THE RELATION BETWEEN OIL PRODUCTION AND THE CO_2 EMISSIONS OF THE MANUFACTURING SECTOR: A DECOMPOSITION ANALYSIS OF MEXICO´S INDUSTRY FROM 1970-2010

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Abstract

Climate change mitigation public policyrequires a honed diagnosis of the main drivers of its greenhouse gases emissions. The natural resource curse theory, NRC, proposes that the production, consumption and exports of oil could induce a myriad of negative economic and social effects. The carbon curse postulate, on the other hand, suggests higher carbon intensity What the NRC has not addressed, so far, is the relationship between hydrocarbonsexploitation andCO_2 emissions. Decomposition analysis has been used by various authors to analyze national energy consumption and emissions, but they have not so far mined the possible relationships between the resource abundance and CO_2 emissions. This paper attempts to fill this gap by studying the main drivers of Mexico´s manufacturing sector CO_2 emissionsfrom 1970 to 2010, period in which there are important discoveries of oil and changes in the oil production, as well as in the economic context. Manufactures are purportedly impacted by oil abundance, inside the NRC literature. Although the period of analysis spans four decades, smaller sub-periods are analyzed to look for subtler changes in energy use and emissions trends. The results show that after the 1982 oil boom, there were several decreasing effects in the manufacturing industry, giving support to a resource curse hypothesis. However, the Carbon Index measure of the Chemicals, Petrochemicals and Cement subsectors remain high after the boom, accounting for the possible high carbon intensity effects proposed by the carbon curse hypothesis.

Keywords: Natural resource curse, carbon curse, CO_2 emission drivers, decomposition analysis

Introduction

The present article carries out a decomposition analysis to enlighten the relationship between oil production and exports, and the resulting changes in the manufacturing industry´s CO_2 emissions. To improve climate change mitigation public policy, it is important for any country to carry out honed diagnoses of the main drivers of its greenhouse gas (GHG) emissions. Although CO_2 emissions are already accounted for (IPCC, 2006) there is a need to make the driving forces behind the amount of fuel burned more explicit, in order to calibrate better mitigation policies.

For oil producers and exporters, the economic effects of fossil fuel extraction, production or exportscould have important implications in terms of their CO_2 emissions, whether it is due to a direct end of pipe accounting of the energy consumption along the entire production chain or through a more indirect analysis of the impacts of the oil sector in distinct economic dynamics. The fields of natural resource economics and environmental economics have studied the relationship between oil production and exports and several economic indicators. More specifically, authors like Auty (1993) and Sachs and Warner (1995) proposed what they called a *natural resource curse (NRC),* in which countries relatively rich in natural resources have shown, in average, lower rates of economic growth over the second halfof the twentieth century.

The natural resource curse

One of the channels of transmission of the NRC is the so called Dutch Disease, DD, (Corden and Neary, 1982), or the premature retreat of tradable sectors induced by the real exchange rate and the equally premature tertiarization of the economy, induced by the increments in wealth after an oil discovery or the unexpected increase in export prices. The symptoms of DD are the crowding-out of production factors such as employment and capital, toward the sector in boom, from the sectors not in boom; a consequent negative impact on tradable sectors not in boom, agriculture and manufacturing; an increasing import activity to satisfy the increments in domestic demand, both intermediate and final, and the decrease of exports of tradable sectors not in boom; the increment of public sector expenditure. All these elements may reduce the economic growth.

If DD appears, it is to be expected that a major hike in oil rents can result in a *diminishing* participation in GDP of manufactures and agriculture, both intensive in energy, and consequently of CO_2 emissions. An opposite effect could be induced by policies oriented to subsidize energy both to all economic activities and households with the aim to speed up industrialization and diversify productive structures and control inflationary pressures in carbon intensive sectors such as the manufacturing industry along with a stronger participation of lesser intensive sectors in the economy such as the services sector. Although the Dutch Disease is a much studied area, its relationship with GHG emissions as well as the analysis of the impact of oil production among the *subsectors* on the manufacturing industry under the light of the natural resource curse are rarer.

Furthermore, Friedrichs and Inderwildi (2013) have suggested a distinct relationship between fossil fuel production and CO_2 emissions. Instead of a decrease in carbon intensity due to less intensive sector predominance, they propose a *carbon curse* in which countries that are rich in fossil fuel resources tend to have a *higher* carbon intensity than countries without them. The causal hypothesesthey suggested are: the presence of a highly carbon intensive sector, namely the fossil fuel producer; the crowding-out related to Dutch Disease that is also present for the energy portfolio, which increases barriers for renewable energies; less investment in energy efficiency technologies; and the presence of fossil fuel subsidies.

