Land ownership and use of pesticides. Evidence from the Mekong Delta

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Land Ownership and Use of Pesticides. Evidence from the Mekong Delta

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Abstract

Massive use of pesticides is one of the major environmental problems in developing countries. I analyse the correlation between land ownership and use of pesticides in the Mekong Delta. Landowners may either use more or less pesticides than renters do. Indeed, pesticides increase land productivity in the short run, while decrease it in the long run. Therefore landowners trade-off immediate and future profits, which include also the value of the land that depends on its productivity. Differently from the extant literature this paper does not consider simply land ownership, but the share of the total land cultivated by the household that the household itself owns. Using data from the World Bank covering 603 farmer households in the Mekong Delta, this paper shows that as the share of cultivated land owned increases, so does the quantity of pesticides used. Policy recommendations may be derived: the governments of developing countries should strengthen their efforts to sensitise and to educate the owners of small farms to use agrochemicals correctly.

Keywords: use of pesticides, land ownership, Mekong Delta

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1. Introduction

Pesticides are harmful both for the environment and for the health of human beings. In 2007 about 5.2 billion pounds of pesticides have been used worldwide[1]. The use of these chemical products has been growing during the last decades especially in developing countries, although also medium and high-income countries have not succeeded to reduce their use (Schreinemachers and Tipraqsa, 2012). In several developing countries land reforms and the growth of the income in rural regions have rendered pesticides affordable; these processes add to the poor education and to the lack of specific training and lead to overuse these chemicals (Dasgupta et al., 2007a). Moreover, the increase of the cultivated areas in developing countries has rendered water for irrigation scarcer than before and, as Cai et al. (2008) show, when the water for irrigation is rationalised, the use of agrochemicals (including pesticides) increases to maintain (or even raise) the levels of production[2].

The Mekong Delta (southern Vietnam) is one of the most densely cultivated areas in the world and a region where the use of pesticides is massive and poorly monitored by the public authorities (Toan et al., 2013), in spite of the concerns of the government and its efforts to promote integrated pest management techniques (Rejesus et al., 2009). In this area, Vietnam produces more than one-half of its entire production of rice (that amounted to 45 million tonnes in 2014[3], making Vietnam the second largest exporter of rice in the world), the most important crop in the Vietnamese diet. The intensive use of the land for agricultural purposes entails massive use of chemical products, including pesticides. Moreover, the concentration of paddies and the capillary canalisation of the area contribute to increase the contamination of water and land. Stampini and Davis (2009) show that the Vietnamese farmers spend part of the additional income from their non-agricultural activities to increase the quantity of inputs employed in the production. In particular, they increase the use of chemicals, reducing that of natural products. The aim of this paper is to investigate the association between the share of cultivated land owned by a household and the quantity of pesticides employed, with particular attention paid to reductions in their use. The Vietnamese transition from a planned to a market economy started in the late Seventies with the so-called *Doi Moi* (literally "renovation") entailed massive

[1] Source: U.S. Environmental Protection Agency. The data for 2007 are the last available.

[2] Actually, Karagiannis and Tzouvelekas (2012) argue that an intensive use of pesticides reduces the total factor productivity of farms.

[3] Source: FAO

land redistributions from collective farms to individual farmers. In the southern regions, characterised by high land ownership concentration before the reunification of the country, collectives were actually never formed (Pingali and Xuan, 1992), but the process of socialisation first, and the *Doi Moi*[4] then operated a redistribution from large estates to smaller properties. As a result, many Vietnamese farmers become owners of small cultivable parcels (generally smaller than 10 ha). In principle, this process was to redistribute land to households according to the number of members in each household (Do and Iyer, 2008). Nevertheless, Deininger and Jin (2008) show that, in some cases, the parcels resulting from this redistribution are insufficient to provide the households with a subsistence output. Therefore, several farmers rent land to increase their production, and the share of rented land has been raising over time, supported by efficient credit markets.

The paper aims at inquiring whether land ownership correlates with increasing or decreasing use of pesticides. The main results of the analysis show that the farmers tend to increase the use of pesticides, especially when they own a substantial share of the land that they cultivate. In section 2, I also present the reasons, which may explain why landowners could (or should), increase or decrease the use of chemicals (and of pesticides in particular). These results are based on 603 farmer households in the Mekong Delta; the data were collected by the World Bank and are publicly available on the website of this institution. The analysis was conducted using econometric techniques that are standard in the field of the microeconomics of development.

The results shown in this work contribute to the extant literature in two ways. First, only few studies have so far investigated the relationship between land ownership and use of pesticides and all these studies measure land ownership through a dummy variable, which takes value 1 if the household owns any land (either a small fraction or the totality of the cultivated fields). In this paper, I use a more sophisticated measure of land ownership that allows for evaluating whether the use of pesticides increases with the share of cultivated land owned. As the results show a positive association between this variable and the quantity of pesticides used, they highlight a systematic difference in the impact of rented and owned land on pesticide employment. A second contribution is to offer empirical evidence to a debated theoretical

[4] "Renovation" in Viet. This is the name of the process of transition from a planned to a market economy, started in Vietnam in the early Nineties. On the implementation of the Doi Moi and on its different effects in urban and rural areas, see Beresford (2008), Do and Iyer (2008) and Migheli (2012).

question. Theoretical models predict that land owners would either use more agrochemicals than renters within a short-run[5] strategy of extracting as much output as possible from their properties in the shortest time, or use less than renters, within a long-run strategy of soil preservation.

2. Related empirical and theoretical literature

In this section, I will summarise some relevant works, which show why the use of pesticides in the developing countries (and not only there) is noxious and the reasons why the farmers overuse or misuse these agrochemicals, to provide some theoretical ground for the empirical analyses presented in this paper.

