AN ECONOMIC ANALYSIS FOR THE FACTORES EFFECTING ON NET FARM INCOME USING PANEL DATA

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ABSTRACT

The aim of this research is studying the affecting factors in net farm income via using panel data models .To achieving requirements of the study we collected the data randomly from 41 farmers in al-maden district – province of Baghdad.To all production activities in farm in 2015 and 2016. We used eviews 6 program and GLS method, we used OLS to estimate three models were net agricultural income was dependent variable and each of the area, costs, value of animal production and value of assets were independent variables, according to LM test and hausman test, the random effects model was the best of the estimating models which confirm that increasing the assets, area and cost by 1% will increase net agricultural income by (0.049, 0.227, 0.552)% respectively. While the farm size entire as a dummy variable in the random effects model indicates that net agricultural income will increase 1.035 when increase this size by one unit. The research concluded that the results of estimation in panel data were more accurate and degree of freedom were more than using one models. The research recommended to intensive the suitable technological factors and providing the required financing and recycling part income to invest it in farming assets.

Keywords: Cross time series, Efficiency, Individual effect.

تحليل اقتصادي للعوامل المؤثرة في صافي الدخل المزرعي باستخدام نماذج Panel Data

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المستخلص

يهدف البحث الى دراسة العوامل المؤثرة في صافي الدخل المزرعي باستخدام نماذج Panel Data. لتحقيق متطلبات البحث جمعت البيانات بصورة عشوائية من 41 مزارعا في قضاء المدائن محافظة بغداد، ولكافة الانشطة الانتاجية في المزرعة لعامي 2015 و2016. استخدم برنامج Eviwes.6 وطريقةGLS, OLS لتقدير النماذج الثلاثة اذ كان صافي الدخل المزرعي متغيرا تابعا والمساحة والتكاليف وقيمة الانتاج الحيواني وقيمة الموجودات متغيرات مستقلة فضلا عن متغيرات صورية تمثلت بحجم المزرعة وبعد المزرعة عن السوق. اشارت النتائج وحسب اختبار LM واختبار Hausman ان انموذج الاثار العشوائية هو افضل النماذج المقدرة الذي اكد على ان زيادة الموجودات والمساحة والتكاليف بنسبة 1% فان صافي الدخل المزرعي يزداد بنسبة (0.049، 0.227، 0.552)% على الترتيب. بينما حجم المزرعة الذي ادخل متغيرا صوريا في انموذج الاثار الثابتة اشار الى ان صافي الدخل المزرعي يزداد بمقدار 1.035 عند زيادة ذلك الحجم بوحدة واحدة. استنتج البحث ان نتائج التقدير في البيانات الطولية تكون اكثر دقة ودرجات الحرية تكون اكثر من استخدام نموذج واحد، ويوصي البحث بضرورة تكثيف العوامل التكنولوجية الملائمة وتوفير التمويل اللازم وتدوير جزء من الدخل لاستثماره في الموجودات المزرعية.

الكلمات المفتاحية: السلاسل الزمنية المقطعية، الكفاءة، الاثر الفردي.

