)	(46.27)	(50.88)	(51.59)	(40.21)	(43.27)	(60.81)	(70.19)
ATTllr	245.82	211.27	223.30	138.14	198.70	182.98	206.60	234.73	356.79	452.57	541.57
	[35.43]	[33.49]	[35.55]	[26.27]	[27.46]	[35.18]	[45.67]	[27.49]	[30.88]	[45.99]	[53.25]
	(43.20)	(39.99)	(37.63)	(32.25)	(27.82)	(39.69)	(52.07)	(33.60)	(35.92)	(55.16)	(61.26)

Notes: Diversified households are all households that combine two income sources (including farming) and their HHI is <= 0.545 (see main text for details). ATT11 = average treatment on the treated nearest neighbour estimator. ATTllr = average treatment on the treated local linear regression estimator. Robust standard errors are clustered by primary sampling unit in brackets. Bootstrapped standard errors (500 replications) are shown in parentheses.

To estimate the results from Table 5 that we have just discussed, we defined diversified households as those for which the HHI calculated over their two income sources is smaller or equal to 0.58 (suggesting the less important source of income contributing at least 30% of the total incomes). While this approach ensures that our diversified households have a more or less balanced contribution from both income sources, it may still be criticised as being too broad. Therefore, to test the robustness of our findings, we checked whether our results hold if we adopt a more stringent definition of diversification. More specifically, we re-estimated the specifications from Table 5 using the HHI smaller or equal to 0.545 and the HHI smaller or equal to 0.52. The former results are presented in Table 6, the latter on the other hand, due to space constraints, are not reported.[22] What should be emphasised, however, is that our results are very robust to both of these tests. One thing that might be mentioned in relation to these additional specifications is that, for the last two years covered by our sample (2007 and 2008), the relative advantage of households relying solely on self-employment over diversified households is no longer statistically significant. The relative better performance of households specialising in farming, however, is still very persistent and, compared to the years 2003-2004, it increases following Poland's accession to the EU.

As an additional robustness test (not reported), we checked if our results depend on whether farming is a dominant income source among the two sources used by diversified households. To achieve this we compared remunerations to various income strategies but this time limited our treated group to pooled diversified households for which farming provided at least 50% of income. Overall, this exercise confirms our general conclusions and our results remain qualitatively the same as before. Obviously, the differences between diversified households and households specialising in farming, especially after 2004, were not as big as before.

As a final robustness check of the results presented in Table 5, we broadened the set of covariates used to estimate the propensity score to include as many interactions between independent variables as possible. This is done in order to gain some more credence that our results are obtained without violating the *conditional independence assumption*. Obviously, this strategy is applied only to specifications where we have enough observations so to avoid running into the so-called 'curse of dimensionality' problem. The relevant results are presented in Table A2 in the Annex. Again, with these tests we confirm the robustness of our general conclusions.

In Table 7, we further investigate the patterns documented above and complement them with some additional information. Again our focus is on diversified households for which one source of income is farming. More specifically, instead of pooling all diversified households together, we now look at the relative performance of households pursuing specific combinations of available income sources. In particular, we distinguish households combining farming and hired off-farm income and households combining farming and unearned income. Providing a more detailed picture for households combining farming and self-employment is not possible due to the insufficient number of observations for this category. Each of the diversifying strategies that we can identify is then compared with a relevant specialising strategy, namely: relying solely on off-farm income and relying solely on unearned income, respectively.

[22] These results are not reported for brevity reasons but may be obtained from the authors upon request. The same applies to any other robustness checks that we perform but not present here due to space constraints.

Table 7. Estimates of earning differentials (monthly disposable income per capita in PLN): Various types of diversified income vs. specialised income strategies

