
A tentative understanding of the differentials in incomes between farm and non-farm households among selected OECD member countries

Bruno Henry de Frahan, Rembert De Blander
and Jérémie Dong
Earth and Life Institute
Université catholique de Louvain
Davis, 26 May 2015

Overview

1. Motivation
2. Background Literature
3. Household Data
4. Estimation Procedure
5. Preliminary Estimation Results
6. Tentative Conclusions

1. Motivation

- Low income problem among OECD farm households
 - Still used to justify government intervention
 - While not well documented
- Research questions:
 - To what extent income differentials still prevail between farm and non-farm households?
 - What can explain these income differentials?
 - Composition effects?
 - Return effects?

2. Background Literature

1. Conventional theoretical frameworks for explaining income differentials b/w farm and non-farm households
2. Available empirical studies on income differentials b/w farm and non-farm households

The Classic Perception in the U.S.

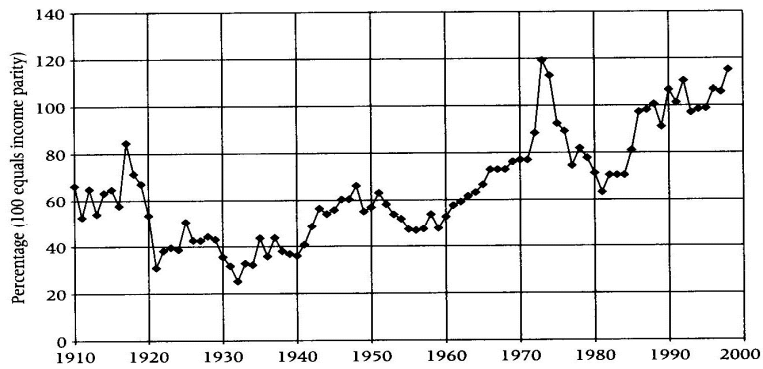
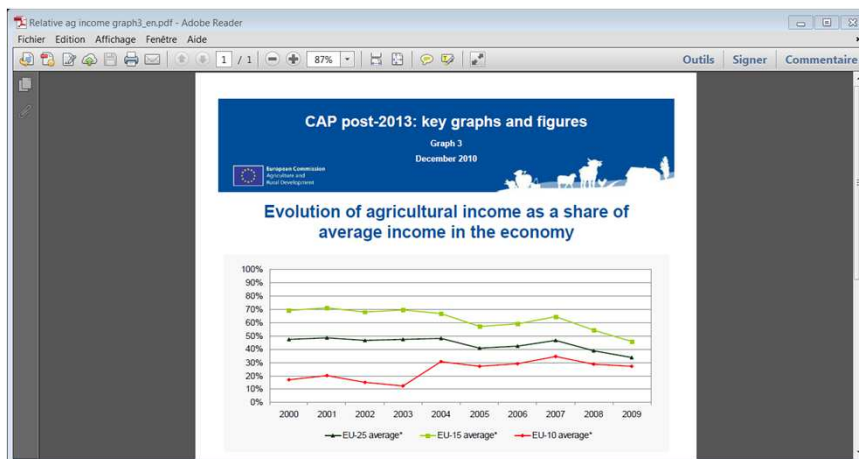


Figure 3.12 Farm as percentage of nonfarm household income. Data from U.S. Department of Agriculture, *Agricultural Outlook*, December 1999; U.S. Department of Commerce (1975).