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INTRODUCTION

An important aim in the agricultural development is the farm's efficiency and it's measured. Efficiency is useful to identities production problems and making suggestions based on experimental results and economic theory. The policy makers are very interested in the results of the efficiency studies. Their analyzes can be used to identify general interventions to improve agricultural productivity and farm income(14). Therefore, the efficiency tacked an important position where the economic units aim to allocate their resources in order to achieve higher economic efficiency based on the optimal use of the inputs available in the unit, that is the basis for achieving a continuous increase in production and labor's productivity and reduce costs. Economic efficiency is achieved through the use of productive resources in the best alternative uses, and refers to the combined effect to achieve the technical and allocation efficiency(15). It is necessary to identify the criteria of economic efficiency at the most important net farm income, which is the best indicators in assessing the achievements of the productive unit and the extent of the possibility of profit, which reflects the efficiency of the resources use, which is a measure of the affecting of the management, to achieve the best value of the marginal product of these resources of their various uses and transfer of low value to the high in order to always add new welfare through the transfer of net income to the hihg (4**).** Net farm income conceder is the main criteria for measuring the farm's economic efficiency and is an important indicator for economic policy-making in the agricultural sector(1). So the welfare of the farm family can be measured(3). Therefore, attention at the different levels of production is important at coordination and directing the various actors efficiently,because net farm income is influenced by some factors that can change within a year and some of them are not clear in less than a year, the use of Panel data models is important because its contains necessary data that deals with the dynamics of time and on multiple vocabulary. It gives more useful information, more variables and reduce bias, it describes the behavior of a number of economic units (farms) at a single time period (13). The problem of research is that the efficiency and returns in the long run depend on the size of the resources, the level of income and returns of the land, labour and capital depends on the services of these resources, as long as the land is limited size, the achieved profits is vary according to the size and performance of used resources, therefore non-efficiency, un-employ of resources lead to a decrease in net agricultural income because the increase in production comes as a result of the efficient use of these resources. This research aims to identify the efficiency of management through economic analysis of the most important factors affecting the net agricultural income as its main indicator. The research is based on the hypothesis that net farm income is result of low profits and there are many factors that can affect it.

MATERIALS AND METHODS

This research requirements a random sample distributed to 41 farmers from Al-Madain district of Baghdad Provence. The questing included questions about income, costs and farm assets, collected for 2015 and 2016. The regression of the Panel Data method was used in its three models:- the Pooled Regression Model (PRM), Fixed Effects Model (FEM) and the Random Effects Model (REM), and the best among these models a range of test have been adopted including F, LM and Hausman.

RESULTS AND DISCUSSION

The panel data method is applied and it increases the quality of economic analysis in a way that may not be possible if we use only cross-section data or time series data to see the effect of a set of factors those effecting on net farm income including cultivated area, costs, value of farm assets, livestock value, farm distance by using Eviews.6 program, the three models were estimated as follows:

First: Pooled Regression Model (PRM)

The classic model is called the panel data, which is the simplest, ignorance the effect of the time, the basic formula of this model is as follows(13):

$$Y_{it} = \alpha_i + X_{it}\beta + \varepsilon_{it}$$

The individual effect, which is supposed to be constant over time t specific to each cross-

section i, if a is the same in all the computational units, the model is the aggregate regression model (9) It assumes the heterogeneous of random error limits between the units, the expected value of the random error limit should be zero. This model also assumes that the variance must be zero, that mean no autocorrelation between random error limits (6). The data in this search were arranged in two parts, the first part represents the individual effect that expresses the units The second part is the time, using the OLS and Eviwes program. The relationship between the net income of the farmer (1000 I.D) is the dependent variable, the cultivated area (donem), costs (1,000 I.D), the value of animal production (1000 I.D),the value of farm assets (1000 dinars) and the farm distance, on the market 0 if the farm far away from the market, 1 if the farm close from the market. As shown in table 1.

Table 1.Results of Pooled Regression Model (PRM)

Dependent Variable: LNNETINCOM
Method: Panel Least Squares
Date: 04/11/17 Time: 21:02
Sample: 2015 2016
Periods included: 2
Cross-sections included: 41
Total panel (balanced) observations: 82

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEARA	0.252041	0.225785	1.116287	0.2678
LNCOSTS	0.681300	0.184895	3.684802	0.0004
LNAPV	0.007864	0.015191	0.517700	0.6062
LNESSETSVALUE	0.002179	0.119747	0.018200	0.9855
DISTANCE	-0.559108	0.223759	-2.498708	0.0146
C	4.945862	3.737629	1.323262	0.1897

R-squared	0.254277	Mean dependent var	16.16012
Adjusted R-squared	0.205216	S.D. dependent var	0.997350
S.E. of regression	0.889144	Akaike info criterion	2.673241
Sum squared resid	60.08387	Schwarz criterion	2.849342
Log likelihood	-103.6029	Hannan-Quinn criter.	2.743943
F-statistic	5.182905	Durbin-Watson stat	1.447038
Prob(F-statistic)	0.000381		