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	Panel A: **Diversified households (combining farming and off-farm labour) vs. off-farm labour**										
ATT11	88.54	43.60	101.59	-3.91	104.40	89.22	32.07	27.44	183.13	157.34	96.84
	[39.87]	*[53.92]*	*[45.79]*	*[47.71]*	*[59.95]*	*[36.38]*	*[45.93]*	*[60.20]*	*[59.84]*	*[56.43]*	*[55.03]*
	(46.38)	*(59.21)*	*(54.77)*	*(60.79)*	*(64.45)*	*(51.59)*	*(60.42)*	*(63.68)*	*(58.43)*	*(65.03)*	*(67.59)*
ATTllr	56.46	39.11	72.46	-68.34	40.04	30.58	20.71	24.80	168.17	159.63	49.28
	[31.56]	*[39.03]*	*[35.54]*	*[28.93]*	*[46.06]*	*[34.47]*	*[36.66]*	*[45.64]*	*[44.52]*	*[47.24]*	*[50.59]*
	(36.59)	*(44.22)*	*(34.38)*	*(39.30)*	*(47.53)*	*(38.59)*	*(41.34)*	*(45.94)*	*(47.45)*	*(48.60)*	*(57.58)*
	Panel B: **Diversified households (combining farming and unearned income) vs. unearned income**										
ATT11	8.79	3.18	3.19	65.59	66.27	74.80	47.55	113.16	220.76	236.06	156.39
	[47.38]	*[44.12]*	*[43.36]*	*[37.47]*	*[36.04]*	*[45.51]*	*[49.81]*	*[59.99]*	*[61.18]*	*[57.05]*	*[78.34]*
	(57.37)	*(53.95)*	*(49.48)*	*(51.47)*	*(45.62)*	*(52.57)*	*(68.39)*	*(60.22)*	*(68.22)*	*(80.95)*	*(79.34)*
ATTllr	20.83	48.53	26.54	56.94	33.62	68.20	45.85	121.24	221.61	233.86	185.63
	[35.79]	*[37.68]*	*[30.78]*	*[37.03]*	*[31.51]*	*[35.05]*	*[42.81]*	*[42.12]*	*[55.54]*	*[53.56]*	*[61.86]*
	(47.39)	*(41.78)*	*(30.71)*	*(42.48)*	*(38.84)*	*(39.68)*	*(48.49)*	*(45.69)*	*(56.25)*	*(69.84)*	*(73.34)*

Notes: Diversified hh as defined in the title for each panel. The HHI threshold is <=0.58 (see main text for details). ATT11 = average treatment on the treated nearest neighbour estimator. ATTllr = average treatment on the treated local linear regression estimator. Robust standard errors are clustered by primary sampling unit in brackets. Bootstrapped standard errors (500 replications) are presented in parentheses.

Table 8. Earning differentials: Diversified households using farming vs. diversified households combining two off-farm income sources

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Panel A: **Diversified households combining two income sources including farming (pooled) vs. diversified households combining two off-farm income sources (pooled)**											
ATT11	-2.97	-56.81	-39.26	-92.43	-71.39	-88.01	6.50	4.63	43.39	65.88	-34.43
	[29.80]	*[28.85]*	*[25.90]*	*[31.54]*	*[21.86]*	*[30.47]*	*[33.30]*	*[32.84]*	*[35.80]*	*[36.66]*	*[42.72]*
	(39.11)	*(37.62)*	*(33.69)*	*(51.00)*	*(35.56)*	*(35.83)*	*(43.65)*	*(41.93)*	*(34.94)*	*(46.72)*	*(47.46)*
ATTllr	-7.39	-33.14	-33.87	-96.74	-57.29	-76.31	-50.71	13.08	46.39	63.78	-36.64
	[22.88]	*[23.87]*	*[19.64]*	*[22.88]*	*[16.94]*	*[22.96]*	*[25.31]*	*[24.16]*	*[24.05]*	*[33.45]*	*[34.78]*
	(36.16)	*(32.83)*	*(25.27)*	*(34.84)*	*(26.35)*	*(30.65)*	*(31.09)*	*(31.94)*	*(31.36)*	*(36.07)*	*(44.56)*
Panel B: **Diversified households combining farming and hired off-farm labour vs. diversified households combining two off-farm income sources (pooled)**											
ATT11	43.81	81.71	116.19	47.54	76.82	68.17	-93.92	87.25	202.07	195.67	62.70
	[50.45]	*[48.06]*	*[54.92]*	*[47.48]*	*[56.59]*	*[69.82]*	*[74.79]*	*[59.72]*	*[53.42]*	*[68.62]*	*[80.97]*
	(68.73)	*(62.29)*	*(55.80)*	*(52.39)*	*(71.12)*	*(64.77)*	*(85.52)*	*(68.68)*	*(65.12)*	*(72.08)*	*(98.74)*
ATTllr	63.43	104.22	139.61	-7.45	62.48	69.61	72.96	74.94	211.39	238.13	110.56
	[36.83]	*[41.83]*	*[41.34]*	*[27.52]*	*[40.00]*	*[33.75]*	*[39.22]*	*[44.22]*	*[42.86]*	*[48.45]*	*[49.25]*
	(44.99)	*(50.82)*	*(44.07)*	*(46.13)*	*(49.29)*	*(42.29)*	*(45.49)*	*(45.97)*	*(49.00)*	*(47.26)*	*(70.89)*
Panel C: **Diversified households combining farming and unearned income vs. diversified households combining two off-farm income sources (pooled)**											
ATT11	-199.81	-153.07	-234.46	-243.52	-134.07	-153.26	-116.47	-133.55	-64.89	-27.10	-283.88
	[71.07]	*[42.07]*	*[38.68]*	*[61.45]*	*[48.47]*	*[43.18]*	*[49.50]*	*[68.13]*	*[52.92]*	*[60.58]*	*[81.47]*
	(85.79)	*(56.68)*	*(51.84)*	*(75.56)*	*(59.35)*	*(55.05)*	*(64.06)*	*(76.24)*	*(65.18)*	*(74.46)*	*(91.78)*
ATTllr	-199.17	-209.84	-209.66	-222.11	-203.39	-178.24	-175.68	-134.03	-98.43	-64.28	-298.89
	[47.18]	*[31.56]*	*[29.00]*	*[39.41]*	*[38.42]*	*[34.03]*	*[42.59]*	*[42.63]*	*[49.92]*	*[56.46]*	*[58.32]*
	(60.85)	*(39.51)*	*(30.51)*	*(45.62)*	*(49.10)*	*(48.88)*	*(54.09)*	*(54.16)*	*(55.75)*	*(68.08)*	*(73.58)*

