The Impact of the FDI Inflow in the "Agriculture and Fishing" Sector of OECD Countries on CO2: Some Empirical Evidence

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Abstract.

With reference to thirty OECD countries and a time-span of twenty-five years (from 1981 to 2005), we analyse the FDI dynamic in the primary sector and, more specifically, in the "agriculture and fishing" sector to observe whether and how its inflow generates a certain level of environmental impact, which can be proved to be statistically relevant. By referring to available data on pollutant agents such as Carbon dioxide (CO2) from fuel combustion, which is considered to be specifically linked to those activities typically run in the considered sector, and FDI inflow per country and per activity sector, we use the econometric technique of panel data analysis. Among the main results of the analysis, we find that the use of CO2 from fuel combustion in the agricultural sector does not generate statistically significant results with regard to the main relationship under investigation (that between FDI inflow in the "agriculture and fishing" sector and the considered pollutant), although some other meaningful evidences are achieved and discussed.

Keywords: FDI and Environment; Environmental Impact of FDI; CO2 emissions.

1. Introduction.

A quick look at the literature review shows how studies on the FDI-environment relationship can be clustered in three main veins of discussion: 1) the environmental effects of FDI flows; 2) the competition for FDI and its effects on environmental standards; 3) the cross-border environmental performance. It has also been highlighted how the theme related to the environmental effect of FDI is still largely unexplored and calls for further research (OECD, 2002[b]). This is even truer when this type of argument is treated at the level of specific economic activity sectors. In fact, there is little research in this sense and it is still far from a definitively clear understanding of the phenomenon.

For this reason, we analyse the relationship between FDI and the environment, while focusing on the environmental effect of FDI in the context of the "agriculture and fishing" sector of thirty out of thirty-four OECD countries[2]. More

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[2] The thirty considered OECD countries are: **1)** Australia; **2)** Austria; **3)** Belgium; **4)** Canada; **5)** Czech Republic; **6)** Denmark; **7)** Finland; **8)** France; **9)** Germany; **10)** Greece; **11)** Hungary; **12)** Iceland; **13)** Ireland; **14)** Italy; **15)** Japan; **16)** Korea Republic; **17)** Luxembourg; **18)** Mexico; **19)** Netherlands; **20)** New Zealand; **21)** Norway; **22)** Poland; **23)** Portugal; **24)** Slovak Republic; **25)** Spain; **26)** Sweden; **27)** Switzerland; **28)** Turkey; **29)** United Kingdom; **30)** United States of

specifically, we want to observe whether and how the sectoral FDI inflow in the considered countries has an impact on environmental features such as Carbon dioxide (CO2) emissions. While postponing the explanation for the reason of the choice of this pollutant to the end of this section, we now would like to recall the essential literature, which our work refers to. In fact, our study basis its idea on some relevant works on this issue and focuses its analysis structure on the decomposition of the impact of FDI on the environment into scale, composition and technique effects (Grossman & Krueger, 1991 and 1993[a]; Cole & Elliott, 2003; He, 2006)[3]. For the purpose of our study, the three types of effect are all the result of the FDI inflow entry in the "agriculture and fishing" sector of the considered OECD economies. However, while the scale effect refers to the increase in the size of the economy, the composition (or structural) effect is associated to the change in its industrial structure occurring as a shift in the pattern of economic activity. Lastly, the technique effect refers to the change in the production method – this involving development, transfer and diffusion of technology – deriving from the FDI inflow. The environmental implication of the scale effect hypothesizes the generation of a detrimental result deriving from the fact that an increase in the size of an economy implies more production and, in turn, more pollution. However, it must be highlighted that the scientific discussion on the scale effect contains the EKC argument in itself and, grasping the different positions from the literature, we are aware of the different viewpoints the empirical investigation on this topic has generated with respect to the above stated hypothesis. With respect to the composition effect, it is generally expected to be beneficial to the environment on the assumption that the free movement of investment encourages allocative efficiency among countries (OECD, 2001). However, this view is not subject to general agreement. Other works highlight how the expected sign of the impact resulting from the composition effect – in a free trade and investment context – is the result of the productive specialization of a country. This, of course, depends on the country's competitive advantages, which can be characterized by opposite sources (Cole & Elliott, 2003). Finally, the environmental implication of the technique effect can be represented by the fact that, as FDI inflow, growth and income increase, the demand for

America. The remaining four OECD countries (Chile, Estonia, Israel and Slovenia) are not taken into consideration, because their accession only took place in 2010. At the last visit made in November 2011, the OECD database within the ESDS International statistical support tool (which is the only database available reporting data on the sectoral breakdown of FDI), does not yet report information on these countries, since it is based on the "OECD international direct investment statistics (vol. 2010, release 01) with updates at 2007. It is here the case to highlight that the above indicated ascending enumeration will be used as country reference for the identification of each single country in some graphs, which will be presented in the annex section.

[3] These terms, which now belong to the standard economic terminology, were entered in the economic literature after they were used by Grossman and Krueger in their seminal work of 1991, where they analysed the environmental impact of trade liberalization within the context of the NAFTA agreement (Grossman & Krueger, 1991). Although these terms were coined in relation to trade, they are also used for the case of FDI studies. This makes sense if we think – as will be highlighted again in the work – that trade and FDI are the two faces of the same coin due to the strong correletion existing between them and proved by various studies (e.g. Ghosh, 2007; OECD, 2002).

environmental quality also increases. This leads to the generation in the considered economy of a new demand for products based on more "environmentally friendly" technologies or to the enforcement of environmental regulation policies. In other terms, the technique effect is generally referred to the development, introduction and diffusion of new and more efficient technologies. For this reason, they are expected to exert a beneficial role on the environment (Grossman & Krueger, 1991 and 1993[a]; Cole & Elliott, 2003; He, 2006; Liang, 2006).

The explanation of the reason why we choose CO2 as the pollutant subject of our analysis is based on the following aspects. First of all, CO2 is the mainly investigated pollutant and represents the main aspect whose reduction policies worldwide are trying to pursue[4]. Furthermore, CO2 is among those few pollutants for which availability in larger and more complete dataset is ensured. Of course, CO2 is here considered, in connection wit the purpose of our analysis, in relation to the activity of fuel combustion occurring in both agriculture and fishing, whose data are available thanks to estimates provided by the International Environmental Agency (IEA). With regard to the relationship between CO2 and agriculture, we must observe how this is fundamentally based on deforestation (quite often caused by the expansion of agriculture to the expense of forested areas) and biomass burning (Fernandes & Thapa, 2009: 2; World Bank, 2009: 8). For other aspects, in relation to the identification of possible links between CO2 and fishing, we can observe that some studies state how the removal of marine biota – basically occurring through uncontrolled fishing activities, which always results into heavy marine resources exploitation – would increase the almost unknown atmospheric Carbon dioxide (pCO2), which implies an increase of CO2 (Fashman, 1993; Shaffer, 1993). Nevertheless, as we have already mentioned above, the link between CO2 and the "agriculture and fishing" sector is here in this study particularly taken into consideration with regard to fuel combustion emission happening in their related activities.

Having so far circumscribed our argument by briefly reviewing the relevant literature for the purpose of our analysis and justifying the choice of the two considered pollutants, we now move onto describing the dataset and the methodology used for our empirical investigation. This will be the aim of the next section. In the further section we will present the results of the analysis and the relative comments. Some final conclusions together with a discussion of the resulting policy implications will be drawn in the final section.