Source: Gardner, 2002

... and in the EU



2.1 Conventional Theoretical Frameworks (Gardner, 1992)

1. Commodity market conditions (e.g., T.W. Schultz, 1945 and others)
2. Earning disequilibrium b/w sectors (e.g., D.G. Johnson, 1959 & 1963)
3. Compensating differential for income earning capacity and other aspects (e.g., D.G. Johnson, 1953, and Gardner, 1992 & 2000)

2.2 Existing Empirical Evidence (1/3)

- Low-income problem among farm households:
 - Not anymore on average in the US since the mid-1960s (Gardner, 1992)
 - Not anymore on average in most EU countries since the 1980s (Eurostat, 2002)
 - Not anymore on average in many OECD countries (OECD, 2003)
- Greater income inequality among farm households:
 - Not anymore in the US by 1990 (Gardner, 2000)
 - Still in most OECD countries in early 1990 (OECD, 2001)

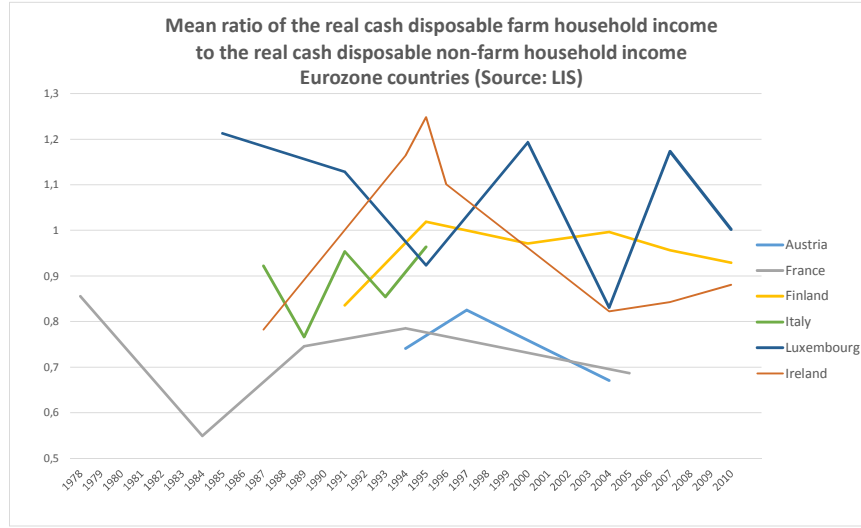
2.2 Existing Empirical Evidence (2/3)

- Mishra *et al.* (2002) in the U.S. for 1999:
 - Average income for farm hh \approx average income for non-farm hh
 - Average wealth for farm hh $>$ average wealth for non-farm hh
- Katchova (2008) in the U.S. for 2004:
 - Average income for commercial farm hh ($>$ US\$ 250,000) \approx average income of non-farm entrepreneurs
 - Average income for intermediate farm hh ($<$ US\$ 250,000) \approx average income of wage-earning for non-farm hh
 - Slightly greater Income inequality among commercial and intermediate farms
- Peake & Marshall (2009) in the U.S. for 2005:
 - Average income for farm entrepreneurs \approx average income on non-farm entrepreneurs

2.2 Existing Empirical Evidence (2/3)

- Henry de Frahan *et al.* (2008)'s study using 1969-2004 LIS surveys:
 - At country level, average incomes of farm households are close or greater to those of non-farm households in most of the surveyed OECD countries since 1970s
 - Large fluctuations for some countries (AU, US)
 - But, greater income inequality and low-income incidence and intensity among farm households

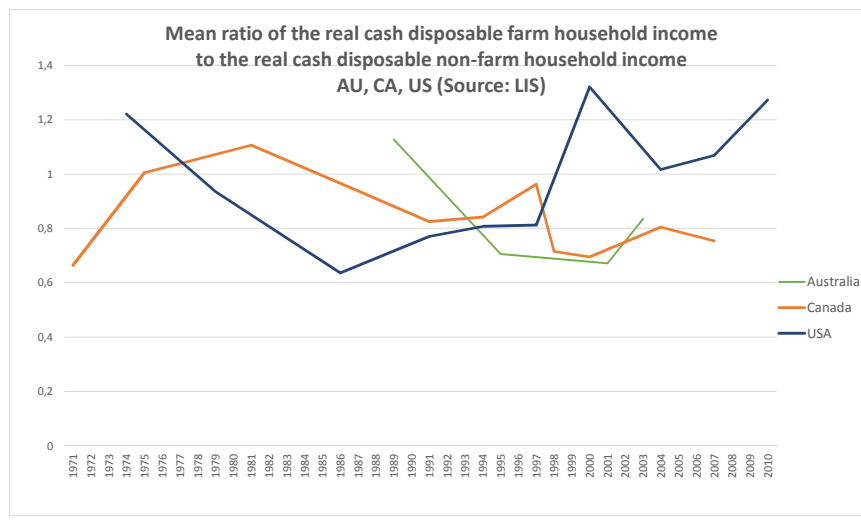
... and our updated calculation for the EU