Pesticides are harmful for people and for the environment. On the one hand, agricultural workers are the most exposed to direct absorption of pesticides during their application (Sunding and Zivin, 2000; Athukorala et al., 2012, and Liu and Huang, 2013) and – especially in developing countries – often get poisoned (Atreya, 2008, and Lopes Soares and Firpo de Sousa Porto, 2009). On the other hand, pesticides represent a more general threat for the people's health and for the environment (Pethig, 2004, and Brainerd and Menon, 2014). In the case of paddies, the issue is particularly relevant, as rice grows in water. Spraying pesticides in such an environment increases the dispersion of the pollutants in the soil and, in addition, the rice growers work with their feet and legs in the poisoned water. Dasgupta et al. (2007b) highlight that, although the Vietnamese law forbids the use of the most poisonous products (such as DDT), the farmers buy and spray them on their rice fields; blood analyses show that high percentages of Vietnamese farmers present evidence of severe and chronic poisoning caused by the chemical products used in cultivating rice. Figuié and Moustier (2009) highlight that residuals of pesticides represent the major threat for the safety of the consumers of treated crops. Toan et al. (2013) report that the concentration of pesticides in drinking water in the Mekong Delta is much higher than the tolerances and chronically exposes people to considerable harms for their health.

[5] While an exact definition of short and long run is difficult to provide, Antonini and Agilés-Bosch (2017) identify long run effects with those effects that are perceivable after 10 years since the reference year. Similarly, Chavas (2008) associates the concept of "short run" to the duration of the effects of some event (droughts in the case of the cited paper). Griliches (1958) analyses the use of fertilisers in the USA and identifies the short run within 1 year from the reference time.

Other externalities associated with the use of pesticides (Skevas et al., 2013) comprise days off work to recover from poisoning symptoms (Maumbe and Swinton, 2003), and have been valued 188 USD per household in Ontario between 1983 and 1998 (Brethour and Weersink, 2001)[6]. People who live close to cultivations drink contaminated water (Zhang, 2012 and Varca, 2012) and final consumers may eat residues of pesticides with food and its derivatives (Kim et al., 2012; Pareja et al., 2012, and Mahmood et al., 2014). Nevertheless, consistently with the conclusions of the theoretical model proposed by Wilson and Tisdell (2001) farmers continue to use these products and to increase their quantities, as they boost the production. The cited model shows that farmers may end up with being “locked in” the use of pesticides: while these reduce production in the long-run (see also Antonini and Argilés-Bosch, 2017), they increase it in the short-run and increase pest resistance to chemical products. Consequently, stopping to use these agrochemicals (or reducing their use substantially) may determine – in the short run – larger losses of production than a massive employment.

Intensive and massive use of pesticides reduces land yields in the end, because the chemical products poison the soil and, to some extent, are noxious also for the crops that the farmers aim at “defending” (Pimentel et al., 1993; Pimentel, 2009, and Hillocks, 2012). Among the economic incentives, which push farmers to provide effort in reducing soil degradation, land ownership could be relevant. Differently from rented land, the owned represents an asset, whose value depends on productivity. This means that, as a massive use of pesticides decreases land yields over time, it reduces the value of the parcels. While this is true also for the rented land, once the yields have decreased below the break-even point, farmers can generally return this land to the owner by stopping renting it, and they can rent other – more productive – fields. Of course, they can also sell their owned land, but the loss in value caused by the use of chemical products will allow them to buy either similar extensions of similar value (i.e. productivity), or smaller extensions of higher value. Therefore, I expect farmers to concern more for preserving the owned than the rented land, and consequently to moderate the use of chemical products rather on owned than on rented fields. This is equivalent to say that the use of pesticides should decrease as the share of owned cultivated land increases (and that of rented land decreases). However, there are mechanisms that can lead to the opposite outcome. Rahman (2003) finds that the use of pesticides in Bangladeshi farms grows with the extension of land owned by the

[6] Atreya (2008) estimated that these costs amount to 144 rupees in Nepal.

household, which cultivates it. Van der Hoek and Konradsen (2005) find that among Singhalese farmers the probability of getting intoxicated by pesticides increases with the socio-economic status of the household, as farmers that are more affluent employ more pesticides. In this study, the ownership of land enters the analysis as one of the constituents of the variable that assesses the household's socio-economic status. The authors measure land ownership through a dummy, which takes value 1 if the household owns any land (either a small fraction of the totality of what cultivated). Some connection between ownership and investments is likely to lead this outcome. If farmers perceive pesticides as inputs that increase the productivity of land (what may happen in the short run), and owners are more incentivised to purchase inputs for their land than renters are, then, owners will use more pesticides than renters. Differently from this study, mine focusses on the effect land ownership per se on the use of pesticides, while controlling also for the economic status of the household. For example, Nkamleu and Adesina (2000) find that farmers with temporary land rights or practicing continuous cropping in the peri-urban areas of Cameroon are more likely to use chemical pesticides than farmers with different rights on the land that they cultivate.

3. Data and methodology

The empirical analysis presented in the paper uses World Bank data (World Bank, 2016). The dataset includes more than 2,000 farmer households from the Mekong Delta; however full data (i.e. responses to all the questions of interest for the present study) are available for 603 households only. Nevertheless, this sample size is large if compared to existing studies on the use of pesticides in the same area: Berg (2001 and 2002) surveyed 120 farmers, van Mele and van Lenteren (2002) 136, Klemick and Lichtenberg (2008) base their work on 310 households. Studies on other countries also use small samples: for example, Maumbe and Swinton (2003) have data on 140 Zimbabwean famer households, while Dasgupta et al. (2007a) observe 821 households in Bangladesh. The questionnaire comprises seven parts. It collected information not only about the use of pesticides and participation in integrated pest management programmes aimed at reducing the use of these chemical products. Information about the household's composition, the quantity of land used for cultivation, the share of this land owned by the household and the share rented, the type of crops, the variation of their prices and yields in the two harvest seasons before the interview. In particular, the survey also asked the interviewees to state whether they reduced the use of pesticides between the last two harvest seasons (i.e. the one in which the interview took place and the previous). In addition, the questionnaire includes information about household income, its composition (sources of income specifically included in the survey are: crops, livestock, fishery, work outside the farm, remittances, and other residual sources), amount of money borrowed from friends, relatives or formal credit institutions. The data include also much information about the household composition (number of members and, in particular, number of children) and its economic conditions (income per capita, wealth and variables related to the agricultural production of the farm).

This set of information allows for linking several aspects of the economic situation of the surveyed households with the use (and in particular the reduction in the use) of pesticides. Some of the surveyed households were exposes to campaigns aimed at sensitising them about the consequences of a massive usage of chemicals. However, there is no evidence of any influence of these campaigns on the farmers' behaviour in the data used in this paper: the correlation coefficient between being exposed to such a campaign and the variation in the use of pesticides is 0.02 with a p-value of 0.62. Nevertheless, the information available shows that some farmers reduced (or augmented) the quantity of pesticides used also regardless external interventions such as programmes for the introduction of integrated pest-management in substitution of pesticides.