2. Data, method and modelling strategy description.

In this section we first describe the main features of our dataset. Afterwards, we will give a specific look at the evolutionary trends – over the considered period of our main investigated variables: the FDI inflows and stocks and the considered

[4] Relevant studies state that, CO2 together with CH4, N2O (Nitrous Oxide) and halocarbons (which is a group of carbons containing fluorine, chlorine or bromine), it is among the four long-living Greenhouse Gases (GHGs) and the main largest contributor to global warming and climate change as a result (IPCC, 2007: 36-37).

pollutants. As has already been referred, our investigation on the impact that FDI arriving into the "agriculture and fishing" sector of receiving countries generates in their environmental contexts focuses on the OECD area. Hence, data cover thirty national countries and, where has been possible on the basis of their availability, are related to the period between 1981 and 2005. As a result, the full dataset we have composed for the purpose of our analysis contains twenty-three different variables and is characterized by remarkable country disparities, which should guarantee a good efficiency level for our empirical analysis. The gathered data – all sourced from the databases of different international organizations – have been handled to build indicators, which have all been tried in numerous analysis attempts aimed at looking for the best fit of the estimated models. For easier reading, the table below (tab. 1) reports very schematically the specification of only those variables (out of the twenty-three total), which have been found to be statistically relevant in our analysis together with the indication of their data source[5].

Tab. 1 – Variable specification

No.	Variable	Description	Source
1	Ln_CO2sct	Dependent variable. Natural log. of the ratio between the amount of Carbon dioxide (in million tons) from fuel combustion in the sector and the amount of population	Our computation on IEA estimation and UN data
1 bis	Ln_CO2tot_pc	Dependent variable. Natural log. of the ratio between the total amount of Carbon dioxide (in mln. tons) and the amount of population	Our computation on IEA estimation and UN data
2	Ln_GDPsct_pw	Natural log. of the ratio between the sectoral GDP (in real US$) and the amount of workers in the sector	Our computation on UN and OECD data
3	Ln_GDPsct_pw2	Natural log. of the squared ratio between the sectoral GDP (in real US$) and the amount workers in the sector	Our computation on UN and OECD data
4	Ln_FLWsct_pGDP[6]	Natural log. of the sectoral FDI inflow (in real mln. of US$) per unit of GDP (in real US$)	Our computation on UN and OECD data
5	Ln_SCTrel_2	Natural log. of a sectoral relevance indicator given by the ratio between the sectoral GDP (in real US$) and the total GDP (in real US$)	Our computation on UN data
6	Ln_GCF_pw	Natural log. of the ratio between the amount of Gross Capital Formation[7] (in real US$) and the total no. of work force (in thousands)	Our computation on WB, ILO

[5] Table 1 reports the two variables *Ln_CO2sct* and *Ln_CO2tot_pc*, because we have used both as dependent variables in our analysis attempts to check their degree of responsiveness in the model we have build. The result will be presented later in the next section.

[6] According to other empirical works, we focus our attention on the FDI inward flow, and not on the inward stock, because the stock measure is unsatisfactory. In fact, FDI stock represents the direct investment position on a historical-cost basis, namely the investment amount already in the host country as opposed to the flow of capital into the host country at a considered year. As already highlighted by Cantwell and Bellack (1998), the use of the book value (which is the historical cost) does not take into account the distribution of the stock age. As a result, international comparison of FDI stocks are almost impossible.

[7] The Gross Capital Formation (GCF) consists of: 1. Gross Fixed Capital Formation (GFCF), that is the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non- produced assets (e.g. subsoil assets or major improvements in the quantity, quality or productivity of land) realised by the productive activity of

7	Ln_edu	Natural log. of the average year of school indicator	Our computation on CID Harvard data
8	Ln_MKTopn_2	Natural log. of a market openness indicator given by the ratio between the amount of export f.o.b. (in real US$) and the total GDP (in real US$)	Our computation on IMF and UN data
9	Ln_1_CRpr_GDP_1	Natural log. of a cross-product derived from the sectoral GDP (in real US$) times the total FDI inflow (in real mln. US$)	Our computation on UN and OECD data
10	Ln_3_CRpr_MKop_2	Natural log. of a cross-product derived from the above market openness indicator times the total FDI inflow (in real millions US$)	Our computation on UN and OECD data
11	Ln_5_CRpr_SCTrel_2	Natural log. of a cross-product derived from the above sectoral relevance indicator times the total FDI inflow (in real mln. US$)	Our computation on UN and OECD data
12	Ln_6_CRpr_GCF	Natural log. of the cross-product derived from the amount of GCF (in real US$) times the total FDI inflow (in real mln. US$)	Our computation on WB and OECD data

Before proceeding to develop any comment, it is important to highlight that all the financial data were gathered in US$ and they were transformed from current to real terms by using the USA Gross National expenditure Deflator (base year = 2000) gathered from World Bank[8]. Moving now onto analysing the dynamic of the trends of the main investigated variables and firstly that of sectoral FDI, the graph below (Graph 1) shows a synthetic view of the trends of the FDI inflow and stock (or inward position) derived from the year by year data aggregation in the thirty OECD countries (see table A1 and table A2 in the appendix section). Although the difficulty arising in dealing with these data, which derives from various gaps and from the way their computation is handled at source, we can see how over all the considered period the trend of the inflows has remained fluctuating in a range varying between minimum of about -736 million (when evidently the amount of disinvestment overtook the investment) and a maximum of +527 million US$ (recorded at 1987). The observation of the aggregated data by country shows how the country which has received the major investment quota is Spain (with a total of about 1,472 million US$) for all the considered period. It is followed by USA (with about 783 million US$) and Italy (with about 595 million US$). The countries which, between 1981 and 2005, have experienced major levels of disinvestment, instead, are: Belgium (with about -2,139 million US$) and Germany (with about -1,528 million US$).

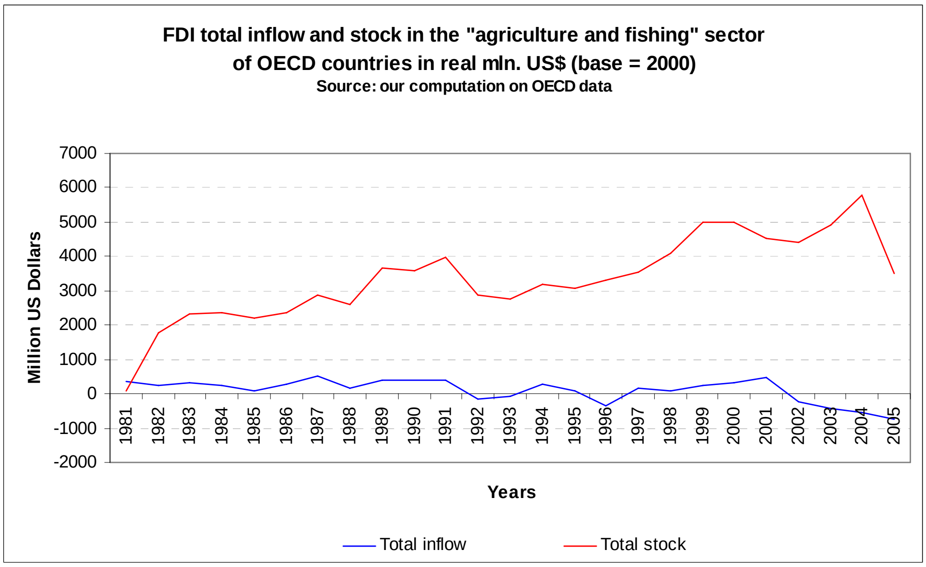
With regard to the FDI stocks trend, the analysis of the OECD aggregated data shows a substantial – although swinging – increase from about 74.5 million US$ in 1981 to about 3,492 million US$ in 2005. As can be observed in the table A2, reported in appendix, the years in correspondence of which the major levels of stock capitalization were recorded are: 2004 (with about 5,798 million US$); 1999 (with about 5,005 US$) and 2000 (with about 4,983 US$). The analysis of the

institutional units; 2. changes in inventories in produced assets like building roads, machinery, stocks of commodities etc. The gross fixed capital formation may also include additions to the produced assets such as improvement of land, cost of transferring land and other non-produced assets between owners. The value of capital formation is added to the value of non-produced assets, but separately 'depreciated' as other changes in volume (http://stats.oecd.org/glossary).