UCDavis 26 May 2015

11

... and for Australia, Canada and the U.S.



UCDavis 26 May 2015

12

3. Household Data

1. National household-based budget surveys
 - Harmonized by Luxembourg Income Study (LIS)
2. Available household data
3. Farm household definition

Country	Survey wave
Australia	1989, 95, 2001, 03
Austria	1994, 97, 2004
Canada	1971, 75, 81, 87, 91, 94, 97, 98, 2000, 04, 07
Finland	1987, 91, 95, 2000, 04
France	1978, 84, 89, 94, 2005
Germany	1973, 78, 83, 2007, 10
Hungary	1991, 94, 99, 2005
Ireland	1987, 94, 95, 96, 2000, 04, 07, 10
Italy	1987, 89, 91, 93, 95
Luxembourg	1985, 91, 94, 97, 2000, 04, 07, 10
Netherlands	1987, 93
Norway	1986, 91, 95, 2000, 04
Poland	1986, 92, 95, 99, 2004
Switzerland	1992, 2000, 02, 04
United States	1974, 79, 86, 91, 94, 97, 2000, 04, 07, 10
15 countries	84 waves => millions of households!

3.2 Available Household Data

- Net disposal household income
- Factor income:
 - gross salaries + farm & non-farm self-employment income + cash property income
- Farm self-employment income
- Geographic: rural vs urban (country-specific)
- Age of household head & spouse
- Education level of the household head & spouse:
 - Low, medium (secondary completed) and high (tertiary completed)
- Gender of the household head
- Household size
- Number of potential earners b/w 18-65 years old
- Expenditures by large categories

15

3.3 Farm Household Definition

Following OECD (2001):

- “broad” definition: households whose farm self-employment income is not zero
- “narrow” definition: households whose farm self-employment income is more than 50% of their factor incomes
- where:
 - self-employment income: return to family labour and some own-capital.
 - factor incomes = gross salaries + farm & non-farm self-employment income + cash property income

UCDavis 26 May 2015

16

Caveats with the “narrow” definition of farm household

- Possible underestimation of farm hh incomes b/c:
 - incomes in-kind are not accounted for
 - incomes from self-employment, including from farming, may be under-reported
 - Hh with accidentally low or negative farm self-employment income are not considered as farm hh:
 - when their factor income is positive
 - unless their negative farm self-employment income is less than half their negative factor income
 - Hh with great return to cash property income (e.g., landowners) may not be considered as farm hh
- ⇒ Need a sensitive analysis on the 50% threshold

UCDavis 26 May 2015

17

4. Estimation Procedure

1. The Oaxaca Decomposition
2. The Outcome Equation
3. The Sample Selection Process
4. Various Tests and Corrections
5. Decomposition
6. Inference of the Composition and Return Effects

UCDavis 26 May 2015

18

4.1 Oaxaca Decomposition

- Using the household income-earning capacity model and few other aspects
- Identify to what extent income differentials result:
 - from differences in the composition of characteristics b/w farm and non-farm hh => composition effects
 - from differences in the return to those characteristics => return effects
- ⇒ Oaxaca (1973) counter-factual decomposition to generate and test the composition and return effects

UCDavis 26 May 2015

19

4.2 The Outcome Equation by Country (1/2)

Construction of the dependent variable ($y_{hy} = \$DADI_{hy}$):