Note: Diversified hh as defined in the title for each panel. The HHI threshold is <=0.58 (see main text for details). ATT11 = average treatment on the treated nearest neighbour estimator. ATTllr = average treatment on the treated local linear regression estimator. Robust standard errors are clustered by primary sampling unit in brackets. Bootstrapped standard errors (500 replications) are presented in parentheses.

Overall, these new results (reported in Table 7) are consistent with those presented in Table 5 and provide some support that what we uncovered above was not a mere coincidence. More specifically, as shown in panel B, our evidence suggests that households adopting a diversification strategy based on combining farming and unearned income performed better than otherwise similar households relying solely on unearned income. This finding is fully in line with the picture emerging from earlier comparisons when our treated group consisted of pooled diversified households. In contrast, compared to our previous results, we get a slightly different perspective when we look at diversified households that combine farming with hired off-farm labour. In this case (panel A), we no longer find that households relying solely on hired-off farm performed better than those combining two income sources prior to Poland's accession to European Union. If any difference is statistically significant, it rather suggests that the diversifying strategy was more profitable. As before, we test whether these results remain stable to different matching estimators, and using ways to calculate standard errors we verify whether they are robust to these checks. We also test if these findings are robust to the HHI threshold used to define diversifying households. Due to data limitations, however, the only alternative threshold that we are able to use in this case is HHI<=0.545. For using the threshold 0.52, we have too few observations. Our results (not reported) are robust to this check.

Further, we leave specialisation strategies aside and highlight the main differences between diversification strategies including farming and diversification strategies based on two non-farm incomes. The relevant results are presented in Table 8. In panel A, we compare two pooled categories (all households with two income sources including farming vs. all households with two income sources without farming). The pattern that emerges from the data again is consistent with what we observed earlier, regardless of the matching algorithm that we use. More specifically, initially, diversified households having at least 30% of income from farming performed worse than otherwise similar households combining two non-agricultural income sources. Starting from 2004, however, the difference between remuneration from strategies adopted by these two types of households has vanished. As before, we confirm this result by estimating additional specifications with HHI thresholds smaller or equal to 0.545 or 0.52 (not reported). To uncover this relationship further, in panels B and C, we provide some estimates where diversified households having income from farming are decomposed into more detailed categories: farming and hired off-farm labour; and farming and unearned income. As a comparison group, we use the pooled group of all households combining two income sources but having no income from farming. The evidence that we report suggests that combining farming and hired off-farm labour provided similar returns as having two non-farm incomes until 2005 and higher returns afterwards.[23] On the other hand, combining farming and unearned income seems to have been less profitable than combining two non-farm incomes, practically speaking, over the whole period under study.

Although interesting, the results presented above can be questioned as they are based on reported household income. It is often argued that publicly collected data do not cover all income sources because of Poland's still large shadow economy, especially in rural areas. In our case the data do not contain any information on sources of income that are illegal. It might be argued that respondents could have tried to hide income sources that are not officially declared and that our estimates are therefore biased. Therefore, in order 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 quite precise information on household total spending, which is difficult to manipulate as it is constructed by summing up daily expenditures. The results of this robustness check (not reported) generally confirm our earlier findings. Obviously, these results cannot be identical to those based on earnings, as households might differ in their savings and investment

[23] For 2008, however, these results are slightly less robust as the difference between these strategies, although being positive, is statistically significant only in specifications using a local linear regression estimator.

behaviour, experience different prices, farmers might consume some of their own products, etc. Nevertheless, they show that on average diversifying households spend more than households relying solely on unearned income, have similar levels of spending as households relying on hired off-farm labour and spend less than households relying on self-employment outside agriculture. Interestingly, however, we do not find such big differences in spending between diversifying households and farmers, which stands out from our earlier results. That said, these tests lead us to conclude that our earlier findings are quite robust.