[8] World Bank database at http://databank.worldbank.org

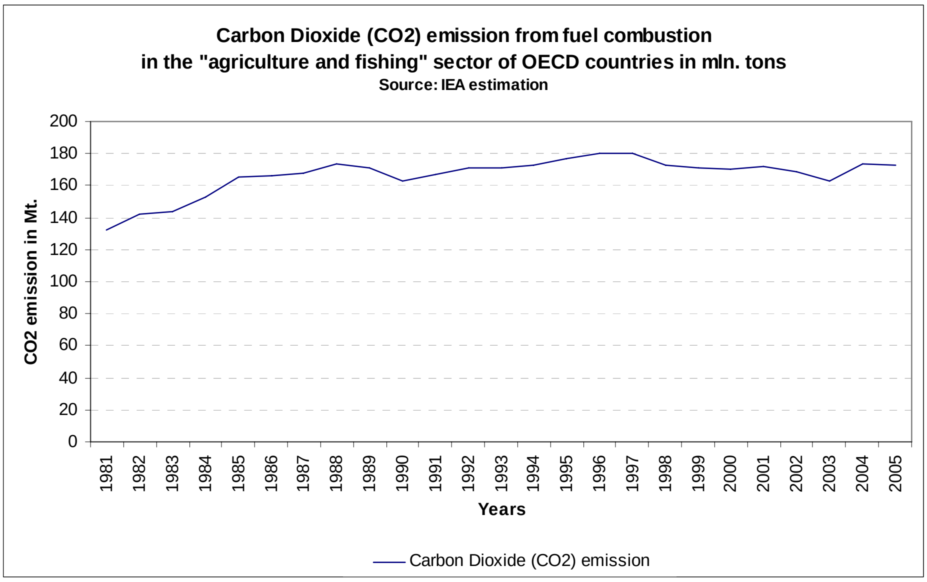
stock dynamic by country makes us observe how, during the all period between 1981 and 2005, USA and Australia are the two countries which have received the highest amount of FDI. In fact, the earlier shows a total stock of about 44,068 million US$, the latter about 18,184 million US$. They are followed by the United Kingdom (with about 4,280 million US$), Mexico (with about 4,086 US$) and Italy (with about 3,834 million US$).

Graph 1



After having observed the evolution of the trend of the sectoral FDI inflows and stocks, we can now move onto commenting the evolution of the trends related to the pollutant we are taking into consideration (CO2 from fuel combustion).
As shown in the graph below (Graph 2), which is built on data estimated by the International Energy Agency (IEA) and reported in the table A3 in the appendix section, we can observe an increase of the sectoral CO2 emission from 132.8 million tons in 1981 to 173.04 in 2005, although during the all period increasing and decreasing fluctuations can be seen. Here again, moving onto analysing the breakdown by country we can see how, during the whole period of the 25 years we are considering, the USA were the major polluters of CO2 from fuel combustion activities in the "agriculture and fishing" sector with about 1,108 million tons. They are followed by Japan (with about 491 million tons), Poland (with about 256 million tons), France (with about 231 million tons), Canada and Italy (with about 192 million tons each) and Netherlands (with about 178). Minor polluting countries are Luxembourg (with 0.56 million tons), Switzerland (with 6.87), Ireland (with 14.92), Iceland (with 16.87) and New Zealand (with its 22.40 million tons).

Graph 2



With regard to the methodology used for the data analysis, we recur to the econometric method and more specifically to the use of the panel data technique, since we deal with both spatial and temporal dimensions. The spatial dimension regards the set of cross-sectional units of observation, which in our case corresponds to the thirty OECD countries. The temporal dimension is characterised by the temporal sources associated in our case study to the time span from between 1981 and 2005. This technique shows the advantage of giving the opportunity of controlling for unobserved heterogeneity so as to eliminate the omitted variable bias together the possibility of investigating in dynamics. Furthermore, it helps to decrease the problem related to the existence of collinearity among variables, which allows the achievement of more precise estimates generated by the efficiency gain resulting from the higher quantity of data which can be considered with respect to other techniques such as cross-section and historical time series analysis (Gujarati, 1995; Woolridge, 2000; Greene, 2003: 291-293)[9].
With regard to the definition of the relationships subject of the present analysis, it can be expressed in log-log terms by the following equations:

[1] $$Ln\_CO2sct_{it} = \alpha + \beta_1 Ln\_GDPsct\_pw_{it} + \beta_2 Ln\_GDPsct\_pw2_{it} + \beta_3 Ln\_FLWsct\_pGDP_{it} + \beta_4 Ln\_SCTrel\_2_{it} + \beta_5 Ln\_GCF\_pw_{it} + \beta_6 Ln\_edu + \beta_7 Ln\_MKTopn\_2_{it} + \beta_8 Ln\_PRTarea_{it} + \beta_9 Ln\_1\_CRpr\_GDP\_1_{it} +$$

[9] A possible problem arising, when employing the panel data technique, can be related to the existence of "attrition". This occurs when units belonging to a dataset are missed to be considered in subsequent steps of the analysis (e.g. the impossibility of interviewing people being part of a dataset – after statistically sampling – because of their absence in the place ant at the moment the interviews are run). However, it is clear this is not our case considered the nature of the data we are considering.

$\beta_{10}Ln\_3\_CRpr\_MKop\_2_{it} + \beta_{11}Ln\_5\_CRpr\_SCTrel\_2_{it} + \beta_{12}Ln\_6\_CRpr\_GCF + \varepsilon_{it}$

where: *i* represents the cross-sectional units related to our 30 OECD countries; *t* is the time dimension referred to the years considered in our time span, that is from 1981 to 2005; ε is the error term. The meaning and construction of all the other variables considered in the above relationships have already been explained in the table reported above (tab. 1), where it is possible to find their detailed specification. Here, it is just the case to specify how the variables in the above equations are associate to the identification of the scale, composition and technique effect. Similarly to what has been done in other studies (e.g. Antweiler et Al., 2001; Cole & Elliott, 2003; Liang, 2006), we associate the scale effect to the two variables identifying the per-capita GDP and its squared computation, these representing the size of the countries' economy and its enlargement. The composition effect is caught by considering two different aspects, which refer to the relevance of the sector in the considered economies and their capitalization levels. More specifically, these two aspects are considered by the ratio between the sectoral and total GDP and by the capital-labour ratio (namely, variables no. 5 and no. 6 as reported in the above tab. 1). Finally and according to Cole and Elliot (2003), the technique effect is identified through the GDP measure taken in isolation, since it happens as a result of a change in the income level[10]. For this reason, in our model we consider the natural logarithm of the per-capita GDP.
A final specification to justify the choice of introducing cross products in our estimation is that sometimes we need a test with power to detect ignored nonlinearities in models estimations and, especially, in those estimated by OLS or 2SLS. To do this, a suggested useful approach consists in adding nonlinear functions, such as squares and cross product (that is a vector obtained by the product of two other vectors) to the original function (Wooldridge, 2002)[11].

[10] In some other relevant work (i.e. Antweiler et al., 2001), scale and technique effects are separately measured through employing of two different identities. While the earlier is measured in terms of GDP per squared km., the per-capita GDP is used for the latter. In agreement with Cole and Elliott (2003: 367), we here decide to use the per-capita GDP to catch the scale effect. Since our analysis focuses on national pollution emissions, the GDP per squared km. would not be significant as a measuring scale. As a result, we observe how the per-capita GDP, which is the obvious measure of the scale effect, is also the measure of the technique effect. Now, the consideration that in the real world the scale effect is likely to be contemporaneous whilst the technique effect is likely to be the result of some past income dynamic, which would suggest diversifying the variable in question by using lagged forms, can be overtaken. Similarly to what has been done by Cole and Elliott (2003), we have tried to run our regressions analysis while using some lagged version of the per-capita GDP, as an alternative to its measure considered at time, and we have reached more or less similar results.

[11] The implementation of such an approach is easy when all explanatory variables are exogenous. F and LM statistics for exclusion restrictions are easily achieved. Complications arise, instead, for models with endogenous explanatory variables, because we need to choose instruments for the additional non-linear functions of the endogenous variable. However, we must consider that transforming into squares and cross product all exogenous variables can considerably consume degrees of freedom (Wooldridge, 2002: 124).

3. Results of the empirical analysis.

To comment on our analysis results, which have been achieved by using the tool Stata/SE 10.0 for Windows, we begin from reporting the table below (tab. 2), where a classical summary statistics of the variables considered in our models appears.