Thus, there is still debate of the possible the direction and impact of oil production on the economy and on GHG emissions. The objective of this paper is to analyze under the light of the described theoretical framework, the impact of oil abundance on the Mexican economy and the energy and carbon intensity of its manufacturing activities.

Decomposition analysis

One way to analyze the relationship between oil production and GHG emissions in the manufacturing activities is through a decomposition analysis (Ang et al, 1998), which observes, first, the drivers ofenergy consumption (Ang, 2004) and GHG emissions (Xu and Ang, 2013), and secondthe "....various underlying factors that contribute to changes in energy and environmental indicators over time" (Ang et al, 1998: 489).

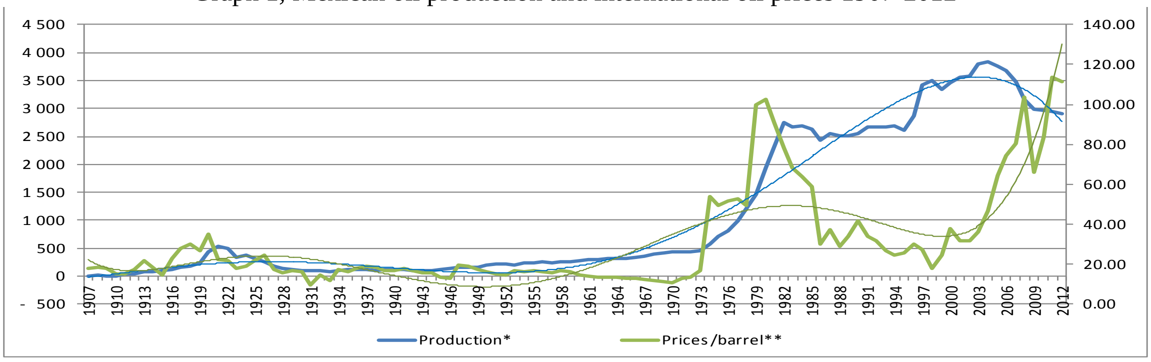
There have already been several studies on the Mexican energy consumption and GHG emissions using decomposition analysis. Sheinbaum and Rodriguez (1997) use the Laspeyres Index decomposition method and find a decrease in total CO_2 emissions for the period of 1987-1993, for the manufacturing sector, due to a significant fall on sector energy consumption. Ozawa et al. (2002) apply the Divisia Index, to study the energy consumption and respective emissions of the iron and steel subsector from 1970 to 1996. They find that primary energy use of the subsectors increased, despite some decreases related to structural and efficiency effects. Sheinbaum et al.(2010) expand the period of analysis until 2006 and use the Log Mean Divisia Index (LMDI), with similar results, whileSheinbaum et al. (2012) apply the LMDI method to study the Mexican manufactures for 1990-2008. They find that CO_2 emissions *increased* by 29% from 1990 to 2008. The main driver of this increment was the overall growth of the economy.

González and Martínez (2012) used the LMDI method for the 1965-2012 period, incorporating four different stages of the Mexican economyduring which two distinct models were instrumented: the import substitution and the export lead models. Yet, theydo not incorporate the effects and implications of the intensification of the energy intensity in the different speed at which changes in emissions take place in each productive activity.

Period of study

The current study analyzes the Mexican manufacturing sector and subsectors with the Log Mean Divisia Index decomposition method, from the discovery and exploitation of the giant oil field Cantarell to 2010. The period is divided in stages according to the evolution of the country´s oil production and considering as well the cycles of the national economy, as depicted in Graph 1.