Source: From the researcher by using Eviwes.6program

Second :Fixed Effects Model (FEM)

If there are clear differences and inconsistencies between data such as management style, the estimated values of the parameters PRM by the use of the OLS method will be biased. To address this problem there are several alternatives in econometric literature as use FEM (5), which assumes that the relationship between the dependent variable and the independent variables is the same for all the variables and that the parameters are vary from unit to another within the cross section of the sample of the research, the difference in the constant in the samples can be attributed to the difference in the behavior pattern of the independent variable effect on the dependent variable from unit to another within the cross section where it is assumed that the parameters change in a constant manner, so that are called the fixed effects models(8). In the static effects model, the aim is to know the behavior of each cross-section data by making the parameter B_0 vary from among the groups, while the Bj slope coefficients remain constant for each set of data. Thus, the fixed effects model is as follows:

$$Y_{it} = \beta_{0(i)} + \sum_{j=1}^{k} \beta_j X_{j(it)} + \varepsilon_{it}$$

In order to allow the B_0 to change and to meet the conditions of this model, we use dummy variables to avoid multicoleanarty. We use the OLS method, the fixed effects model, called the Least Squares Dummy Variable (10) after added dummy Variable (7):

$$Y_{it} = \alpha_1 + \sum_{d=2}^{N} \alpha_d D_d + \sum_{j=1}^{k} \beta_j X_{j(it)} + \varepsilon_{it}$$

α1 means the change in the cross pooled for the B_0. Through the fixed effects model, the heterogeneity of the pooled units can be calculated at the constant difference, so (a) is unknown must be estimated. If the number of dummy variables is large, the estimation by using Partitioned Regression according Fixed Effects Model (FEM) between the income net and previous independent variables as well as dummy variable has been added (farm size) (0) In the case of the small farm of less than (30) dunums and (1) for the relatively large farms, more than 30 dunums. As shown in table 2.

Table 2. Results of Fixed Effects Model

Dependent Variable: LNNETINCOM
Method: Panel Least Squares
Date: 04/11/17 Time: 20:59
Sample: 2015 2016
Periods included: 2
Cross-sections included: 41
Total panel (balanced) observations: 82

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEARA	0.254811	1.078768	0.236205	0.8146
LNCOSTS	0.133318	0.305879	0.435853	0.6655
LNAPV	-0.008902	0.037619	-0.236631	0.8143
LNESSETSVALUE	0.302537	0.250019	1.210057	0.2341
FARMSIZE	1.035368	1.027622	1.007537	0.3204
C	8.824707	7.704934	1.145332	0.2596

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.768450	Mean dependent var	16.16012
Adjusted R-squared	0.479013	S.D. dependent var	0.997350
S.E. of regression	0.719881	Akaike info criterion	2.479291
Sum squared resid	18.65626	Schwarz criterion	3.829401
Log likelihood	-55.65092	Hannan-Quinn criter.	3.021339
F-statistic	2.654982	Durbin-Watson stat	3.904762
Prob(F-statistic)	0.001592		

Source: From the researcher by using Eviwes.6 program

Third: Random Effects Model(REM)

Although it is easy to apply the fixed effects model or LSDV model, the contrast is high because of the degrees of freedom. We have many cross-section units, so the random effects model reduce the degrees of freedom. We do not need an estimate of N cross parts of the Y axis for each unit. We only need to estimate the expected value for cross part and its variation from y axis (10). This model is treated cross and time effects as a random and not a fixed parameter, this assumption is based on the cross effects and time effects are independent random variables by mean zero and limited variation added as random components in the random error, the REM model assumes that each farm or year is different in its random term, the fixed effect is as a special case within the random effect is called the error component model (ECM) if the time and cross effects are available in the random effects model (12). The error variance is constant and homogeneous, there is no autocorrelation. The B0 is treated as a random variable with a rate u:=

B_0 =u +vi

The random effects model is as follows:

$$Y_{it} = \mu + \sum_{j=1}^{k} \beta_j X_{j(it)} + v_i + \varepsilon_{it}$$

v_i: represents the random error term in the cross-section data i. Based on the above

formula, the REM model has several characteristics (2)**:**

E (ξit) = 0, var (ξit) =σ^2_{ξ}, E(vi)=0, var (vi) = σ^2_{v}, E (Wit) = 0, var (Wit) = σ^2_{ξ} + σ^2_{v}Wi= vi + ξit

Therefore, this model can not be estimated by OLS method because it will give inefficient estimators with incorrect standard errors, usually use the Generalized Least Squares (GLS) method which gives the best unbiased linear estimate.