Overall, we conclude that in the period 1998-2008 households that combined two income sources, one of which was farming, performed worse than otherwise similar households but specialised in farming or households relying solely on self-employment outside agriculture. Until 2005, diversified households also fare worse when compared to otherwise similar households but specialising in hired off-farm labour. This pattern, however, has been reversed since 2005. It seems plausible to assume that this change could be attributed to Poland's joining the EU and benefiting from the Common Agricultural Policy. What should be clearly stated, however, is that further investigation into this phenomenon is needed.

Our results may provide some arguments into the debate about a relatively modest success of measures aimed at promoting income diversification in rural areas in Poland. In fact, they show, especially for the period preceding Poland's accession to the EU, that diversifying households had lower incomes than otherwise similar households specialised in alternative occupations. Note that these results may also serve as an explanation of the more general pattern of agricultural labour adjustment sketched out from a more macroeconomic perspective (Dries & Swinnen, 2002; Swinnen et al., 2005). We provide evidence that shifting towards family farms during transition, a phenomenon observed at a macro level, had strong micro foundations in terms of financial returns. Our results also complement earlier studies on barriers to off-farm diversification (Chaplin et al., 2004). While these studies show that moving outside agriculture was hampered by low human capital and remote location, we argue that there might have been no financial incentive for this shift to happen.

6. Conclusions

It is generally believed that economic diversification of rural areas may contribute to more efficient resource allocation and help reduce poverty. This belief provides the rationale for encouraging farm households to diversify outside agriculture. While this resulted in a considerable share of public funds devoted to rural areas being spent to promote off-farm employment and the establishment of non-agricultural enterprises, our understanding of the incentives of farm households to combine farming with some non-agricultural activities remains limited. One of the main question, obviously, is how remuneration derived from combining farm and off-farm incomes compares to other strategies.

In this paper, we took a closer look at this issue by examining an extensive dataset from Poland spanning 1998-2008. We focus on rural households with two income sources, one of which is farming, and compare them to households with a single income source and households with two income sources but not involved in agriculture. In theory, diversification could provide an attractive alternative to other income strategies as rural households may still use their agricultural assets while also pursuing profitable off-farm employment. Drawing on the propensity score matching method, we demonstrated, however, that in rural Poland returns from diversification are lower than those from farming. In general, our evidence suggests that they were also lower than returns from relying solely on self-employment outside agriculture. In contrast, our results indicate that diversification is preferable in comparison to relying on unearned income (social allowances) and, especially after Poland joined the EU in 2004, comparable or preferable to specialising in hired-off farm employment. Similarly, starting from 2005-06, incomes in rural households relying on combined farm and off-farm income were comparable to incomes in households combining two off-farm incomes. That said, detailed analysis shows that important differences occur between various types of diversified households. For instance, households combining

farming and unearned income were relatively worse off than those combining farming and hired off-farm employment. In fact, households pursuing strategies based, at least to some extent, on unearned income performed worse than those relying on other strategies.

Overall, our results cautiously suggest that over the period 1998-2008 farmers in Poland may have lacked financial incentives to (partly) quit agriculture. This is because households relying solely on farming performed better than otherwise similar households combining farm and off-farm incomes. This obviously should be seen against the caveat that our dataset does not allow us to observe a given household shifting from one income strategy to the other. In effect, we have to rely on comparisons between similar but not the same households. Future investigations using panel data with observations for households changing their rural occupations could shed more light on this issue.

Furthermore, the relative improvement in the performance of households partly or fully involved in agriculture observed around the year 2004, that is, the time when Poland joined the EU, is in line with arguments stating that in rural areas these were mainly farmers who benefited from the accession. One may assume that this effect could be attributed to the Common Agricultural Policy funds. Whether this is indeed the case, however, and what are the exact transmission mechanisms through which this effect may happen are interesting areas for future research.

Other potential extensions of our approach include, for instance, more careful examination of where the non-agricultural activities take place (whether in domicile/in town/abroad). Similarly, a closer look at wage employment could allow us to include a distinction between agricultural and non-farm wage employment.

References

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

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

Barrett, C.B., T. Reardon and P. Webb (2001), "Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications", *Food Policy* 26: 315–331.

Barry, P.J. and L. Robinson (2001), "Agricultural finance: credit, credit constraints, and consequences", in B.L. Gardner and G.C. Rausser (eds), *Handbook of Agricultural Economics* 1A, Amsterdam: Elsevier, 513–571.

Benjamin, C. (1994), "The Growing Importance of Diversification Activities for French Farm Households", *Journal of Rural Studies* 10(4): 331–342.

Blundell, R. and M. Costa Dias (2008), "Alternative Approaches to Evaluation in Empirical Microeconomics", IZA Discussion Paper No. 3800, Institute for the Study of Labour, Bonn.