Tab. 2 – Summary statistics of the variables considered in the models

Variable	Obs	Mean	Std. Dev.	Min	Max
Id	750	15.5	8.661218	1	30
Year	750	1993	7.215915	1981	2005
Ln_CO2sct (dep. var. in [2])	744	-15.55893	.8372048	-18.57597	-12.6687
Ln_GDPsct_pw	600	17.83365	2.826254	14.23709	31.6578
Ln_GDPsct_pw2	600	326.0136	122.0182	202.6947	1002.216
Ln_FLWsct_pGDP	331	-12.79029	21.74173	-39.42923	33.39568
Ln_SCTrel_2	650	-3.354633	.7404608	-5.598056	.3206728
Ln_GCF_pw	657	22.67215	.6319137	20.43895	23.74382
Ln_edu	750	2.12257	.2730594	1.029619	2.505526
Ln_MKTopn_2	662	-2.459594	3.221396	-15.70503	3.740827
Ln_1_CRpr_GDP_1	547	30.36875	10.78978	-33.8916	46.42584

The estimation results of the model subject of our analysis are displayed in the table here below (tab. 2.3), where OLS, FE and RE estimation are reported. As expected, a first look at all the estimates achieved, makes us realize that this model does not produce relevantly significant outcomes[12]. Moreover, the estimates of the considered model do not allow us to achieve significant evidence of a direct effect of the sectoral FDI inflow on CO2, which is actually the main purpose of our investigations. The Brush-Pagan (LM) test (tab. 4) shows a chi2 equal to 669.19 with a p-value equal to 0.0000. This makes us choose the FE or RE over OLS. Hence, for the choice between FE and RE the Hausman test is run, which generates a chi2 equal to -25.37 and fails to meet its asymptotic assumption (tab. 5). For this reason, we rerun the Hausman test by employing a specific option of the STATA software, which enables forcing the test[13]. The result of this rearranged Hausman test is shown further down in this section (tab. 6) and, considering its significance level (p-value = 0.0022), it would induce us to choose the FE model. However, as done before in the previous section on the consideration that that our model can contain both fixed and random effects, we

[12] The reason why we did not expect to achieve significant results from the estimation of the considered model is due to the fact that, although we are here working on IEA estimates of CO2 from fuel combustion in the "agriculture and fishing" sector, it must be highlighted that this pollutant is not really associated to the exercise of agricultural activities. In fact, according to the World Resources Institute (WRI) estimates – as will be better reported in the concluding section of this work – the quota of "other fuel combustion" associated to "agricultural energy use" is just 1.4% of the total CO2 generated by anthropogenic activities (Herzog, 2009; Baumert et al., 2005).

[13] Sometimes, in finite samples, the Hausman test stat can result < 0 and fails to meet its asymptotic assumption because different estimates of the error variance are being used in V_b and V_B. STATA software provides us with the possibility of forcing the same variance to be used in both by employing the "sigmamore" option, which bases both (co)variance matrices on disturbance variance estimate from efficient estimator (STATA help).

rerun our analysis while taking into account both time and individual effects and by employing the same mixed modeling strategy as before. The results produced, reported in tab. 2.7 further down, show signs and coefficients very similar to those achieved with the RE estimations, but appear to be slightly better in their level of statistical significance. For this further reason, we focus our reporting on them.

Tab. 3 – Panel data estimation results for model [2]; ***Ln_CO2sct_pc dep. var***.

	OLS	**FE**	**RE**
Ln_GDPsct_pw	.2844477†† (.1986525)	-.0793763 (.2500167)	.0256665 (.2140511)
Ln_GDPsct_pw2	-.0040813 (.004959)	-.000889 (.006338)	-.0030242 (.0054049)
Ln_FLWsct_pGDP	.0027183† (.0018141)	-.0002738 (.000715)	-.0001679 (.0007295)
Ln_SCTrel_2	.8850387* (.0750126)	.1359481*** (.0921773)	.166646** (.0856273)
Ln_GCF_pw	.4196495* (.1174747)	.1085437 (.1257066)	.1586885†† (.1202299)
Ln_edu	.7128855* (.1605166)	1.906183* (.398073)	1.578326 (.3394628)
Ln_MKTopn_2	.1274578* (.0482939)	-.164718* (.0612228)	-.1369007** (.0556679)
Ln_1_CRpr_GDP_1	-.0150997* (.0045776)	-.0030535** (.0017816)	-.0033269*** (.0018274)
Constant	-26.41582* (2.112724)	-20.15614* (3.040656)	-21.67185* (2.720045)
N. obs.	**278**	**278**	**278**
N. groups	**-**	**25**	**25**
R-squared	**0.4820**	**Rho = .93850564**	**Rho = .89525986**
Adj. R-squared	**0.4666**		

Standard errors in parenthesis; P-value: * = 0.000; ** ≤ 0.05; * ≤ 0.10; † ≤ 0.15; †† ≤ 0.20**

Tab. 4 – The Brush-Pagan (LM) test results.

	Var	**sd = sqrt(Var)**
Ln_CO2sct_pw	.6949337	.8336269
E	.0475666	.2180977
U	.4065725	.6376304
Test: Var(u) = 0	**Chi2(1)** = 669.19	**Prob > chi2** = 0.0000

Tab. 5 – The Hausman test results.

	Coefficients (b) fe	Coefficients (B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Ln_GDPsct_pw	-.0793763	.0256665	-.1050429	.1291917
Ln_GDPsct~w2	-.000889	-.0030242	.0021352	.0033101
Ln_FLWsct_~P	-.0002738	-.0001679	-.0001059	.
Ln_SCTrel_2	.1359481	.166646	-.0306978	.0341267
Ln_GCF_pw	.1085437	.1586885	-.0501448	.0367002
Ln_edu	1.906183	1.578326	.3278571	.2079112
Ln_MKTopn_2	-.164718	-.1369007	-.0278172	.0254818
Ln_1_CRpr_~1	-.0030535	-.0033269	.0002734	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -25.37 chi2<0 ==> model fitted on these
data fails to meet the asymptotic
assumptions of the Hausman test;
see suest for a generalized test

Tab. 6 – The forced Hausman test results.

	Coefficients (b) fe	Coefficients (B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Ln_GDPsct_pw	-.0793763	.0256665	-.1050429	.1427709
Ln_GDPsct~w2	-.000889	-.0030242	.0021352	.003651
Ln_FLWsct_~P	-.0002738	-.0001679	-.0001059	.0000962
Ln_SCTrel_2	.1359481	.166646	-.0306978	.0408242
Ln_GCF_pw	.1085437	.1586885	-.0501448	.0477546
Ln_edu	1.906183	1.578326	.3278571	.2293231
Ln_MKTopn_2	-.164718	-.1369007	-.0278172	.0295088
Ln_1_CRpr_~1	-.0030535	-.0033269	.0002734	.0001496

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 22.37
Prob>chi2 = 0.0022

Tab. 2.7 – Mixed model estimation results.