In order to account also for the household's wealth, I consider the ownership of a series of goods such as bikes, motorbikes, radios, TVs, etc. However, the inclusion of all these dummies in the regressions would render them uselessly heavy, as their specific effect goes beyond the scopes of this paper. To reduce the number of regressors that assess the household's wealth, I resort to principal component analysis. This procedure has two advantages: first, it reduces the number of variables from 18 to the five components retained[7]; second, the principal components are continuous variables, which allow for nuancing the differences between the households more than just using a dummy for each good owned. Table A1 (in the appendix) reports the correlations between each component used in the regressions and the eighteen assets entered in the principal component analysis.

[7] As usual, I retained and used in the regressions all the components with eigenvalue larger than 1.

I analyse the effect of land ownership on two variables: the first is discrete and captures whether the farmers have decreases, increased or not varied the quantity of pesticides used during the last crop season in comparison with the previous crop season. The variable takes value 0 if the quantity was decreased, 1 if it remained unchanged and 2 if there was an increase. The second dependent variable of the econometric analysis is the percentage of variation in the quantity of pesticides used during the last crop season with respect to the previous crop season. This variation is assessed in percentage points, and is therefore a continuous variable. Given the nature of these two dependent variables, for the first I use ordered probit estimation, while OLS apply to the second. Several specifications are presented to provide the reader with evidence in favour of robustness. To account for non-linear effects, the share of land owned is introduced in the regressions also in squared value. The main novelty with respect to the extant literature is how land ownership is measured. The percentage of the total land cultivated by a household that the household owns is a much better measure than just a dummy capturing that the considered household owns some (or all) of the land cultivated. Finding a positive relationship between such a variable and the quantity of pesticides used is indeed different from finding the same relationship when land ownership is captured by a dummy that takes value 1 whichever share of the land cultivated is owned by the household considered. In this second case, indeed, it is not possible to assess that the use of pesticides increases with land ownership. Landowners may just use more agrochemicals, as land ownership eases access to credit. Famers who can borrow money can afford to buy more products than renters can. Showing that as the share of land owned (independently of its total extension, which may constitute a collateral for loans) increases so does the quantity of agrochemicals used proves that is land ownership itself that fosters the use of pesticides.

Other controls are: the educational level of the interviewee (unfortunately this information may not be representative of the average education of the households' members); the per capita income of the household's members (in millions of dongs); the share of cultivated land used for rice, orchard, fishes or other cultivations. The inclusion of this partition is useful as there is evidence of reduced use of pesticides when the farmers also grow fishes in the paddies or other products in the immediate neighbourhood of them. The reason is that, in such cases, the pesticides poison the fishes and reduce their number (Berg, 2002 and Klemick and Lichtenberg, 2008) or harm the other cultivations (Van Mele and van Lenteren, 2002). Moreover, I also control for whether the respondent or some other member of the household followed a course about the use of chemical products in agriculture and the risks associated; the age of the responder, the number of household's members who work outside the farm; whether the household is classified as absolutely poor and, finally, the number the household's components.

There are at least two reasons to include the many variables that are present in the regressions. The first is to show that the core results are very robust to different specifications. The second is to provide results that are cleaned from the effects of the socio-economic variables, which affect the use of pesticides according to the extant literature.

Table 1 presents the descriptive statistics for the variables used in the paper. The table shows that a substantial share of farmers varied the quantity of pesticides used between the previous and the current crop seasons. The net effect between increases and decreases is slightly positive (+4.36%); this figure does seem worrisome, but it masks two important facts. First, more than one quarter of the interviewees augmented the quantity used, increasing the soil contamination and the risk of poisoning underground waters and themselves; second, the share of households, which increased the quantity used is much larger than that which decreased it (this result is consistent with evidence from other developing countries, Williamson et al., 2008). Indeed, the farmers that increased the use of pesticides sprayed on average 25.63% of chemicals more than in the previous season; the households that diminished this quantity, sprayed on average 24.52% of chemicals less than in the previous season. Cultivated areas are small and range between 0.1 and 10 hectares, of which the household of the interviewee owns a very large share. However, there are few cases of farmers who rent all the land cultivated; for parcels smaller than 1ha, there is some negative correlation (-0.16, p-value 0.016) between the extension of the land cultivated and the share of it owned by the household. This correlation disappears when the household cultivates fields larger than 1 ha.

One may have concerns about the possible presence of endogeneity in the analysis. However, if the concern is about strict endogeneity (i.e. the possibility that some regressor is function of the dependent variable), this risk seems rather unlikely. On the one hand, the controls, which may be affected by the variation in the use of pesticides, are lagged exactly to avoid endogeneity. On the other hand, the variable of interest (the share of land owned) may well depend on the quantity of pesticides used in the past (via the income produced, that the farmers used to purchase parcels), but not in the current (from the point of view of the interviewee) crop season. If the concern is about indirect endogeneity (i.e. the omission of a variable which affects both some regressor and the dependent variable), I wish to highlight that all the most relevant controls (income, variation in the field yields, education, household wealth, type of crop cultivated) are present in many specifications. Moreover, the introduction of one or more of these controls in the estimations does not modify sensibly the coefficients nor the standard errors. This suggests that there are no omitted variables, which may influence some of these controls and the dependent variable. Given this, the presence of other sources of indirect endogeneity that have not been included in the analysis seems rather improbable.

Before turning to the results, I would stress that there are also two methodological reasons why focussing on the Mekong Delta is relevant. The first is that this region is representative of an important developing country, where the use of pesticides is massive; the second is that the crops in that region are extremely homogeneous and almost limited to rice (see Table 1)[8]. This homogeneity reduces the noise in the data.

4. Results

This section is divided into two sub-sections: in the first I comment and discuss the effect of land ownership on the use of pesticides; in the second I briefly present the other relevant results obtained in the analysis.