Błąd, M. (2006), "Dywersyfikacja ekonomiczna wsi", in J. Wilkin and I. Nurzyńska (eds), *Polska Wieś 2006*, Warszawa: FDPA, 75–86.

Buchenrieder, G., M. Kirk and B. Knerr (eds) (2004), *Poverty impacts and policy options of non-farm rural employment*, Weikersheim, D: Margraf Verlag.

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

Caliendo, M. and S. Kopeinig (2008), "Some Practical Guidance for the Implementation of Propensity Score Matching", *Journal of Economic Surveys* 22(1): 31–72.

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

–––––––– (2007), "Impediments to the Diversification of Rural Economies in Central and Eastern Europe: Evidence from Small-scale Farms in Poland", *Regional Studies* 41(3): 361–376.

CSO (Polish Central Statistical Office) (1999), "Metodyka badania budżetów gospodarstw domowych", Warszawa, GUS.

–––––––– (2013), "Sytuacja społeczno-ekonomiczna gospodarstw domowych w latach 2000-2011. Zróżnicowanie miasto-wieś", Warszawa, GUS.

Deininger, K. and G. Feder (2001), "Land institutions and land markets", in B.L. Gardner and G.C. Rausser (eds), *Handbook of Agricultural Economics* 1A, Amsterdam: Elsevier, 288–331.

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

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

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

Ellis, F. (2000), *Rural Livelihoods and Diversity in Developing Countries*, Oxford: Oxford University Press.

European Commission (2011), "Rural Development in the European Union. Statistical and Economic Information. Report 2011", Directorate-General for Agriculture and Rural Development.

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

Grootaert, C. (1998), "Social capital: The missing link?", Social Capital Initiative Working Paper No. 3/1998, World Bank, Washington, D.C.

Haggblade, S., P. Hazell and T. Reardon (2010), "The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction", *World Development* 38 (10): 1429–1441.

Hazell, P. and S. Haggblade (1990), "Rural-urban growth linkages in India", PRE Working Paper No. 430, Agriculture and Rural Development Department, World Bank, Washington, D.C.

Heckman, J.J., H. Ichimura and P. Todd (1997), "Matching as an Econometric Evaluation Estimator: Evidence From Evaluating a Job Training Program", *The Review of Economic Studies* 64 (4): 605–654.

Henningsen, A. (2009), "Why is the Polish farm sector still so underdeveloped?", *Post-Communist Economies* 21(1): 47–64.

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

Jackman, R. (1994), "Economic Policy and Employment in the Transition Economies of Central and Eastern Europe: What Have We Learned?", *International Labour Review* 133(3): 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: 287–314.

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

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

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

–––––––– (1996), "Demographic Composition of Farm Households and its Effects on Time Allocation", *Journal of Population Economics* 9: 429–429.

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

Koenker, R. and G. Basset (1978), "Regression Quantiles", *Econometrica* 46(1): 33–50.

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

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

Lass, D.A., J.L. Findeis and M.C. Hallberg (1991), "Factors Affecting the Supply of Off-farm Labor: A Review of Empirical Evidence", in M.C. Hallberg, J.L. Findeis and D.A. Lass (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: Oxford University Press.

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

Lerman, Z. and P. Schreinemachers (2005), "Individual farming as a labour sink: evidence from Poland and Russia", *Comparative Economic Studies*, 47(4): 675–695.

Lerman, Z., E. Serova and D. Zvyagintsev (2008), "Diversification of Rural Incomes and Non-Farm Rural Employment: Survey Evidence from Russia", *Journal of Peasant Studies* 35(1): 60–79.

Macours, K. and J.F.M. Swinnen (2005), "Agricultural Labour Adjustments in Transition Countries: The Role of Migration and Impact on Poverty", *Review of Agricultural Economics* 27(3): 405–411.

–––––––– (2008), "Rural-Urban Poverty Differences in Transition Countries", *World Development* 36(11): 2170–2187.

Möllers, J., J. Fritzsch and G. Buchenrieder (2008), "Farm and non-farm incomes of rural households in Slovenia. A Canonical correlation analysis", *The South East European Journal of Economics and Business* 3(2): 39–48.

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

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

Ramniceanu, I. and R. Ackrill (2007), "EU rural development policy in the new member states: Promoting multifunctionality?", *Journal of Rural Studies* 23: 416–429.

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

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

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

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

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

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

Samuelson, P.A. (1967), "General proof that diversification pays", *Journal of Financial and Quantitative Analysis* 2: 1–13.

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).

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

Smith, J. and P. Todd (2005), "Does Matching Overcome LaLonde's Critique of Nonexperimental Estimation?", *Journal of Econometrics* 125(1-2): 305–353.

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

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

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

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

Winters, P., T. Essam, A. Zezza, B. Davis and C. Carletto (2010), "Patterns of Rural Development: A Cross-Country Comparison using Microeconomic Data", *Journal of Agricultural Economics* 61(3): 628–651.