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood =-27.100118
Iteration 1:   log likelihood =-26.832485
Iteration 2:   log likelihood =-26.823903
Iteration 3:   log likelihood =-26.822222
Iteration 4:   log likelihood =  -26.8219
Iteration 5:   log likelihood =-26.821864
Iteration 6:   log likelihood =-26.821857
Iteration 7:   log likelihood =-26.821856

Computing standard errors:

Mixed-effects ML regression                     Number of obs      =       278
Group variable: _all                           Number of groups   =         1

                                                Obs per group: min =       278
                                                               avg =     278.0
                                                               max =       278


                                                Wald chi2(8)       =     33.42
Log likelihood =-26.821856                      Prob > chi2        =    0.0001
```

Ln_CO2sct	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Ln_GDPsct_pw	-.0062505	.2178569	-0.03	0.977	-.4332421	.4207412
Ln_GDPsct~w2	-.0023703	.0055081	-0.43	0.667	-.013166	.0084255
Ln_FLWsct_~P	-.0002113	.0007006	-0.30	0.763	-.0015845	.0011618
Ln_SCTrel_2	.1526086	.0848969	1.80	0.072	-.0137864	.3190035
Ln_GCF_pw	.1399028	.1182142	1.18	0.237	-.0917928	.3715985
Ln_edu	1.678889	.3466082	4.84	0.000	.9995497	2.358229
Ln_MKTopn_2	-.1452394	.055575	-2.61	0.009	-.2541644	-.0363143
Ln_1_CRpr_~1	-.0032135	.001752	-1.83	0.067	-.0066473	.0002202
_cons	-21.17935	2.728448	-7.76	0.000	-26.52701	-15.83169

Random-effects Parameters	Estimate	Std. Err.	[95% Conf.	Interval]
_all: Identity				
sd(R.id)	.8037536	.1183846	.6022126	1.072744
_all: Identity				
sd(R.year)	.0000581	.0323734	0	.
sd(Residual)	.2149413	.0095819	.1969582	.2345663