4.1 Effect of land ownership on the use of pesticides

Table 2 reports the estimates of the ordered probit regressions. For the sake of clarity and to limit the dimension of the table, I report only the marginal effects for two outcomes: choosing to decrease the quantity of pesticides used (DEC) and choosing to increase it (INC). In the estimation, the "middle" choice (i.e. keep the quantity unchanged) is used as reference category. Starting from the variable of interest, we can observe that the effect of the percentage of land owned by the household is not linear. In particular, the figures highlight an inverse U-shaped relationship between the probability of increasing the use of pesticides and the share of cultivated land owned. These results are very robust to the different specifications

[8] While the main crop in the Mekong Delta is rice, some farmers also grow fish and/or cultivate orchards. According to Smith (2013) paddies occupy the 94.19% of the cultivable land in the Mekong Delta; orchards represent the 3.23% of the cultivable land of the region and aquaculture covers 1.43% of the cultivable extension.

presented in the paper and suggest that landowners are more reluctant to reduce the quantity of pesticides used than land renters are.

The figures in the table suggest also that the yields per hectare in the previous crop seasons affect the decision whether to increase or decrease the use of pesticides. In particular, the relationship between the two variables is non-linear, but this time this is U-shaped. The figures suggest that very high yields in the previous crop season induce the farmers to increase the use of pesticides, while this diminishes for intermediate yields. Farther past (i.e. the yields in the second-to-last crop season) has no statistically significant effect on the variable of interest. As the yield depends also on the management of the land in the past, and as landowners tend to use pesticides – which decrease the yields in the long run (8 years or more) – more than the renters, one might argue that the yields decrease as the share of owned cultivated land increases. Should this be the case, and if farmers believed that pesticides increase land productivity, then there would be endogeneity in the phenomenon observed. Owners use more pesticides and these harm the yield of their land in the ling run. However, the farmers believe that pesticides have the opposite effect, and therefore they use more pesticides on the owned land, because it is less productive than the rented. This would a consequence of the fact that the land has been poisoned by massive use of pesticides in the past. However, the data do not support the mechanism just described: the yields in the two past crop seasons before that of the interview do not vary with the share of land owned by the household. This suggests that farmers do not use more pesticides on owned lands because these are less productive than the rented, and therefore the previous possible mechanism is not source of endogeneity in the current analysis. Likely, the farmers use more pesticides on the owned fields, as they perceive this as an investment to improve their asset. Freeing owned land by pests renders them more productive – in the short run – and therefore to the farmers' eyes it looks like an improvement.

Table 3 reports the OLS estimates, where the dependent variable is the variation – in percentage points – of the quantity of pesticides used between the last and the previous crop season. The results are consistent with those presented in the previous table: as the percentage of owned land over the total cultivated land increases, so does the quantity of pesticides used. While also in this case there is an inverse U-shaped relationship between the two variables, the maximum of the parabola is around 155 percentage points. This figure means that the decreasing section of the parabola is never reached in practice (since nobody can own more than 155% of the land he cultivates[9]) and that, consequently, as the share of land owned increases, so does the quantity of pesticides used. The figures (both the coefficients and the standard errors) are very robust to different specifications. It is also interesting to notice that the extension of the land cultivated has no effect on the change in the use of pesticides. This means that this last variable does not depend on how much land the farmer cultivates, but on how much s/he owns of it. One could have argued that the use of chemical products correlated negatively to the extension of land cultivated. To reach subsistence levels of production, households with small parcels may need higher productivities than households with large fields. However, the analysis does not support such a possibility. Again, these results suggest that the farmers view the use of pesticides as a tool to better off their land, and therefore the larger the share they own, the more the incentives to buy and to spray pesticides[10].

As a partial conclusion of the empirical evidence presented so far, I have to highlight that the land redistribution from collectives to particular households realised in Vietnam may have contributed to increase the probability that farmers intensify the use of pesticides (and likely of other chemical products), with the intent of raising the yields of their fields. While this may have positive effects on both the total agricultural production of the Mekong Delta and on the farmers' income, in the end the Mekong Delta may become a poisoned land, where cultivation of rice (and of other crops) might be difficult. In addition, the absence of any effect of sensitising campaigns on the use of pesticides suggests that either these are not well designed, or that the farmers simply are concerned with maximising the current yields and do not consider the information conveyed by these campaigns. The large and growing disparities of income between the urban and the rural areas may contribute to explain why farmers try to extract as much income as possible from their land. The results presented in Tables 2 and 3 suggest that the interviewed farmers do not care about – or simply are not aware of – the long-run consequences of a massive use of pesticides on the productivity of their fields, nor on their health.

4.2 Effects of other variables on the use of pesticides

[9] Of course, one might rent out some owned land and can consequently own more land that that cultivated. However, the data here reports the share of cultivated land which is owned by the household and not the extension of owned land in proportion to that cultivated. Therefore, the maximum theoretical and practical value for this variable is 100%.

[10] Notice that these results hold also once controlling for income and wealth. Consequently, they are not led by the quantity of money available to purchase pesticides as one might have thought.

Another interesting effect is that of the number of household's members who work in the farm. This effect is negative, suggesting that the use of pesticides declines as the number of household members working in the farm increases. This result may suggest that as the number of people exposed to the harmful effects of pesticides increase, they become more cautious in the use of these chemical products. Unfortunately, another – more likely – interpretation is possible: as the number of people who work in the farm increases, the quantity of other factors (such as pesticides) aimed at increasing the production may be decreased (i.e. there is a trade-off between labour and pesticides as production inputs). Table 3 shows an analogous (i.e. negative) result if some component of the household works outside the farm earning income, i.e. if the production of the farm is not the only source of income for the household. In such a case, the maximisation of the productivity of the land – also by the means of spraying pesticides – becomes less a priority than when the products of the farm are the only source of income (i.e. there is negative effect of income-source diversification on the use of pesticides). The evidence provided by these two variables therefore suggests that the interviewed farmers use pesticides as a way to increase the household income via the production of their fields. However, human work both in and out the farm is a substitute for pesticides (or vice-versa), as it concurs to increase the household income, what is, apparently, the ultimate goal.

Past yields and variations in the price of the commodities during the second- and the third-to-last crop seasons influence the variation in the use of pesticides. In particular, farmers reduce the quantity of pesticides if the yields in the previous period were high (compared to the average of the sample). However, a positive variation in the prices of the main commodity produced induces the farmers to spray more products in the following season. This fact seems to support the claim that farmers attribute gains in productivity also to the use of pesticides.