Annex

Table A1. Distribution of selected covariates across treated and control households (one-to-one matching) – 1998, 2003 and 2008

		Diversified hh vs. farming		**Diversified hh vs. off-farm labour**		**Diversified hh vs. self-employment**		**Diversified hh vs. unearned**	
Year		**1998**							
Variable		Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control
Age	Unmatched	43,608*	45,429	43,608*	41,644	43,608	42,420	43,608	44,167
	Matched	43,802	43,914	43,327	42,794	42,538*	40,169	44,069	45,332
Gender	Unmatched	1,259 *	1,135	1,259	1,254	1,259	1,204	1,259*	1,424
	Matched	1,202	1,179	1,258	1,278	1,236	1,246	1,276	1,276
Gender ratio	Unmatched	1,190	1,159	1,190	1,141	1,190	1,123	1,190*	0,858
	Matched	1,196	1,128	1,181	1,214	1,126	1,177	1,111	1,155
Higher education	Unmatched	0,025*	0,004	0,025*	0,087	0,025	0,045	0,025	0,008
	Matched	0,000*	0,016	0,028	0,028	0,031	0,005	0,026	0,030
Secondary education	Unmatched	0,036	0,022	0,036	0,043	0,036	0,064	0,036	0,038
	Matched	0,031	0,019	0,036	0,036	0,051	0,051	0,034	0,052
Secondary vocational educ.	Unmatched	0,137	0,100	0,137*	0,208	0,137*	0,274	0,137*	0,087
	Matched	0,136	0,132	0,149	0,169	0,149	0,113	0,121	0,082
Vocational education	Unmatched	0,403	0,421	0,403	0,455	0,403	0,484	0,403	0,409
	Matched	0,416	0,424	0,415	0,335	0,456	0,549	0,392	0,397
Other hh member educ. same as hh head	Unmatched	0,417	0,469	0,417	0,408	0,417	0,395	0,417	0,424
	Matched	0,428	0,447	0,419	0,403	0,426	0,390	0,422	0,440
Other hh member educ. better than hh head	Unmatched	0,169	0,199	0,169*	0,239	0,169	0,242	0,169*	0,327
	Matched	0,156	0,152	0,169	0,194	0,200	0,174	0,194	0,177
Number of people below 15 years old	Unmatched	1,266*	1,115	1,266*	0,768	1,266	1,159	1,266*	1,546
	Matched	1,226	1,245	1,065	1,173	1,246	1,415	1,323	1,332
Number of people between 15 and 65 years old	Unmatched	3,043	2,703	3,043*	2,810	3,043*	2,573	3,043*	2,354
	Matched	2,973	2,914	2,980	3,109	2,821	2,815	2,910	2,970

Notes: Diversified households refer to households combining two income sources where one of them is farming and the HHI<=0.58 (see main text for the details). Diversified households comprise our treated group, whereas specialised households comprise a control group.

* Denotes significantly different means at the 5% level between observations from the unmatched (matched) treatment group and from the unmatched (matched) control group in a t-test.

Table A1. continued - 2003

		Diversified hh vs. farming		**Diversified hh vs. off-farm labour**		**Diversified hh vs. self-employment**		**Diversified hh vs. unearned**	
Year		**2003**							
Variable		Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control
Age	Unmatched	44,212	45,612	44,047	43,104	44,047	42,397	44,047	45,486
	Matched	44,570	44,650	43,991	45,200	43,227	43,968	44,158	44,548
Gender	Unmatched	1,244*	1,127	1,257	1,288	1,257	1,240	1,257*	1,463
	Matched	1,182	1,164	1,268	1,319	1,243	1,227	1,274	1,220
Gender ratio	Unmatched	1,186	1,240	1,175	1,140	1,175	1,190	1,175*	0,948
	Matched	1,215	1,208	1,175	1,303	1,212	1,203	1,154	1,232
Higher education	Unmatched	0,000	0,000	0,027*	0,121	0,027*	0,068	0,027	0,017
	Matched	0,000	0,000	0,030	0,034	0,027	0,016	0,029	0,017
Secondary education	Unmatched	0,056*	0,009	0,054	0,051	0,054	0,082	0,054	0,043
	Matched	0,009	0,019	0,055	0,098	0,059	0,027	0,058	0,075
Secondary vocational educ.	Unmatched	0,132	0,093	0,128*	0,235	0,128*	0,301	0,128	0,137
	Matched	0,117	0,122	0,140	0,136	0,146	0,195	0,124	0,091
Vocational education	Unmatched	0,528	0,519	0,514*	0,435	0,514	0,445	0,514*	0,420
	Matched	0,565	0,500	0,515	0,494	0,573	0,514	0,506	0,515
Other hh member educ. same as hh head	Unmatched	0,364	0,401	0,354	0,399	0,354	0,445	0,354	0,397
	Matched	0,393	0,369	0,366	0,340	0,373	0,373	0,361	0,402
Other hh member educ. better than hh head	Unmatched	0,180	0,134	0,202	0,241	0,202	0,205	0,202*	0,274
	Matched	0,140	0,131	0,200	0,204	0,200	0,173	0,203	0,199
Number of people below 15 years old	Unmatched	1,104	0,981	1,101*	0,688	1,101	1,096	1,101	1,178
	Matched	1,112	1,136	0,996	0,919	1,060	1,049	1,100	1,046
Number of people between 15 and 65 years old	Unmatched	3,204*	2,761	3,191*	2,791	3,191*	2,630	3,191*	2,605
	Matched	3,023	3,079	3,081	3,094	2,946	2,968	3,116	3,075