- Net disposal income: DPI from LIS
 - DPI adjusted for household size: $ADI = DPI / s^e$
 - s is the hh size (LIS)
 - e is the equivalence elasticity (= 0.55) from Förster (1994)
 - Deflated ADI: $DADI = ADI / CPI$
 - CPI is the 2005 base Consumer Price Index (OECD)
 - $\$DADI = DADI / \PPP
 - $\$PPP$ is the US\$ Purchasing-Power Parity exchange rate for household actual individual consumption (OECD)
- ⇒ Deflated adjusted household net disposal income in real \$PPP

20

4.2 The Outcome Equation by Country (2/2)

Independent variables (x_{jhy}):

- Skills:
 - education level dummies (high = 1, if not = 0; medium = 1, if not = 0) of the household head & spouse
 - age of the household head (linear & in square)
- Adjustment costs in labour movement:
 - area dummy (urban = 1, rural = 0)
 - age of the household head (linear & in square)
- Others:
 - gender dummy of the household head (male = 1, female = 0)
 - potential earners b/w 18-65 years old
 - time period dummies except for the starting year
- Hh dummies as well as in interaction w/ all variables

 - farm hh (farm hh = 1, if not = 0)
 - non-farm hh (non-farm hh = 1, if not = 0)

21

4.3 The Sample Selection Process

- To take care of the possible endogeneity of the farm household dummy in the outcome regression
 - Use a Probit to generate a control variable that is the likelihood of being a farm household as a function of the indpt variables (and possible instruments)
 - Add this control variable in the outcome equation as well as in interaction w/ all indpt variables
 - Similar to a treatment-effects model
-

22

4.4 Various Tests and Corrections

- Tests and correction for multicollinearity
- Recovery of the coefficient for orthogonalised variables (age) and associated variances
- Correction of the variance matrix to account for the use of control variables

4.5 Decomposition

- The expected outcome difference between farm and non-farm households ($\bar{y}_F - \bar{y}_{NF}$) can be decomposed into:
 - a composition effect C
 - a return effect R
 - that can be recovered for each independent variable x_j :

$$C_j = \frac{1}{2} (\hat{\alpha}_{x_j F} + \hat{\alpha}_{x_j NF}) (\bar{x}_{jF} - \bar{x}_{jNF})$$

$$R_j = \frac{1}{2} (\bar{x}_{jF} + \bar{x}_{jNF}) (\hat{\alpha}_{x_j F} - \hat{\alpha}_{x_j NF})$$

4.6 Inference of the Composition and Return effects

- Calculate the variance and covariance of every sum and difference of coefficients $\hat{\alpha}_j$ and means \bar{x}_j
- Calculate the variance and covariance of the products of the terms in coefficients and in means to obtain the variance of the composition and return effects assuming uncorrelatedness between coefficients $\hat{\alpha}_j$ and means \bar{x}_j
- But for now,
 - we test whether the terms in difference are equal to zero generating p-values following a Z-test
 - we generate the significance for the sum of all composition and return effects using a Wald test assuming that all these terms are uncorrelated