Graph 1, Mexican oil production and international oil prices 1907-2012



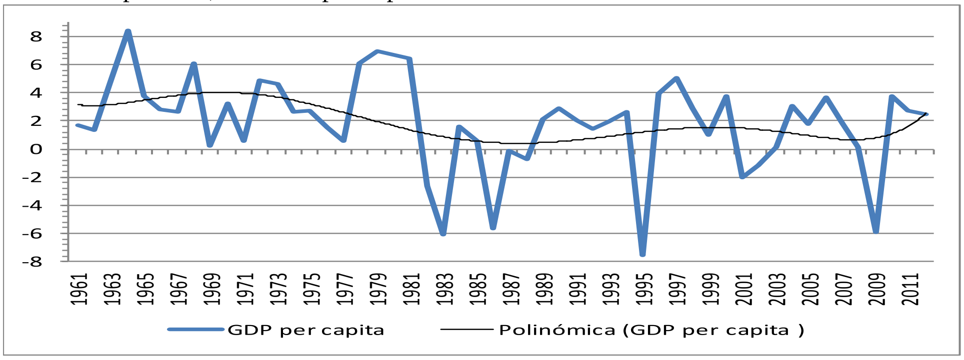
Source: Puyana, 2014

As Graph 1 shows, Mexican crude production is a protracted history, starting in the early 20th century and maintaining relatively low initial levels, from the discovery and production of the first wells in the beginning of the twentieth century to the early 1970s, ranging from approximately 0.1 to 500thousands of barrels per day (tbpd). During this decade, the oil policyof the President López Portillochanged from supplying mainly the domestic market to exports, amongst others, to have the external resources to pay the external debt and guarantee essential imports (Puyana, 2014).The substantial oil bonanza fromCantarell facilitated this change of direction. Consequently, the country´s oil production increased approximately six fold in the decade spanning 1972 to 1982.

The interplay between increasing oil prices, due to OPEC and in the quantum produced oil bonanzasMexico enjoyed from mid seventies until 2008, when production declined, still remains above the levels registered before Cantarell was put into production. The fossil fuel resource international price and its physical availability that defines a specific boom mark 1974 as a starting year,when national production and price were not in boom. After that, 1982 marks the next cross section, when oil production in Mexico reaches its highest peak so far in history. After this segment in time, the international oil prices begin to decrease as sharply as they rose only ten years before and remained so until the end of the twentieth century. Mexican oil production remained relatively stable around the high levels obtained since 1981 during this period as well.

Graph 2 shows the changes for the annual growth rate of Mexican Gross Domestic Product (GDP). From Graph 2 it emerges, first, that the Mexican economy has experienced several crises which mark two clear periods: from 1960 up to 1982, that registered an average rate of per capita GDP growth of 4% and the second one comprising 1982-2012, when the rate of growth falls to 1% per annum: Second, that there are several short, two or three year sub periods, with higher growth, but never above the four percent of the first period. The period of faster economic growth corresponds to the import substitution industrialization during which manufactures enjoyed large economic stimuli such as subsidized energy, tax exemptions and rebates, high import tariff protection, amongst others. After 1982 and Mexico´s entrance to the North American Free Trade Agreement (NAFTA), protection such economic stimuli were eliminated.

Graph No 2, Mexican per capita GDP. Annual Rates of Growth 1960-2012



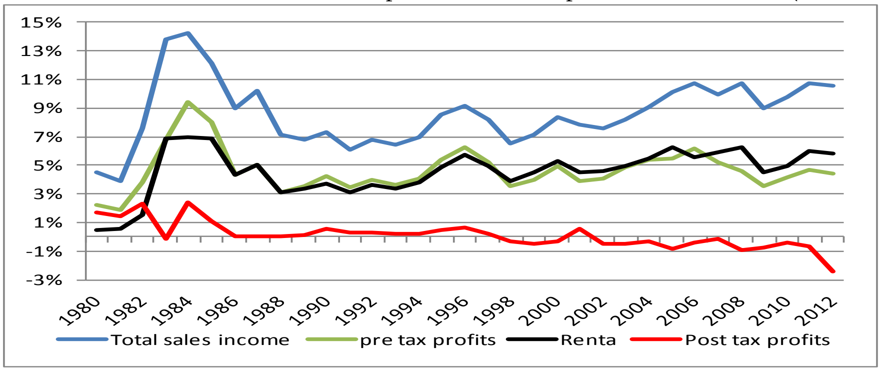
Source: Own elaboration based on World Bank, 2014

After the instrumentation of the NAFTAin 1994, the economy suffered a deep crisis from which the recovery was hard. Since 1994 to 2012, NAFTA did expand Mexican exports at a dramatic speed, from 79 to 370 billion dollars, but the economy maintained the one percent annual growth. In the NAFTA era, oil production ascended to 3.36 million barrels a day for an accumulated production of 22.6 billion barrels, out of which a 50% was exported. Mexican total oil consumption grew at 2% annually, slightly faster than per capita GDP. The intense liberalization of the Mexican economy and the structure of its external trade, highly concentrated in one market of destination of its exports, the United States of America, and on manufactures inserted in global value chains explain why Mexican per capita GDP contracted by 6% in 2009, for the contagion of the global financial crisis of 2008. From Graph 1 we could suggest that the Mexican oil production registered three distinctive stages: 1907-1973 when it expanded at an average rate of 4%, between 1974 and 2004 the rate was 8% annually to fall to -3% per annum in 2004-2012.