Notes: Diversified households refer to households combining two income sources where one of them is farming and the HHI<=0.58 (see main text for the details). Diversified households comprise our treated group, whereas specialised households comprise a control group.

* Denotes significantly different means at the 5% level between observations from the unmatched (matched) treatment group and from the unmatched (matched) control group in a t-test.

Table A1. continued - 2008

		Diversified hh vs. farming		**Diversified hh vs. off-farm labour**		**Diversified hh vs. self-employment**		**Diversified hh vs. unearned**	
Year		**2008**							
Variable		Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control	Mean Treated	Mean Control
Age	Unmatched	47,219	47,683	47,219*	44,841	47,219*	44,157	47,219*	49,283
	Matched	47,216	47,068	47,120	47,083	46,259	46,223	47,677	46,449
Gender	Unmatched	1,231*	1,167	1,231*	1,283	1,231	1,193	1,231*	1,493
	Matched	1,192	1,199	1,237	1,215	1,191	1,211	1,253	1,263
Gender ratio	Unmatched	1,237	1,237	1,237*	1,156	1,237*	1,093	1,237*	0,914
	Matched	1,265	1,212	1,239	1,253	1,233	1,155	1,229	1,147
Higher education	Unmatched	0,051*	0,008	0,051*	0,115	0,051*	0,115	0,051*	0,019
	Matched	0,007	0,014	0,052	0,055	0,048	0,052	0,039	0,025
Secondary education	Unmatched	0,027	0,036	0,027*	0,066	0,027*	0,092	0,027	0,046
	Matched	0,027	0,034	0,028	0,025	0,036	0,036	0,028*	0,077
Secondary vocational educ.	Unmatched	0,183	0,205	0,183*	0,246	0,183*	0,321	0,183	0,173
	Matched	0,195	0,212	0,188	0,188	0,211	0,199	0,158*	0,088
Vocational education	Unmatched	0,514	0,530	0,514*	0,447	0,514*	0,423	0,514*	0,425
	Matched	0,545	0,500	0,511	0,532	0,542	0,574	0,512	0,593
Other hh member educ. same as hh head	Unmatched	0,297*	0,426	0,297*	0,370	0,297*	0,393	0,297	0,338
	Matched	0,315	0,332	0,305	0,258	0,319	0,251	0,309	0,312
Other hh member educ. better than hh head	Unmatched	0,117	0,148	0,117*	0,208	0,117*	0,223	0,117*	0,306
	Matched	0,099	0,106	0,120	0,142	0,131	0,139	0,126	0,130
Number of people below 15 years old	Unmatched	0,916	0,765	0,916*	0,730	0,916	0,879	0,916	0,884
	Matched	0,849	0,873	0,865	0,788	0,880	0,817	0,902	0,895
Number of people between 15 and 65 years old	Unmatched	3,126*	2,839	3,126*	2,756	3,126*	2,495	3,126*	2,406
	Matched	3,051	2,962	3,108	3,132	2,932	2,984	3,000	2,902

Notes: Diversified households refer to households combining two income sources where one of them is farming and the HHI<=0.58 (see main text for the details). Diversified households comprise our treated group, whereas specialised households comprise a control group.

* Denotes significantly different means at the 5% level between observations from the unmatched (matched) treatment group and from the unmatched (matched) control group in a t-test.