Consistently with the extant literature, as the use of pesticides also the variation in this use depends on the type of product for which the land is used. Specifications 6 and 7 of Tables 2 and 3 include the share of worked land used to cultivate 1) rice, 2) fruit trees and 3) to grow fishes ("growing other vegetables" is the reference category). In particular, as the share of land used for this last production increases by one hectare, the use of pesticides decreases by about 30 percent. While this figure may appear very large, we should recall that the interviewed households cultivate parcels with an average extension of 1.47 hectares and that the extension of paddles for growing fishes ranges from 0 to 0.84 hectares.

Farmers who borrow from informal credit institutions are more likely to increase the quantity of pesticides used and, in addition, they increase this use more than the farmers who do not borrow from informal institutions. A possible explanation for this result is that, in general, formal lenders require the borrowers to adopt sustainable techniques, which may entail also reductions in the use of pesticides (Olatunbosun, 2012; Cranford and Mourato, 2014 and Tumusiime and Matotay, 2014). Consequently, farmers who want to increase the quantity of pesticides resort to informal credit, alimenting it; and this constitutes an additional negative externality of the massive use of pesticides.

5. Discussion and conclusions

The main new finding of the analysis presented before is the positive relationship that links land ownership and use of pesticides. Some works had already inquired this issue, but there land ownership was measured as a dummy, taking value 1 if the household own some or all of the cultivated land. In the present analysis, I use a continuous variable, which captures the share of the cultivated land that the household owns. With respect to the previous works, the use of this variable allows for capturing the real effect of owning land on the quantity of pesticides used.

The results presented in the paper suggests that owners look for productivity increases in the short run more than renters do. While one may interpret this outcome as good news, there are dark sides of such a behaviour. Increasing land productivity is positive in developing country such as Vietnam, where the population grows at a fast pace, but the related and out-of-control increase in the use of pesticides witnessed by the results presented before urges the government to design educational programmes, which teach the farmers sustainable ways to increase the agricultural productivity. The results show also that the rate of increase of pesticide use is decreasing with ownership (while the absolute variations are positive). In addition, the analyses seem to suggest that if the farmers had higher incomes, then they would use less pesticides; in other words, the use of chemical products appears to be functional to the achievement of some income level. This is another novel result: the use of agrochemicals does not necessarily increase with income, once wealth and land ownership are accounted for. However, it is also possible that the farmers pursue relative than absolute goals in this sense, i.e. they try to increase their income with respect to their peers (neighbours). Should this be the case, then the use of pesticides would not decline if the income of the entire reference group shifts up. Unfortunately, the data available do not allow understanding which mechanism – if any – leads the farmers' choices.

Moreover, the existing trade-off between the income produced within the farm and that earned outside the farm may have some relevant policy implication. In particular, the empirical evidence suggests that in households with members working outside the farm, the use of pesticides is lesser than when all the household income comes from the production of the farm. Therefore, in order to stimulate reductions in the use of chemical products – and of pesticides in particular – the Vietnamese government could enhance income diversification through different programmes. One could be to support some industrialisation of the Mekong Delta, so that some people who currently work in farms can find a job outside it. Another possibility to offer the farmers some opportunity of income outside the farm may be to hire them for the realisation of public works (the Indian *workfare program* – see Todaro and Smith, 2015 – may be a useful example to follow). Other possible policies to reduce the use of pesticides in the Mekong Delta include further promotion of innovative techniques, such as the integrated pest management, which have been successful in some Western countries (see for example the experience of the French winemakers: Saint-Ges and Bélis-Bergouignan, 2009). Huan et al. (2005) analyse a second (so far experimental) way to reduce the quantity of pesticides: a decrease in the seed rates[11], as, in some cases, these are so high to render marginal returns negative. They find that this drop in the seed rates also reduces the quantity of chemicals used in the productive process and decreases the production costs of rice. Unfortunately, the mechanisms behind this are counterintuitive and, although farmers were motivated to participate in the experiment, they were reluctant to apply the new techniques.

The evidence presented in this paper refers to the Mekong Delta; however, the situation of this area is not very different from that of other agricultural regions of many developing countries (Ecobichon, 2001 and Schreinemachers and Tiprasqa, 2012). We can therefore expect that this evidence observed in Vietnam is common to many other developing countries, where the overuse and the misuse of pesticides damage human health and soil. The extant evidence

[11] Also the use of transgenic crops, which are more pest-resistant than traditional crops, may help reducing the use of pesticides (Zilberman et al., 2007, Kouser and Qaim, 2013).

suggests that the governments should conceive specific training programs for the farmers, and monitor the use of agrochemicals more effectively than they do now.

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Table 1. Descriptive statistics				
	Mean	Standard deviation	Minimum	Maximum
Percentage of households that increased pesticides in last season	28.690	45.269		
Percentage of households that decreased pesticides in last season	16.584	37.224		
Average change in pesticide use (% w.r.t. the previous season)	4.358	19.476	-70.00	60.00
Cutlivated land (has)	1.451	1.355	0.100	6.500
Share of cultivated land owned	97.910	11.304	0.00	100.00
Age	42.446	10.999	77	18
Per capita income (Millions dong)	3.747	3.824	0.367	37.500
Percentage of working time spent working in the farm	76.335	23.592	10.00	100.00
Number of household members working in the farm	2.312	1.176	1	8
Number of household's members	5.022	1.666	1	11
Participation to educational programmes on the risks of the use of chemicals in agriculture (% of interviewees)	48.259	50.017		
Earn money from job outside farm (% of interviewees)	55.721	49.713		
Remittances received (in dongs)	461.857	2.144.181	0	21.600.000
Credit from formal institutions (in dongs) - full sample	5.063.184	10.400.000	0	145.000.000
Credit from formal institutions (in dongs) - borrowers only	10.700.000	13.000.000	1.000.000	145.000.000
Credit form informal institutions (in dongs)	93.085	803.950	0	12.000.000
Credit from informal institutions (in dongs) - borrowers only	3.508.125	3.627.744	500.000	12.000.000
Credit from relatives (in dongs)	6.635	99.613	0	2.000.000
Credit from relatives (in dongs) - borrowers only	1.333.333	577.350	1.000.000	2.000.000
Absolutely poor (% of poor households in the sample)	19.237	39.449		
In-kind household income (millions dong)	70.083	470.430	0	8.100.000
Residential land (in percentage of total land)	5.166	9.394	0.8	12.5
Highest educational level: high school (% of interviewees)	17.247	37.810		
Highest educational level: secondary school (% of interviewees)	44.279	49.713		
Highest educational level: primary school (% of interviewees)	34.992	47.734		
Land use (in hectares)				
Rice cultivation	1.267	1.199	0.100	10.000
Fish growing	0.008	0.046	0.000	0.840
Orchards	0.144	0.277	0.000	2.750
Other crops	0.051	0.192	0.000	1.800

Table 2. Variation in the use of pesticides. Maginal effects of ordered probit estimates (standard errors in parentheses).