UCDavis 26 May 2015

25

5. Preliminary Estimation Results

1. For USA and Canada
2. For France and Italy

UCDavis 26 May 2015

26

Variable	USA: 492,180 hh		CANADA: 284,737 hh	
	Composition effect	Return effect	Composition effect	Return effect
age	13387,55**	388293,82**	-1092,25**	-88769,47**
age square	-8550,41**	-183000**	795,32**	39363,16**
pot. earners	-91,66**	-7700,3**	103,99**	-2307,38**
high educ, head	-1958,56**	-888,3**	3548,22**	-11360,76**
medium educ, head	1004,86**	4554,79**	217,88**	-4025,08**
high educ, spouse	-57,85*	-3139,76**	-274,02**	-608,45**
medium educ, spouse	2768,5**	10260,71**	200,02**	3434,1**
male	7331,36**	37229,7**	765,68**	598,24**
urban	-1776,86**	3384,96**	2221,35**	-5744,48**
year 1975	-	-	-743,56**	-2734,14**
year 1979	-461,02**	-874,97**	-	-
year 1981	-	-	396,52**	1270,85**
year 1986	248,01**	2493,74**	-	-
year 1987	-	-	165,91**	1181,25**
year 1991	462,3**	14969,65**	8,38**	1584,95**
year 1994	-420,31**	15702,73**	-317,76**	2816,65**
year 1997	-1713,42**	17364,68**	-145,41**	2379,33**
year 1998	-	-	-1023,22**	6927,43**
year 2000	61,14	-605,84**	-682,13**	4463,09**
year 2004	-3170,4**	19318,46**	-1029,31**	5616,4**
year 2007	-4910,5**	22799,64**	-1293,25**	4241,37**
year 2010	-5054,1**	20908,46**	-	-
constant	0	-281000**	0	4781,89
total	-2901,35	79785,15	1822,38	-36891,05
std. dev.	1920,92	13479,3	2372,24	7636,71

* sig. at 5%; ** sig. at 1%

UCDavis 26 May 2015

27

Variable	FRANCE: 53,196 hh		ITALY: 40,713 hh	
	Composition effect	Return effect	Composition effect	Return effect
age	5478,93**	11972,59**	1479,95*	-242000**
age square	-3887,99**	-4093,67**	-2615,07**	112988,4**
pot. earners	-298,95*	12036,91**	-2445,06**	-22809,02**
high educ, head	-439,16**	-1227,15**	-4921,91**	6663,24**
medium educ, head	-190,86**	-604,79**	3461,73**	-14308,04**
high educ, spouse	-1074,42**	1126,85**	-3227,9**	7105,72**
medium educ, spouse	-195,31**	256,26**	-1919,49**	6791,59**
male	31,75*	-4580,38**	-595,48**	-11788,13**
urban	1382,1**	-4031,38**	2318,99**	-31705,22**
year 1984	197,76**	1085,9**	-	-
year 1989	-2,03	2685,63**	134,01	1861,55**
year 1991	-	-	-268,02*	-3473,64**
year 1993	-	-	687,24**	-5768,46**
year 1994	-41,3*	1809,77**	-	-
year 1995	-	-	432,59**	-4378,15**
year 2005	1527,69**	8549,59**	-	-
constant	0	-55185,51**	0	236155,01**
total	2488,21	-30199,39	-7478,42	34871,62
std. dev.	1645,39	6007,1	4469,87	24602,46

* sig. at 5%; ** sig. at 1%

UCDavis 26 May 2015

28

Some observations

- Countries tend to have their own pattern of composition and return effects
- Difficulties to generalise explanations for income differentials
- Positive return effects to education of the farm hh spouses
- Positive return effect to medium education of the farm hh head in the U.S. and to high education in Italy
- Positive return effect to urban location of the farm hh in the U.S. but negative in Canada, France and Italy
- Improvements of the return effects to years for farm hh through the time period for the U.S. (except 2000), Canada and France
- Income differences prevail through the time period:
 - Positive for farm hh in U.S. and Italy
 - Negative for farm hh in Canada and France

UCDavis 26 May 2015

29

6. Tentative Conclusions (1/2)

- Unexplained difference in income is still large
- Many return effects call for further investigations
- Farm hh are doing better and better in the U.S and Canada and, to some extent, in France
- This analysis contributes to demystify income differentials between farm and non-farm households

UCDavis 26 May 2015

30

6. Tentative Conclusions (2/2)

- Perform a sensitivity analysis on the definition of farm hh
- Remove some social transfers from DPI
- Add indpt variables for the US: regions and race
- Add new available waves
- Perform adequately the statistical inference
- Investigate further unexplained differences using the commodity and factor market conditions and, possibly, enlarging the framework of investigation
- Draw lessons for emerging countries

Thank you!