Table A2. Robustness test to including interaction terms in the set of covariates. Estimates of earning differentials (monthly disposable income per capita in PLN): Pooled diversified households (combining two income sources including farming) vs. single-source income strategies

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	Panel A: **Diversified households (combining two income sources including farming) vs. farming**										
ATT11	36.91	-74.67	-95.91	-139.61	-203.76	-126.25	-45.80	-102.35	-53.13	-249.70	-318.49
	[43.73]	*[42.76]*	*[48.09]*	*[58.60]*	*[43.83]*	*[36.07]*	*[38.44]*	*[43.89]*	*[47.36]*	*[51.42]*	*[62.57]*
ATTllr	-7.47	-44.90	-123.21	-172.43	-189.97	-92.60	-65.96	-125.52	-54.59	-222.59	-284.30
	[30.15]	*[29.85]*	*[27.36]*	*[27.25]*	*[26.19]*	*[27.24]*	*[37.85]*	*[32.94]*	*[32.92]*	*[37.01]*	*[39.02]*
	Panel B: **Diversified households (combining two income sources including farming) vs. off-farm income**										
ATT11	-22.29	-24.59	-136.66	-254.54	-95.01	-100.53	-59.54	-11.86	40.59	39.13	-73.41
	[37.02]	*[34.81]*	*[27.20]*	*[37.04]*	*[39.07]*	*[42.35]*	*[43.28]*	*[39.31]*	*[37.75]*	*[40.34]*	*[61.20]*
ATTllr	-14.16	-72.69	-100.56	-183.56	-87.25	-103.55	-76.49	-46.30	47.52	35.92	-72.76
	[28.94]	*[30.77]*	*[27.01]*	*[23.12]*	*[29.87]*	*[30.24]*	*[35.46]*	*[31.34]*	*[32.21]*	*[40.76]*	*[45.98]*
	Panel C: **Diversified households (combining two income sources including farming) vs. self-employment**										
ATT11	15.79	-239.90	-171.76	-297.14	-198.09	-144.88	-198.52	-123.39	-101.95	-59.49	10.15
	[48.67]	*[57.76]*	*[43.69]*	*[55.68]*	*[52.48]*	*[54.62]*	*[62.55]*	*[45.92]*	*[67.90]*	*[57.78]*	*[58.98]*
ATTllr	-5.72	-240.92	-191.34	-250.88	-242.46	-181.41	-258.58	-148.66	-98.26	-85.21	7.15
	[42.09]	*[43.51]*	*[33.93]*	*[30.23]*	*[34.48]*	*[35.89]*	*[51.62]*	*[30.46]*	*[41.53]*	*[50.48]*	*[54.97]*
	Panel D: **Diversified households (combining two income sources including farming) vs. unearned income**										
ATT11	259.53	237.90	253.16	185.19	215.46	219.77	204.48	235.04	374.50	427.67	546.76
	[35.47]	*[35.55]*	*[30.27]*	*[24.37]*	*[25.80]*	*[38.70]*	*[46.36]*	*[32.06]*	*[35.07]*	*[53.74]*	*[47.13]*
ATTllr	247.21	238.84	237.48	185.57	187.64	224.84	226.97	235.34	390.28	455.49	518.41
	[29.37]	*[30.34]*	*[28.61]*	*[24.22]*	*[23.13]*	*[28.80]*	*[34.71]*	*[23.84]*	*[33.05]*	*[44.60]*	*[43.82]*

Notes: Diversified households are all households that combine two income sources (including farming) and their HHI is <= 0.58 (see main text for details). ATT11 = average treatment on the treated nearest neighbour estimator. ATTllr = average treatment on the treated local linear regression estimator. Robust standard errors are clustered by primary sampling unit in brackets.

Comparative Analysis of Factor Markets for Agriculture across the Member States

245123-FP7-KBBE-2009-3

The Factor Markets project in a nutshell

Title	Comparative Analysis of Factor Markets for Agriculture across the Member States
Funding scheme	Collaborative Project (CP) / Small or medium scale focused research project
Coordinator	CEPS, Prof. Johan F.M. Swinnen
Duration	01/09/2010 – 31/08/2013 (36 months)
Short description	Well functioning factor markets are a crucial condition for the competitiveness and growth of agriculture and for rural development. At the same time, the functioning of the factor markets themselves are influenced by changes in agriculture and the rural economy, and in EU policies. Member state regulations and institutions affecting land, labour, and capital markets may cause important heterogeneity in the factor markets, which may have important effects on the functioning of the factor markets and on the interactions between factor markets and EU policies. The general objective of the FACTOR MARKETS project is to analyse the functioning of factor markets for agriculture in the EU-27, including the Candidate Countries. The FACTOR MARKETS project will compare the different markets, their institutional framework and their impact on agricultural development and structural change, as well as their impact on rural economies, for the Member States, Candidate Countries and the EU as a whole. The FACTOR MARKETS project will focus on capital, labour and land markets. The results of this study will contribute to a better understanding of the fundamental economic factors affecting EU agriculture, thus allowing better targeting of policies to improve the competitiveness of the sector.
Contact e-mail	info@factormarkets.eu
Website	www.factormarkets.eu
Partners	17 (13 countries)
EU funding	1,979,023 €
EC Scientific officer	Dr. Hans-Jörg Lutzeyer