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	DEC	INC	DEC	INC	DEC	INC	DEC	INC	DEC	INC	DEC	INC	DEC	INC
VARIABLES	Marginal effects		Marginal effects		Marginal effects		Marginal effects		Marginal effects		Marginal effects		Marginal effects	
Cutlivated land (has)	-0.0147	0.0200	-0.0151	0.0206	-0.00973	0.0133	-0.00680	0.00918	-0.00695	0.00939	-0.00967	0.0132	-0.000809	0.00111
	(0.0110)	(0.0150)	(0.0111)	(0.0152)	(0.0115)	(0.0158)	(0.0121)	(0.0164)	(0.0124)	(0.0168)	(0.0834)	(0.114)	(0.0793)	(0.109)
Share of cultivated land owned	-0.0211	0.0287	-0.0207	0.0282	-0.0233	0.0319	-0.0233	0.0315	-0.0221	0.0299	-0.0224	0.0305	-0.0246	0.0338
	(0.00786)***	(0.0105)***	(0.00762)***	(0.0102)***	(0.00904)***	(0.0121)***	(0.00920)**	(0.0122)***	(0.00853)***	(0.0113)***	(0.00858)***	(0.0114)***	(0.00837)***	(0.0112)***
Share of cultivated land owned (squared)	0.000134	-0.000183	0.000131	-0.000179	0.000151	-0.000206	0.000150	-0.000202	0.000141	-0.000191	0.000142	-0.000193	0.000157	-0.000216
	(5.76e-05)**	(7.73e-05)**	(5.63e-05)**	(7.58e-05)**	(6.54e-05)**	(8.82e-05)**	(6.64e-05)**	(8.83e-05)**	(6.22e-05)**	(8.30e-05)**	(6.19e-05)**	(8.26e-05)**	(6.07e-05)***	(8.15e-05)***
Age	-0.00230	0.00313	-0.00225	0.00306	-0.00204	0.00279	-0.00217	0.00293	-0.00266	0.00359	-0.00225	0.00306	-0.00237	0.00325
	(0.00114)**	(0.00156)**	(0.00113)**	(0.00156)*	(0.00114)*	(0.00158)*	(0.00116)*	(0.00158)*	(0.00120)**	(0.00166)**	(0.00118)*	(0.00164)*	(0.00118)**	(0.00164)**
Per capita income (Millions dong)	0.00266	-0.00362	0.00264	-0.00360	0.00309	-0.00424	0.00349	-0.00471	0.00237	-0.00320	0.00306	-0.00417	0.00303	-0.00415
	(0.00203)	(0.00283)	(0.00206)	(0.00286)	(0.00202)	(0.00285)	(0.00203)*	(0.00283)*	(0.00212)	(0.00290)	(0.00210)	(0.00289)	(0.00222)	(0.00307)
Percentage of working time spent working in the farm	-0.000423	0.000577	-0.000470	0.000641	-0.000546	0.000749	-0.000684	0.000924	-0.000782	0.00106	-0.000825	0.00112	-0.000822	0.00113
	(0.000560)	(0.000763)	(0.000562)	(0.000767)	(0.000560)	(0.000768)	(0.000566)	(0.000764)	(0.000571)	(0.000774)	(0.000573)	(0.000781)	(0.000571)	(0.000782)
Number of household members working in the farm	0.0282	-0.0385	0.0289	-0.0395	0.0258	-0.0353	0.0238	-0.0322	0.0286	-0.0387	0.0279	-0.0379	0.0295	-0.0405
	(0.0119)**	(0.0165)**	(0.0123)**	(0.0171)**	(0.0124)**	(0.0172)**	(0.0124)*	(0.0171)*	(0.0122)**	(0.0168)**	(0.0121)**	(0.0168)**	(0.0122)**	(0.0170)**
Number of household's members	-0.0152	0.0207	-0.0150	0.0204	-0.0157	0.0215	-0.0159	0.0214	-0.0149	0.0201	-0.0165	0.0224	-0.0168	0.0230
	(0.00843)*	(0.0115)*	(0.00844)*	(0.0115)*	(0.00840)*	(0.0115)*	(0.00852)*	(0.0115)*	(0.00848)*	(0.0115)*	(0.00851)*	(0.0116)*	(0.00848)**	(0.0116)**
Participation to educational programmes on the risks of the use of chemicals in agriculture (dummy = 1 if yes)	-0.0263	0.0358	-0.0267	0.0365	-0.0223	0.0305	-0.0257	0.0347	-0.0252	0.0341	-0.0232	0.0315	-0.0256	0.0351
	(0.0257)	(0.0352)	(0.0257)	(0.0352)	(0.0260)	(0.0356)	(0.0264)	(0.0357)	(0.0266)	(0.0359)	(0.0263)	(0.0358)	(0.0262)	(0.0359)
Earn money from job outside farm (dummy = 1 if yes)			0.0226	-0.0308	0.0199	-0.0273	0.0283	-0.0381	0.0302	-0.0408	0.0239	-0.0325	0.0232	-0.0318
			(0.0257)	(0.0352)	(0.0257)	(0.0353)	(0.0260)	(0.0353)	(0.0261)	(0.0355)	(0.0258)	(0.0353)	(0.0256)	(0.0353)
Remittances received (in dongs)			4.14e-09	-5.65e-09	5.42e-09	-7.43e-09	5.59e-09	-7.55e-09	4.46e-09	-6.03e-09	4.87e-09	-6.62e-09	3.66e-09	-5.02e-09
			(6.00e-09)	(8.18e-09)	(5.96e-09)	(8.16e-09)	(6.04e-09)	(8.15e-09)	(6.02e-09)	(8.12e-09)	(5.92e-09)	(8.04e-09)	(6.36e-09)	(8.70e-09)
Credit from formal institutions (in dongs)							-7.30e-10	9.85e-10	-9.27e-10	1.25e-09	-1.07e-09	1.45e-09	-1.14e-09	1.56e-09
							(1.49e-09)	(2.02e-09)	(1.49e-09)	(2.02e-09)	(1.51e-09)	(2.06e-09)	(1.48e-09)	(2.04e-09)
Credit form informal institutions (in dongs)							-2.92e-08	3.94e-08	-3.07e-08	4.14e-08	-2.99e-08	4.07e-08	-3.30e-08	4.53e-08
							(1.57e-08)*	(2.12e-08)*	(1.59e-08)*	(2.17e-08)*	(1.60e-08)*	(2.19e-08)*	(1.64e-08)**	(2.26e-08)**
Credit from relatives (in dongs)							1.48e-06	-2.00e-06	1.51e-06	-2.05e-06	1.52e-06	-2.07e-06	1.57e-06	-2.15e-06
							(9.12e-08)***	(9.48e-08)***	(9.23e-08)***	(1.08e-07)***	(9.38e-08)***	(1.05e-07)***	(1.14e-07)***	(1.27e-07)***
Absolutely poor (dummy; yes = 1)									-0.0260	0.0368	-0.0270	0.0386	-0.0316	0.0459
									(0.0335)	(0.0497)	(0.0331)	(0.0498)	(0.0357)	(0.0551)
In-kind household income (millions dong)									0.0250	-0.0338	0.0207	-0.0282	0.0301	-0.0413
									(0.0249)	(0.0336)	(0.0272)	(0.0370)	(0.0280)	(0.0383)
Residential land (in percentage of total land)									2.28e-05	-3.08e-05	2.85e-05	-3.88e-05	3.00e-05	-4.11e-05
									(2.36e-05)	(3.20e-05)	(2.37e-05)	(3.25e-05)	(2.39e-05)	(3.30e-05)
Highest educational level: high school									-0.0555	0.0837	-0.0650	0.101	-0.0541	0.0831
									(0.0620)	(0.104)	(0.0589)	(0.104)	(0.0605)	(0.104)
Highest educational level: secondary school									0.00591	-0.00797	-0.00457	0.00623	-0.00416	0.00572
									(0.0692)	(0.0932)	(0.0680)	(0.0928)	(0.0674)	(0.0927)
Highest educational level: primary school									-0.0506	0.0715	-0.0611	0.0878	-0.0581	0.0840
									(0.0667)	(0.0986)	(0.0646)	(0.0982)	(0.0645)	(0.0985)
Price variation (%) of the sold commodity									-0.00585	0.00790	-0.00398	0.00541	-0.00530	0.00727
									(0.00969)	(0.0131)	(0.00943)	(0.0128)	(0.00930)	(0.0127)
Yield variation (t-1 - t)					0.0150	-0.0205	0.0137	-0.0184						
					(0.00570)***	(0.00791)***	(0.00574)**	(0.00784)**						
Yield variation (t-1 - t) squared					-0.000361	0.000495	-0.000339	0.000458						
					(0.000158)**	(0.000216)**	(0.000159)**	(0.000215)**						
Yield variation (t-2 - t-1)					0.00176	-0.00241	0.00205	-0.00277						
					(0.00749)	(0.0103)	(0.00757)	(0.0102)						
Yield variation (t-2 - t-1) squared					-2.21e-05	3.03e-05	-2.44e-05	3.29e-05						
					(5.31e-05)	(7.26e-05)	(5.35e-05)	(7.21e-05)						
Land use (in percentage of total cultivated land)														
Rice cultivation											-0.00602	0.00818	-0.0169	0.0231
											(0.0846)	(0.115)	(0.0805)	(0.110)
Fish growing											0.469	-0.638	0.423	-0.580
											(0.263)*	(0.359)*	(0.259)	(0.357)
Orchards											0.123	-0.168	0.119	-0.163
											(0.0937)	(0.128)	(0.0902)	(0.124)
Principal components capturing household's wealth														
Component 1													-1.64e-05	2.25e-05
													(0.00729)	(0.01000)
Component 2													-0.00318	0.00435
													(0.0113)	(0.0155)
Component 3													-0.00740	0.0101
													(0.0117)	(0.0160)
Component 4													0.0344	-0.0471
													(0.0125)***	(0.0171)***
Component 5													0.0239	-0.0328
													(0.0127)*	(0.0170)*
Observations	552	552	552	552	552	552	552	552	552	552	552	552	552	552