```
LR test vs. linear regression:       chi2(2) =    450.22   Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.
```

We begin by observing how in our model the variables considered to represent the sectoral features, through which we want to assess the magnitude of the impact of the sectoral dynamics on CO2 emission levels, do not generate any useful evidence. Hence, we argue by saying that the achieved estimates do not allow us to release any comment on the impact the “agriculture and fishing” sector produces on the CO2 sectoral emissions levels from fuel combustion. In fact, we do not observe any statistical significance with regard to the relationship between CO2 and the GDP and GDP squared variables, which makes us fail to report on both technique and scale effects of this model. As already anticipated, overall we do not even observe a direct effect of the sectoral FDI inflow on the considered measure of CO2. The findings showing a statistically significant relationship to CO2, apart from that associated to the relevance of the investigated sector, are all external to the "agriculture and fishing" sector and, more specifically, associated to the education levels existing in the considered economies, the market openness and the cross-product built between GDP and the total inflow of FDI.

With regard to the magnitude of the sectoral relevance, a significant (p-value = 0.072) and positive relationship (+0.1526) is found between its indicator and CO2, this indicating – further than one of the two aspects of the composition (or structural) effect considered in our model – that at an increase of 1% in the relevance of the sector would produce an increase of about 0.15% of the CO2 emission level. It must be noted how the economy capitalization variable (GCF), representing the further face of the composition effect of our model, is not found statistically significant since its p-value is a above of a little bit the maximum threshold of statistical acceptance.

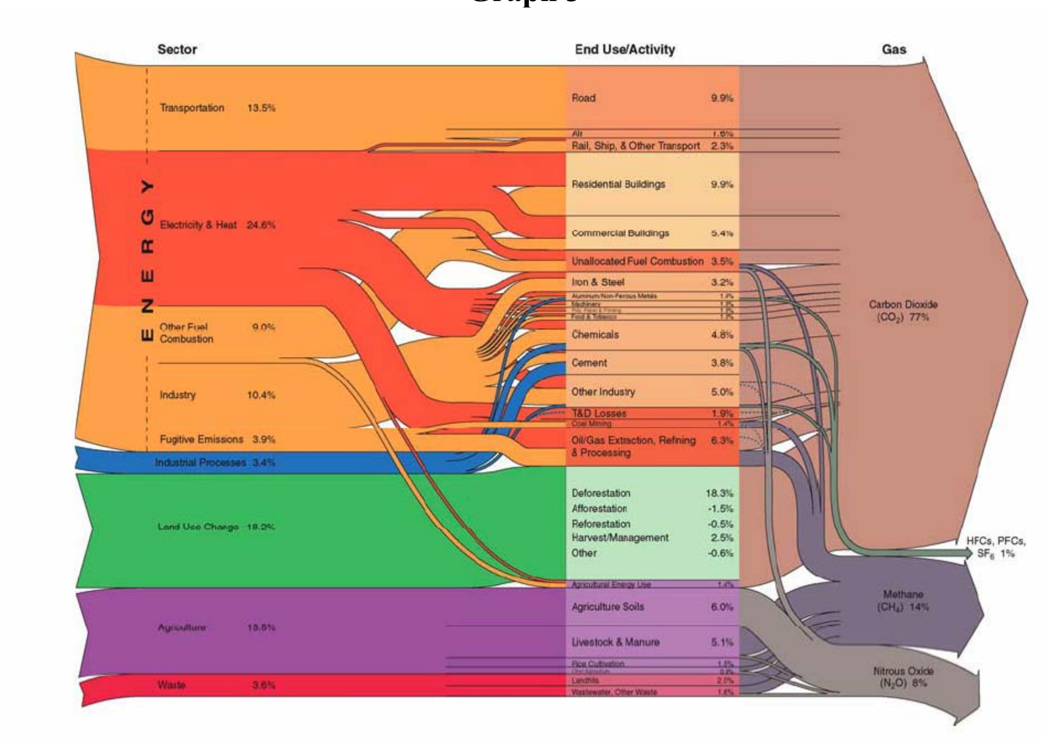
A very high level of statistical significance (p-value = 0.000) and a positive coefficient (+1.678) can be observed in relation to the linear impact between the education level and CO2 emissions. This outcome would make us think that that a 1% increase of the education level in the considered country areas generates an increase of about 1.67% in the level of CO2 emission.

Very significant (p-value = 0.009) and negative (-0.142) is the finding associated to the relationship between the variable indicating the market openness and CO2. The practical implication of the achieved relationship would mean that a 1% increase in trade openness produces a decrease of the CO2 level of about 0.14%. The last statistically significant finding (p-value = 0.067) can be observed in relation to the linear effect shown by the cross-product accounting for the interactive effect of GDP the total flow of FDI on CO2. Its negative coefficient (-0.032) would suggest that an increase of 1% of the sectoral GDP generates a decreased impact of about -0.03% of the total inflow of FDI on CO2.

4. Concluding remarks.

In this work we analyzed the context of thirty OECD countries between 1981 and 2005 to primarily assess whether the FDI inflow in the "agriculture and fishing" sector can be considered beneficial or detrimental for the environment, namely if it plays a role in the dynamic of CO2 arising from fuel combustion activities in the "agriculture and fishing" sector. To this aim we carried out our analysis by using an equation model which, according to the mainstream literature, took into account scale, composition and technique effects. This model was estimated through the use of the panel-data technique. Moving now onto specifically discussing the achieved result, we move onto highlighting again that the considered model did not show results characterized by particular statistical significance and, for this reason, does non help us to achieve any useful evidence to comment on the relationship between the FDI inflow in the agricultural sector and the environment (this considered in terms of CO2 sectoral emissions from fuel combustion). As already anticipated in a footnote in the previous pages, the reason of this could be identified in the fact that the contribution of the agricultural sector to the generation of sectoral CO2 from fuel combustion is very little and this could represent the misleading aspect of our analysis. As can be observed in the following two charts, which are produced by the World Resources Institute (WRI) for years 2000 and 2005, the world contribution of agriculture to the generation of CO2 is about 1.4% of the total emission[14].

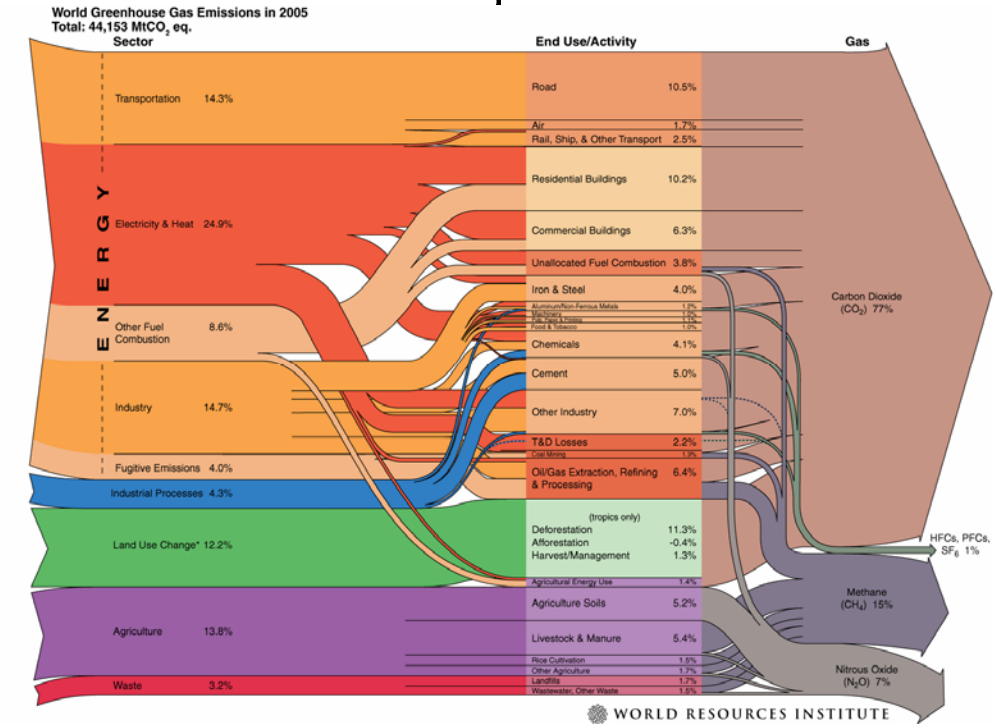
Graph 3



Source: Baumert et al., 2005, p. 14.

[14] We do not have a similar detailed evidence for the OECD area. Similar computations do no exist in relation to the area subject of our investigation. However, the U.S.A is the only OECD country which benefits from this computations thanks to the activity run by the WRI with data at 2005. These again show the irrelevance of agriculture in contributing to the generation of CO2 emission (www.wri.org/chart/us-greenhouse-gas-emissions-flow-chart). Approximating to these evidences, we consider all the other OECD countries in the same way.

Graph 4



Source: Herzog, 2009, p. 2.

As reported in detail in the previous section presenting the estimation findings, our model result did not show any statistical significant evidence proving the existence of some linear effect between CO2 and GDP and, still, between CO2 and GDP squared. This implies that the considered model does not allow us to comment either on the technique effect (which recurs when the GDP in considered in isolation) or on the scale effect (which recurs when the GDP is considered in its squared form). As well, no comment can be released on the relationship between the FDI inflow in the agricultural sector and CO2 since no statistical significance was observed in the result of the empirical analysis.
About the composition (or structural) effect, which was considered in our model in terms of relevance of the "agriculture and fishing" sector in the whole economy, the achieved finding shows a positive linear effect between the sectoral relevance and the sectoral CO2 generated from fuel combustion. This would mean that the "agriculture and fishing sector" does not play a beneficial role for the environment. In fact, the considered measure of CO2 emissions increase as the sector becomes more and more relevant. In other words, this result would suggest that a greater level of economic specialization in the "agriculture and fishing" sector generates a negative environmental impact (in terms of CO2 from fuel combustion). This finding agrees with those results proving that the composition effect does not always generate beneficial effects on the environment, but it can also produce a negative and detrimental impact. In fact, contrarily to what is generally said in a part of the literature referring the existence of a beneficial

result of the composition effects (or structural effect) on the environment[15], our result makes us recall Cole and Elliott (2003), who clarify how the actual role (positive or negative) of the composition effect on the environment depends upon the comparative advantages of a given country which – we would add – should be considered not only between sectors but also within a given sector. The policy implication which implicitly could be recalled is a typical approach of environmental economics, which refers to the importance of pricing environmental goods and externalities to ensure trade and investment towards an efficient path so avoiding their shift towards environmentally damaging sectors and/or – we would add – activities within the same sector.