Paradoxically, Mexican fastest growth took place when prices were falling, and the decline in production coincided with prices recovered after 2003. At the same rate, as commented above, the trajectories of oil production and per capita GDP do not coincide, since the period starting in 1982 up to 2012, it grew only at 1% per annum. Nevertheless, oil production at relative low prices, compared with international prices and costs provided Mexico with generous rents, fully captured by the Mexican State.

From 1980 to 2013, Mexican oil rent represented 4.7% of GDP, equivalent to 33% of total fiscal income and 106% of the national oil company PEMEX's pre tax rents, as shown in Graph 3. Oil rent captured by the Mexican State in 1982-2011, escalated from 8.2 to 70 billion dollars in 2011 to fall to 59 in 2012 and 2013 due to decreasing production. All in all, the government accumulated oil income amountingto 432 thousand billion dollars, which represents an increase in public expenditure capacity without imposing taxes, and explains in big part the protracted revaluation of the Mexican peso and the intense Dutch Disease effect the Mexican Economy presents. In 2012 the share of manufactures in GDP was 18 % which is 4% points lower than it would be at the Mexican per capita GDP, and agriculture share was 3.8%, a full 7% lower according to the Chenery norm (Puyana 2014). Puyana (2014) finds, applying a standard Dutch Disease model, that the revaluation of the Mexican peso and the fall of agriculture and manufactures as sources of GDP are directly and strongly related to oil rent (Puyana 2014)

Graph 3, Mexico. Oil rent and PEMEX, pre and after tax profits as % of GDP (1980-2013).



Source: Puyana 2014

Data

To capture the effect of oil abundance on energy intensity and CO_2 emissionsthis study applies the decomposition analysis of GHG emissions which requires three types of data: sector and subsector economic product, energy consumption and CO_2 emission factors.

Data for sector and subsector GDP is taken from the National Institute of Statistics and Geography (INEGI, 2013). Given the data requirements for a long period (1974-2010), some adjustments were requiredto better manage the information. The first was to unify different data bases: the SCNM (*Sistema de Cuentas Nacionales de México*) and SCIAN (*Sistema de Clasificación Industrial de América del Norte*).These changes make it difficult to compare the periods under study since the structure and content of industrial productive activities do notcompletely coincide. For instance,the petrochemical production was agregatted to theChemicals subsector. Thus, this study is done on a lower detail and disaggregation (where Chemicals concentrates both chemical and petrochemical activities), guaranteeingthat all subsectors remain grouped in similar ways across the period of interest.Energy consumption data is taken from the Energy Information System (SENER, 2010).

Carbon emission factors are taken from the IPCC´s National Greenhouse Inventories Guidelines (2006). Carbon emission factors for electricity generation are not easily available for all years, so this study recollects those used by the aforementioned authors that have utilized the same technique in studying Mexico´s manufacturing sector, namely Ozawa et al. (2002), Sheinbaum et al. (2012) and Gonzalez and Martínez (2012). A projection of missing values is done for those years that do not exactly coincide with these academic works.

Methodology

Decomposition analysis is a flexible method in which an aggregate magnitude can be separated into structuring components, to analyze their relative contributions. Because the components that are included depend on what is the goal of the analysis, there is not a unique way of doing a composition breakdown. The present study carries out the same combination as Sheinbaum et al. (2012), described as follows.

Final energy consumption (E) is a decomposition (or a product) of three components, or effects: the energy intensity (I) and structure (S) effects for each subsector, and total activity (A) effects for the aggregate sector. The equation that describes this relation is:

$$E = A \sum I * S$$

where A is the GDP value for the entire manufacturing sector, I_i is the ratio of the energy consumption of one subsector for a given year divided by its GDP, and S_i is the ratio of the GDP of the subsector divided by the GDP of the manufacturing sector. This is the basic essence of a decomposition analysis; to explain an aggregate entity (final energy consumption in the manufacturing sector) based on three separate components, as described, and also by the relative proportions of each subsector within the industry aggregate level.