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Land ownership and percentage variation in pesticide use. OLS estimantes, s.e. on parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: pesticide use variation (in %)							
Cutlivated land (has)	0.701	0.808	0.446	0.613	0.925	7.008	6.735
	(0.681)	(0.680)	(0.696)	(0.756)	(0.799)	(4.922)	(5.013)
Share of cultivated land owned	1.021	1.029	1.089	1.087	1.062	1.041	1.244
	(0.405)**	(0.407)**	(0.432)**	(0.433)**	(0.417)**	(0.417)**	(0.372)***
Share of cultivated land owned (squared)	-0.00661	-0.00655	-0.00701	-0.00696	-0.00680	-0.00657	-0.00793
	(0.00305)**	(0.00309)**	(0.00327)**	(0.00327)**	(0.00316)**	(0.00313)**	(0.00286)***
Age	0.217	0.212	0.197	0.200	0.229	0.212	0.206
	(0.0705)***	(0.0704)***	(0.0701)***	(0.0703)***	(0.0738)***	(0.0741)***	(0.0731)***
Per capita income (Millions dong)	-0.383	-0.376	-0.420	-0.439	-0.367	-0.383	-0.342
	(0.164)**	(0.169)**	(0.167)**	(0.163)***	(0.164)**	(0.163)**	(0.165)**
Percentage of working time spent working in the farm	0.0509	0.0546	0.0679	0.0695	0.0660	0.0671	0.0581
	(0.0347)	(0.0348)	(0.0353)*	(0.0350)**	(0.0350)*	(0.0351)*	(0.0348)*
Number of household members working in the farm	-1.527	-1.753	-1.514	-1.442	-1.731	-1.732	-1.610
	(0.750)**	(0.776)**	(0.790)*	(0.789)*	(0.769)**	(0.758)**	(0.760)**
Number of household's members	0.640	0.638	0.613	0.644	0.636	0.714	0.646
	(0.510)	(0.513)	(0.510)	(0.513)	(0.512)	(0.514)	(0.512)
Participation to educational programmes on the risks of the use of chemicals in agriculture (dummy = 1 if yes)	0.654	0.698	0.416	0.521	0.498	0.249	0.127
	(1.614)	(1.607)	(1.614)	(1.635)	(1.653)	(1.640)	(1.642)
Earn money from job outside farm (dummy = 1 if yes)		-3.497	-3.120	-3.300	-3.522	-3.170	-3.264
		(1.619)**	(1.618)*	(1.625)**	(1.634)**	(1.618)*	(1.624)**
Remittances received (in dongs)		-2.64e-07	-3.63e-07	-3.49e-07	-2.77e-07	-3.17e-07	-1.68e-07
		(3.89e-07)	(3.91e-07)	(3.93e-07)	(3.81e-07)	(3.74e-07)	(4.16e-07)
Credit from formal institutions (in dongs)				-5.54e-08	-4.43e-08	-3.02e-08	-3.27e-08
				(1.12e-07)	(1.14e-07)	(1.16e-07)	(1.06e-07)
Credit form informal institutions (in dongs)				1.54e-06	1.81e-06	1.77e-06	1.85e-06
				(5.69e-07)***	(5.76e-07)***	(5.86e-07)***	(6.43e-07)***
Credit from relatives (in dongs)				-4.08e-06	-4.21e-06	-4.16e-06	-3.83e-06
				(8.93e-06)	(9.65e-06)	(9.95e-06)	(9.63e-06)
Absolutely poor (dummy; yes = 1)					1.625	1.659	1.641
					(2.103)	(2.105)	(2.244)
In-kind household income (millions dong)					-1.144	-1.292	-1.358
					(0.969)	(1.415)	(1.446)
Residential land (in percentage of total land)	-0.00157	-0.00162	-0.00137	-0.00156	-0.000350	-0.000560	-0.000430
	(0.00203)	(0.00201)	(0.00210)	(0.00205)	(0.00133)	(0.00134)	(0.00131)
Highest educational level: high school					5.493	5.930	5.258
					(4.476)	(4.418)	(4.496)
Highest educational level: secondary school					1.058	1.403	0.745
					(4.269)	(4.224)	(4.256)
Highest educational level: primary school					4.344	4.747	3.814
					(4.397)	(4.343)	(4.390)
Price variation (%) of the sold commodity					0.506	0.575	0.529
					(0.279)*	(0.278)**	(0.276)*
Yield variation (t-1 - t)			-0.898	-0.837			
			(0.356)**	(0.357)**			
Yield variation (t-1 - t) squared			0.0196	0.0181			
			(0.00982)**	(0.00980)*			
Yield variation (t-2 - t-1)			0.596	0.557			
			(0.321)*	(0.316)*			
Yield variation (t-2 - t-1) squared			-0.00461	-0.00433			
			(0.00238)*	(0.00234)*			
Land use (in percentage of total cultivated land)							
Rice cultivation						-5.999	-5.370
						(4.933)	(5.032)
Fish growing						-30.24	-30.84
						(11.53)***	(11.84)***
Orchards						-11.17	-10.23
						(5.458)**	(5.518)*
Principal components capturing household's wealth							
Component 1							0.542
							(0.465)
Component 2							-1.368
							(0.738)*
Component 3							0.307
							(0.695)
Component 4							-2.062
							(0.820)**
Component 5							-0.230
							(0.791)
Constant	-460.6	-447.3	-421.7	-427.5	-484.4	-452.4	-446.1
	(139.8)***	(139.7)***	(139.0)***	(139.2)***	(146.2)***	(146.7)***	(144.5)***
Observations	603	603	603	603	603	603	603
R-squared	0.056	0.065	0.078	0.083	0.083	0.095	0.114