Table 3. Results of Random Effects Model

Dependent Variable: LNNETINCOM
Method: Panel EGLS (Cross-section random effects)
Date: 04/11/17 Time: 21:04
Sample: 2015 2016
Periods included: 2
Cross-sections included: 41
Total panel (balanced) observations: 82
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEARA	0.227773	0.254455	0.895140	0.3735
LNCOSTS	0.552669	0.190178	2.906060	0.0048
LNAPV	0.005381	0.016528	0.325547	0.7457
LNESSETSVALUE	0.049839	0.128054	0.389207	0.6982
DISTANCE	-0.609642	0.255548	-2.385628	0.0195
C	6.204034	3.955220	1.568569	0.1209

Effects Specification	S.D.	Rho
Cross-section random	0.515742	0.3391
Idiosyncratic random	0.720029	0.6609

Weighted Statistics			
R-squared	0.186144	Mean dependent var	11.35306
Adjusted R-squared	0.132600	S.D. dependent var	0.784874
S.E. of regression	0.730987	Sum squared resid	40.61000
F-statistic	3.476512	Durbin-Watson stat	2.031662
Prob(F-statistic)	0.006973		

Unweighted Statistics			
R-squared	0.247882	Mean dependent var	16.16012
Sum squared resid	60.59916	Durbin-Watson stat	1.361501

Source: From the researcher by using Eviwes.6 program

The preference between the used models

The choice of any of the estimated models is important and depends on a set of tests as well as the assumptions that the researcher places on the possible correlation among the section units, amount of error and independent variables. These tests include the following:

1.Preference between the Pooled Regression Model (PRM) and the Random Effects Model(REM): The LM test is the Random Effects Test, it used to test the presence or absence of random effect. It is proposed by Breuch and Pagan in 1987 to preference between PRM and REM model. When applying this test, an alternative hypothesis was implemented that states the superiority of the random effects model as shown in Table 4.=

2.Preference between the Pooled Regression Model and the fixed effects model

F test is used to compare the FEM and PRM model, the test indicated to the advantage of the fixed effects model. We conclude from both tests that the pooled regression model is no appropriate.as shown in Table 4.

Table 4.Results of F,LM Tests

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.541930	(40,36)	0.0954
Cross-section Chi-square	81.848250	40	0.0001

Reference: From the researcher by using Eviwes.6 program

3.Preference between the fixed effects model and random effects model

Hausman test used for the preference between the FEM and the REM model (11). It used in the case of a fundamental difference between fixed and random effects, its the range which the individual effect is associated with independent variables. The null hypothesis depend on this correlation, therefore fixed and random estimators are consistent but the random effects are more efficient. In the case of the alternative hypothesis, fixed effects estimators are only consistent. When H test is applied to the models that have χ^2 distribution based on the Wald statistic show the superiority of the random effects model,we accept null hypothesis as shown in table 5.

Table 5.Results of Hausman test

Correlated Random Effects - Hausman Test
Equation: EQ03
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.330948	4	0.1758