With regard to the role of capitalization and education, the findings of the empirical analysis showed a statistically insignificant result in the relationship between the economy capitalization level and CO2. In relation to the education variable, namely the relationship between education and CO2 emission, a statistically significant relationship was found. Here again, this evidence refers the existence of a detrimental impact of education on the environment. This result goes against the mainstream approach in understanding such a kind of relationship where higher education levels (most of the time associated to higher capitalization levels) are found to exert a reducing effect on polluting emissions (Lan J. et al., 2011; OECD, 2002). An explanation of this counterintuitive result could be seen in the fact that higher education does not mean that people automatically switch on more modern and cleaner technologies. In this sense, some work (e.g. Hill and Magnani, 2002) we have already recalled in the previous pages refers that higher education induce people of low-income countries to an easier access to polluting technologies (cars in their example) and we have reasons to believe that the same happens in wealthier countries. With regard to this, we would like to highlight how education should not be considered a meaningful variable to explain such a kind of phenomenon and that a better approach would be that of entering in the qualitative information of education through distinguishing the different types of education (scientific, humanistic, etc.) on the consideration that the attitude towards innovation of people very likely depend on their education background.

With regard to the market openness variable and its relationship with the environment our analysis found a negative relationship with CO2, this showing that the more a country is open the less it is polluting. According to the mainstream literature, particularly recalled by various international organizations, this result would confirm that free trade and investment – as a result – always generate minor levels of pollution thanks to their capacity of ensuring major efficiency in resources allocation (OECD, 2002; Antweiler et al., 2001; Lucas et al. 1992). However, it is the case to highlight that the opposite view is also referred in the specific literature, where the existence of a positive relationship is referred between market openness and pollution levels on various developing and

[15] This is referred to happen on the consideration that free trade and investment promote comparative advantages among nations inducing them to an efficient specialization of their economies. Hence, those countries showing a higher specialization level would result less polluting thanks to sectoral efficiencies in resource allocation, which implies that production is ensured by the employment of lower inputs per unit of output (OECD, 2001).

developed countries (e.g. Feridun et al., 2006; Hill & Magnani, 2002). The policy implication deriving from our observation could focus on the opportunity that trade and investment agreements should hold stricter provisions, especially with regard to those sectors of activity generating CH4 emission, to avoid environmental degradation while guaranteeing at the same time that free trade and investment can take place.
The last result we achieved in the empirical task showed a significant negative relationship between the cross-product considering the interactive effect of GDP and the total inflow of FDI on CO2, so showing the existence of a sort of technique effect which happens through the entry of total inflow of FDI in the considered countries. This evidence would suggest that FDI might vehicle technological advances which generate a lesser impacts on the environment in terms of CO2. On the consideration of this beneficial role of the inward flow of FDI, the policy implication would be that of encouraging the entrance of FDI in the considered countries.

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Appendix Section

Tab. A1

	FDI inflow in the "agriculture and fishing" sector in real million of US Dollars (Source: our computation on OECD data)																									
	1981	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**Total**
Australia	62.38	-24.15	29.13	-2.58	3.99	24.48	50.13	-15.41	46.04	5.71	276.71	-431.15	15.43	-56.00	70.88	-8.33	-30.45	13.74	49.38	48.07	3.55	14.47	-6.53	143.46	-75.50	**207.43**
Austria																		15.06	1.09				2.13	3.42	-14.30	**7.40**
Belgium																							-401.78	-1,110.17	-626.93	**-2,138.88**
Canada																										
Czech Republic													2.26	1.12	8.68		7.37	8.33	6.46	8.36	28.48	-1.86	1.77	76.55	4.40	**151.91**
Denmark		9.33	-2.69	-3.98	0.94	0.52		22.48					23.67					-31.11	6.14	17.80	2.24	35.22	0.86	-0.31	-0.30	**80.83**
Finland																										
France	-4.37	6.28	14.13	-35.34	7.31	-3.46	16.64	20.32	-38.69	12.99	14.60	9.55	25.29	24.82	5.66	27.45	-1.18	110.03	47.84	7.37	6.15			7.98	-5.50	**275.88**
Germany			0.60		0.97	-3.24	2.26	14.99	-2.02	15.85	0.71	7.36	8.94	21.91	3.03	-456.75	-399.99	-399.62	-375.11	-13.82	50.05	-10.07	25.58	0.00	-19.80	**-1,528.19**
Greece								22.84			12.36	11.04									3.07	6.68	0.90	-8.06		**48.83**
Hungary																			35.94		122.37	37.10	21.85	15.45	5.78	**238.51**
Iceland										-0.06	0.06	-2.69	-0.35	-0.03	-0.05	0.20	-0.10	0.09	0.39	0.03	-0.21	-0.04	0.03	0.01	0.01	**-2.71**
Ireland													0.00													
Italy	-1.49	2.35	3.04	0.84	0.75		2.08	10.11	8.31	1.02	-2.84	2.80	3.94	27.10	5.68	36.08	42.77	17.70	18.48	11.98	171.21	-88.75	103.38	218.84		**595.35**
Japan																									-1.61	**-1.61**
Korea Republic					0.37	0.24		6.28		-0.12		-1.72		0.11	0.87		35.68	120.63	52.14	3.20	-17.16	-1.55	-4.43	0.37	0.44	**195.34**
Luxembourg																										
Mexico	10.17	9.52	60.00	7.35	7.14	12.68	29.73	-23.68	-2.53	96.34	64.71	28.74	36.36	33.33	91.43	33.72	11.47	29.38								**535.86**
Netherlands		-6.54	-10.24	-9.62	11.18	-7.47	11.34	2.66	-5.37	21.43	18.25	-3.27	-72.21	26.86	-17.60	5.56	227.10	31.23	40.23	-16.59	21.95	31.11	29.84			**329.83**
New Zealand				1.66	0.71	-1.47	1.59	-7.74	0.76																	**-4.49**
Norway														3.62												**3.62**
Poland														2.89	13.26	4.68	5.26	8.65	58.16	10.90	9.02	8.64	36.70	75.50	44.78	**278.44**
Portugal	15.25	7.94	3.08	1.47	5.71	4.23	17.57	31.58	27.85	30.49	24.71	19.54	17.05	3.61	1.08											**211.14**
Slovak Republic											0.00									-0.19	-0.04	1.50	8.83			**10.10**
Spain	33.10	71.26	32.91	237.86	29.80	69.64	116.60	114.55	254.74	212.29	56.95	85.52	65.39	31.74	21.76	34.93	11.96	27.85	2.17	10.14	-12.29	52.15	26.64	-115.12		**1,472.53**
Sweden									0.20	0.21					0.30		-1.38	4.06	198.84	4.04	0.66	1.50				**208.44**
Switzerland																										
Turkey																				9.00			0.94	5.50	4.42	**19.87**
United Kingdom			2.33	1.96	-1.83	-10.32	50.82	56.17	28.98	41.16	14.53	90.79	-25.59	27.21	12.01	8.30	10.35	10.35	23.11	27.25	15.53	11.65	-44.68	65.56		**415.63**
United States	247.46	152.38	175.38	30.88	2.86	180.28	228.38	-113.16	93.67	-54.88	-78.82	17.24	-180.68	115.56	-128.26	-38.30	235.79	102.08	56.12	207.00	51.96	-321.36	-217.92	71.56	-52.21	**783.01**
Total OECD Countries	**362.50**	**228.37**	**307.67**	**230.51**	**69.91**	**266.09**	**527.14**	**141.99**	**411.92**	**382.41**	**401.91**	**-166.26**	**-80.52**	**263.84**	**88.73**	**-352.45**	**154.64**	**68.43**	**221.41**	**334.54**	**456.53**	**-223.60**	**-415.90**	**-549.45**	**-736.30**	**2,394.06**

Tab. A2

	FDI stock in the "agriculture and fishing" sector in real million of US Dollars (Source: our computation on OECD data)																									
	1981	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**Total**
Australia			405.21	506.54	446.54	356.85	480.70	491.07	1016.85	514.70	1291.11	582.88	583.91	684.62	604.10	524.83	414.48	401.02	694.04	698.59	499.98	623.41	958.29	770.19	634.62	**14,184.53**
Austria						10.79	14.41	13.40			3.85	3.64	3.09	6.01									22.64	23.74		**101.58**