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 1: Correlations between the principal components used in the regressions and the eighteen indicators of the household's wealth.

Table A1. Correlations between the principal components and the originating variables (s.e. in parentheses)

	Component 1	Component 2	Component 3	Component 4	Component 5
Television	0.425	0.423	0.045	-0.015	0.022
	(0.000)	(0.000)	(0.245)	(0.715)	(0.582)
Radio	0.423	0.102	-0.040	-0.026	0.461
	(0.000)	(0.012)	(0.328)	(0.522)	(0.000)
Music player system	0.540	-0.017	0.320	0.234	0.118
	(0.000)	(0.673)	(0.000)	(0.000)	(0.004)
Video/DVCD	0.664	0.014	0.252	0.295	0.000
	(0.000)	(0.734)	(0.000)	(0.000)	(0.996)
Bicycle	0.233	0.439	-0.343	0.142	-0.176
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Motorbike	0.645	-0.107	-0.193	0.170	-0.063
	(0.000)	(0.008)	(0.000)	(0.000)	(0.121)
Refrigerator	0.413	-0.377	0.114	-0.066	-0.395
	(0.000)	(0.000)	(0.005)	(0.106)	(0.000)
Electric fan	0.460	0.471	-0.211	-0.185	0.116
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)
Telephone	0.482	-0.355	-0.052	-0.038	-0.297
	(0.000)	(0.000)	(0.198)	(0.353)	(0.000)
Computer	0.014	0.207	0.238	0.750	0.003
	(0.730)	(0.000)	(0.000)	(0.000)	(0.935)
Cooker	0.580	0.212	0.018	-0.350	-0.092
	(0.000)	(0.000)	(0.662)	(0.000)	(0.024)
Gas stoven	0.662	0.029	0.178	-0.216	-0.138
	(0.000)	(0.476)	(0.000)	(0.000)	(0.000)
Washing machine	0.133	-0.341	0.301	-0.141	0.168
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Bathroom/toilet	0.510	-0.149	-0.157	0.032	-0.157
	(0.000)	(0.002)	(0.000)	(0.433)	(0.000)
Motor boat	-0.052	0.316	0.689	-0.283	0.075
	(0.199)	(0.000)	(0.000)	(0.000)	(0.067)
High quality furniture	0.519	-0.215	0.034	-0.038	0.415
	(0.000)	(0.000)	(0.407)	(0.353)	(0.000)
Pipewater connection	0.333	-0.125	-0.409	-0.030	0.496
	(0.000)	(0.000)	(0.000)	(0.460)	(0.000)
Other high value items	0.198	-0.037	0.006	-0.040	0.022
	(0.000)	(0.369)	(0.882)	(0.324)	(0.596)