Source: From the researcher by using Eviwes.6 program

We can also consider whether it is possible to rely on the FEM model or the REM model by the number of N (number of cross-section units) and the number of T (number of time series data). As long as N is large and T is small, the estimates obtained are significant differences. Since the sample is random a larger community, the REM model is better. In this case, the statistical inference is unconditional (10). This was agreed with the Hausman test. Based on the above, we adopt the model of random effects in interpreting the results.The most important variables affecting the net income studied in this study are the area variable, where the reference is identical to the economic logic, the value 0.22,means when the area increased by 1%, the net income will increase by 0.22% because it provides the minimum requirements to full employment for family farm, the ability to utilization modern high-productivity resources to ensure a net income that meets the requirements of these families, Failure to do so may not help to provide that level of income that helps to exploit the surplus to reinvestment to increase in the profits in the long run. The logic of this increase and its reflection on the increase in income is due to the fact that the most important factors on which the income depends is the size of the possession, which increases the production by its breadth. This relationship is based on the fact that large farms can provide the possibilities to grow larger areas and enable higher rates of products which mean the high rates of income, and can benefit from increasing the area of the advantages of large production through the optimal utilization of resources and the possibility of taking advantage of advanced technology and its link to the complex intertwined in its economic and social aspects and financing and administrative skills family size. Permanence size of the area is constant or decreasing as a result fragmentation of position with continuous increase in the rural population will cause pressure on the area, contribute to the increase in employment, resulting in lower wages compared to the cost of capital and thus lower net income. The cost variable is positive. It is contrary to the logic of the economic theory, which assumes that the increase in costs reduces net farm income, but this relationship can be justified by increasing the production accompanied by an increase in costs and continuing to increase production as long as the increase in revenue exceeds the cost that contributed to its increase, because the average cost of area that are relatively constant or decrease when increasing the production, there should be depend on the use of modern technologies in the pot will increase the amount of production to the combination of various productive activities appropriate, thus reflected in the increase in net income. The value of animal production parameter is positive, but it is in

line with the economic logic, if the farm income increases with the value of animal production. Therefore, if its value increases by 1%, the net farm income will increase by 0.005%, this also reflects the profitability of the animal production activity and its contribution to agricultural income. The value of agricultural assets is 0.049 and it is positive and confirms the relationship between net income and asset size. The increase in net farm income is entirely related to the size of investments in farm assets, especially real assets. The balance is composed of different types of assets divided by their useful life (fixed, medium, current). The value percentage of any type of these types of total depends on the type of project, the size of the sales, the available possibilities, the capital owned and the management's ability to finance them. Therefore, the increase of farm assets by 1%, net farm income will increase by 0.049% this confirms that one of the most important factors affecting the growth of projects is reinvested in the assets, the rates of return is unstable because the costs rising and price fluctuations requires the gradual intensification of continued investment in medium-run assets and real assets to ensure the increase in profits in the short run, ensure diversification and distribution of the use of real assets of projects to ensure at least minimum farm income, increase in productivity may be due to higher income and the reinvestment of surplus in the development of technology and other means. The distance or farm from the market is an important determinant of net farm income, as the sample farms are far from the sales centers, this reflects negatively on the net farm income, distance of the farm resulting high costs of transportation and crop damage as well as most cultivated areas are small that and produce small quantities that do not bear the high costs of transporting them to a far distance so farmers have to sell them at the farm gate at a lower price if the distance increase in one unit, net farm income will decrease by 0.6%. Statistically, the cost and distance variables were significant at 1%, while the other variables did not achieve the statistical significance, This was due to the lack of time series and the greatest number of cross-section data that missing in degrees of freedom, but the model as a whole was significant at 1% according to F test 3.476, this value indicates the importance of the variables included in the analysis and the realism of the function. R^2 is lower, which is lower in the random effects model than the other models. This is normal because the determine coefficient depends on different measurements in its calculation in the models. The research concludes that the results of the estimation in the long data are more accurate, the degrees of freedom are more than the use of one model, and that the distance of the farm from the market and its size has a clear effect on the net income of the farmer, it reflects its effect on the area productivity and the revenues achieved from it, and on the costs of the productive unit, decline the net agricultural income is not due to the non-operation of the elements of production to the extent that these elements do not reach full employment, therefore search recommends the need to intensify the appropriate technological factors and provide the necessary funding and recycling part of the income to invest in agricultural assets. And to identify clearly the scientific means to increase production and achieve the maximum farm income of the same resources, possibilities available and deal with the unit area of the proper management and scientific use.

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