Belgium																										
Canada																										
Czech Republic																	5.56	23.69	18.25	34.37	46.51	19.73	10.33	99.11	68.25	**325.80**
Denmark											20.89			37.08				32.63	20.00	17.58	13.17	27.42	20.59	2.35	1.68	**193.39**
Finland																										
France									209.51	268.91	208.94												439.67	486.11		**1,613.14**
Germany		50.09	40.10	32.70	41.79	59.51	72.63	65.78	76.79	133.05	91.57	111.81	106.64	113.35	128.91	275.67	134.51	140.10	217.32	144.23	127.87	158.83	187.07	171.20		**2,681.53**
Greece																		2.97	4.84	2.79	0.15	1.92	2.48	3.75		**18.90**
Hungary												36.52	85.30	99.47				160.04	165.27		237.42	393.41	229.15			**1,406.57**
Iceland										1.96	1.48	-1.34	-0.42	-0.21	-0.27	0.42	0.30	0.44	1.10	1.13	0.54	0.65	0.81	0.89	0.01	**7.49**
Ireland																										
Italy		37.08	35.25	31.17	28.95	36.28	51.99	58.46	60.77	86.34	78.72	40.64	85.38	116.66	120.03	162.56	205.68	270.35	269.48	250.30	367.21	253.52	447.32	740.66		**3,834.80**
Japan																									31.51	**31.51**
Korea Republic										3.90	3.76	1.95	1.93	2.00	2.83	2.77	38.42	158.54	207.55	206.60	185.39	182.04	172.45	168.07	162.57	**1,500.78**
Luxembourg																										
Mexico	74.58	33.33	66.15	8.82	8.57	19.72	47.30	57.89	105.06	259.76	292.94	241.38	105.68	145.56	202.17	380.85	344.21	440.94	599.90	652.08						**4,086.89**
Netherlands				68.78	94.83	131.07	162.70	124.37	141.42	177.52	136.19	122.29	77.87	76.85	49.46	72.61	135.70	171.36	162.99	133.06	159.84	337.01	7.15	7.50		**2,550.56**
New Zealand																										
Norway														5.09										389.08		**394.18**
Poland														6.67	20.65	24.79	24.42	33.96	149.90	158.70	173.43	180.19	224.43	358.44	360.80	**1,716.38**
Portugal															36.39											**36.39**
Slovak Republic																		1.72	3.84	3.88	15.57	20.53				**45.55**
Spain																										
Sweden																										
Switzerland																										
Turkey																				45.00	45.10	26.21	41.51	217.43	286.73	**661.98**
United Kingdom				35.72			336.36	330.95	325.16	366.79	369.74	366.70	158.22	119.79	107.83	112.00	100.97	90.11	225.97	219.35	199.07	236.29	242.45	336.67		**4,280.14**
United States		1663.49	1766.15	1691.18	1580.00	1760.56	1689.19	1468.42	1708.86	1776.83	1467.06	1386.21	1554.55	1792.22	1788.04	1737.23	2136.84	2155.21	2265.31	2416.00	2457.84	1938.83	1899.06	2022.94	1946.02	**44,068.04**
Total OECD Countries	**74.58**	**1784.00**	**2312.87**	**2374.91**	**2200.68**	**2374.78**	**2855.28**	**2610.35**	**3644.43**	**3589.77**	**3966.26**	**2892.69**	**2762.15**	**3205.16**	**3060.13**	**3293.72**	**3541.10**	**4083.06**	**5005.76**	**4983.66**	**4529.10**	**4400.00**	**4905.39**	**5798.12**	**3492.17**	**83,740.12**

Tab. A3

CO2 from fuel combustion in Agriculture and Fishing in Million tons (Mt) (Source: IEA estimations)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Australia	2.97	3.27	2.97	3.38	3.28	3.23	3.37	3.27	3.47	3.36	3.38	3.43	3.55
Austria	2.51	2.44	2.24	2.40	2.29	2.06	1.98	1.81	1.68	1.23	1.19	1.15	1.04
Belgium	1.36	1.35	1.24	1.13	1.12	1.40	1.36	1.78	1.71	1.51	1.68	2.20	2.42
Canada	5.19	4.89	9.36	5.64	5.81	5.84	5.92	6.30	7.14	7.27	7.32	7.91	8.26
Czech Republic	4.23	3.79	3.99	4.04	3.90	4.03	4.27	4.37	4.31	3.74	3.68	2.67	3.05
Denmark	3.01	2.56	2.51	2.27	1.53	1.57	1.52	1.46	1.39	2.25	2.37	2.33	2.13
Finland	1.62	1.71	1.60	1.71	1.79	1.82	1.92	2.02	2.07	2.09	1.78	1.94	1.93
France	8.83	8.78	8.57	8.60	8.50	8.53	8.57	8.61	9.89	10.40	10.38	10.18	9.44
Germany	7.66	7.30	7.28	7.68	7.89	7.80	7.49	7.50	7.58	7.39	8.42	8.21	6.06
Greece	1.98	2.11	2.38	2.59	2.65	2.36	2.62	2.79	2.81	2.72	3.01	2.80	2.72
Hungary	3.63	3.46	3.01	3.31	3.29	3.09	3.23	3.07	2.95	2.59	2.11	1.61	1.50
Iceland	0.51	0.53	0.55	0.51	0.47	0.53	0.58	0.60	0.62	0.66	0.70	0.75	0.78
Ireland	0.07	0.05	0.03	0.04	0.04	0.64	0.61	0.60	0.60	0.65	0.67	0.68	0.69
Italy	5.78	5.75	5.80	5.82	6.24	6.27	6.81	7.26	8.31	8.35	7.72	7.93	8.62
Japan	8.80	21.09	21.70	24.67	23.68	24.74	26.51	28.59	28.22	20.70	21.70	21.21	20.22
Korea Republic	2.10	2.06	2.08	2.29	2.38	3.16	3.34	3.79	4.20	4.69	5.13	5.78	6.49
Luxembourg	0.02	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mexico	6.38	6.60	5.62	5.53	5.63	5.46	5.79	6.02	5.31	5.17	5.33	5.36	5.39
Netherlands	0.73	0.94	0.78	5.18	5.52	6.26	6.57	6.65	6.80	7.98	8.77	8.64	9.19
New Zealand	0.68	0.77	0.75	0.77	0.74	0.68	0.66	0.63	0.62	0.96	0.87	0.90	0.88
Norway	0.64	0.62	0.59	0.61	0.61	0.62	0.61	0.62	0.60	0.64	1.83	1.74	1.66
Poland	7.46	7.33	7.16	6.96	7.81	7.56	6.30	7.85	7.96	7.82	8.38	9.69	11.58
Portugal	0.97	1.03	1.16	1.14	1.20	1.20	1.20	1.24	1.28	1.34	1.34	1.34	1.33
Slovak Republic	2.24	2.03	2.00	1.95	1.95	1.90	1.96	1.99	1.95	1.75	1.22	0.91	1.00
Spain	6.06	6.61	6.67	6.76	7.09	6.89	7.22	6.40	3.95	4.17	4.53	4.89	5.06
Sweden	1.52	1.37	1.25	1.29	1.37	1.73	1.61	1.53	1.38	1.36	1.39	1.34	1.19
Switzerland	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.35	0.36	0.36	0.38
Turkey	2.91	3.65	3.97	4.06	4.47	4.37	5.37	5.41	5.21	5.84	5.78	5.90	7.14
United Kingdom	3.14	3.13	3.13	3.08	3.08	3.09	2.90	2.81	2.62	2.66	2.71	2.73	2.72
United States	38.89	36.22	35.49	39.41	50.41	48.91	46.95	48.19	45.80	43.11	43.03	46.88	44.53
Total OECD Countries	**132.18**	**141.75**	**144.19**	**153.13**	**165.06**	**166.06**	**167.56**	**173.48**	**170.76**	**162.77**	**166.80**	**171.48**	**170.97**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Australia	3.63	3.76	3.77	3.92	4.00	4.09	4.16	4.17	4.99	5.67	6.00	6.36	**97.45**
Austria	0.98	1.01	1.02	1.02	1.03	1.04	0.97	0.98	0.96	0.97	0.95	0.93	**35.88**
Belgium	3.06	3.44	3.85	3.27	2.91	2.68	2.06	2.16	1.81	2.51	1.92	2.48	**52.41**
Canada	8.35	8.85	9.39	9.79	9.43	9.70	9.87	8.76	7.79	8.00	7.98	7.87	**192.63**
Czech Republic	3.03	3.41	1.83	1.37	1.23	1.56	1.66	1.52	1.41	1.35	1.32	1.29	**71.05**
Denmark	2.12	2.10	2.22	2.20	2.12	2.12	2.12	2.08	2.03	1.96	1.84	1.84	**51.64**
Finland	1.68	1.64	1.68	1.64	1.68	1.66	1.74	1.78	1.75	1.73	1.72	1.70	**44.40**
France	9.01	9.56	9.68	9.89	9.87	9.74	9.50	9.49	9.32	8.89	8.97	8.74	**231.94**
Germany	6.17	6.01	6.14	6.13	6.16	6.09	6.26	6.11	5.83	5.90	5.90	5.57	**170.53**
Greece	2.74	2.55	2.60	2.59	2.59	2.60	2.60	2.63	2.86	3.07	2.62	2.69	**65.68**
Hungary	1.58	1.53	1.67	1.65	1.66	1.71	1.59	1.45	1.49	1.39	1.29	1.23	**55.09**
Iceland	0.79	0.78	0.85	0.83	0.79	0.77	0.73	0.65	0.71	0.75	0.72	0.71	**16.87**
Ireland	0.78	0.90	0.72	0.75	0.74	0.78	0.81	0.82	0.82	0.82	0.79	0.82	**14.92**
Italy	8.63	8.78	8.80	8.51	8.45	8.24	8.04	8.34	8.29	8.86	8.30	8.37	**192.27**
Japan	19.58	19.00	19.72	18.95	18.35	17.69	15.72	15.01	14.77	14.14	13.65	12.72	**491.33**
Korea Republic	7.39	8.02	8.99	9.87	8.46	9.23	9.70	10.21	9.85	8.75	7.95	7.42	**153.33**
Luxembourg	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.05	**0.56**
Mexico	4.74	5.36	5.30	5.71	5.66	6.27	6.37	6.27	6.04	6.49	6.76	7.34	**145.90**
Netherlands	8.40	9.37	8.81	8.64	8.94	9.36	8.94	8.87	8.81	7.88	8.13	8.48	**178.64**
New Zealand	0.94	0.97	1.00	1.06	1.10	1.09	1.01	0.98	1.07	1.18	0.99	1.10	**22.40**
Norway	1.75	1.72	1.91	1.92	1.97	1.92	1.79	1.89	1.91	1.89	1.84	1.76	**33.65**
Poland	13.52	13.04	13.71	14.20	12.84	13.24	12.36	12.21	11.43	11.62	11.92	12.45	**256.40**
Portugal	1.35	1.34	1.32	1.48	1.67	1.79	1.99	1.34	1.22	1.15	1.53	1.48	**33.43**
Slovak Republic	0.64	0.60	0.57	0.56	0.50	0.45	0.41	0.36	0.28	0.31	0.34	0.35	**28.22**
Spain	5.28	5.41	5.37	5.30	4.79	5.45	6.40	5.86	5.79	7.27	8.34	7.74	**149.30**
Sweden	1.20	1.22	1.27	1.27	1.52	1.19	0.98	1.03	1.22	1.24	1.13	0.98	**32.58**
Switzerland	0.45	0.46	0.47	0.45	0.50	0.41	0.00	0.00	0.00	0.00	0.00	0.00	**6.87**
Turkey	7.17	7.73	8.06	8.00	7.92	8.14	8.14	8.12	8.86	7.99	8.99	9.07	**162.27**
United Kingdom	2.72	2.62	2.87	2.63	2.64	2.39	2.10	2.26	2.00	1.32	1.18	1.41	**63.94**
United States	45.29	45.33	46.46	46.92	43.11	39.62	42.07	46.28	45.29	39.85	50.77	50.10	**1,108.91**
Total OECD Countries	**172.99**	**176.53**	**180.07**	**180.54**	**172.65**	**171.05**	**170.11**	**171.65**	**168.62**	**162.97**	**173.88**	**173.04**	**4,160.29**