Furthermore, this method can be used to monitor changes through time. In this case, the study tracks the difference between the final energy consumption at two distinct points in time (*o* as the starting year and *t* as the ending year), or ΔE, which is then decomposed by the sum of the respective time differences in each of its component effects, for each subsector:

$$\Delta E = \Delta EA + \Delta ES + \Delta EI$$

where, for each subsector *i*:

$$\Delta EA = \sum_i [Logarithmic\ mean\ (Et, Eo) * \ln(\frac{At}{Ao})]$$

$$\Delta ES = \sum_i [Logarithmic\ mean\ (Et, Eo) * \ln(\frac{St}{So})]$$

$$\Delta EI = \sum_i [Logarithmic\ mean\ (Et, Eo) * \ln(\frac{EIt}{EIo})]$$

Sheinbaum et al. (2012) carry out the calculations of each subsector´s CO_2 emission trends in a similar manner; in the above equations E (final energy use) is substituted by CO_2(emissions) and calculated accordingly. CO_2 emissions for each subsector are calculated following IPCC´s best practice guidelines (2006), which multiplies the consumption of energy or electricity by fuel specific emission factors. As in the work of these authors, the present document also adds an additional carbon index, CI, dividing CO_2 emissions by energy consumption of each subsector, and its respective change in time.

Results and Discussion

1974-1982

During this eight year period, Table A.1 shows that the main drivers of energy consumption and CO_2 emissions were the Chemicals, Cement, Iron and Steel and the Others category. For the Chemicals subsector, the main effects that resulted in such energy consumption and emissions were the energy intensity and activity effects. For the Cement subsector, the main drivers of energy consumption and emissions were the activity and energy intensity effects. Lastly, for the Iron and Steel subsectors, the main driver is the activity effect.

This corresponds with the relevant absolute values for each indicator and subsector, as indicated by Tables A.3 and A.4. In general, there is an approximate increase of fifty percent between the total manufacturing GDP in 1974 and that of 1982. An important part of this growth was due to the subsector GDP increase in the Chemicals industries, which is reflected in the high activity effect value of Table A.1 for this susbector. This growth was fueled by an important increase in energy consumption, which almost tripled for the Chemicals subsector from 1974 to 1982. Also, along with these increases, energy intensity for the subsector grew by 1.5 times, the largest increase in intensity by any subsector during this period. The resulting increase in emissions is a staggering doubling of CO_2 emissions during the eight year period.

1982-2010

Table A.2 shows the results of the decomposition analysis for this twenty eight year period. The main driver of energy consumption was the Others category, followed by the Iron and Steel and Cement subsectors. The Iron and Steel subsector increased driven by the activity effect while the Cement susbector was driven mainly by the activity and structure effects. In terms of CO_2 emissions, the Others category show the greatest of impact on the sums, followed by the Cement subsector.

The CO_2 emission effects of the Chemicals subsector is negative, due mainly to a reduction in the energy intensity effect. In absolute terms, Tables A.4 and A.5 show that the CO_2 emissions from the Chemicals subsector decrease its highest level of 1982 to a lower level in 2010, but still remain the third highest in the time period. The greatest increase in emissions from this period comes from the Cement and Others subsectors. The Cement CO_2 emissions grow by 1.7 times, its energy intensity decreases and its energy consumption increases.

Conclusion

The present study has carried out a decomposition analysis of the manufacturing industry subsectors, for two time segments from 1970 to 1982 and from 1982 to 2010 in order to analyze the effects of the resource boom in energy consumption and emissions. The results are similar to those of Gonzalez and Martinez (2012), in the sense that the major actors before 1982 in terms of energy consumption and CO_2 emissions are the Petrochemical and Chemical industries, followed by the Cement and the Iron and Steel subsectors.

The interesting finding is what happens in the next period, as pertaining to possible resource curse or carbon curse implications. As Gonzalez and Martinez also discuss, for the period of 1982 and 2010, the main actors in terms of energy consumption is Cement and the Others category, which they suggest includes the Maquiladora industry that benefited the most from NAFTA. More specifically, the Cement industry decreases in terms of its energy intensity, but increases in terms of energy consumption and consequently, CO_2 emissions. These changes can indeed be attributed to a change in the economic model from the Mexican government.

Some possible implications of these results in the carbon curse hypothesis is that if Mexico suffers from this phenomenon, a higher carbon intensity could result from the growth in emissions from the Cement and Manufacturing industries, although more analysis is needed to prove this causal link. However, the decomposition analysis highly suggests this could be the case.

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Annex 1

Table A.1 Results of the decomposition analysis, 1974-1982

Subsector	**Energy**				**CO_2 Emissions**				
	Total sector change (ΔE)	**By Activity (ΔEA)**	**By Structure (ΔES)**	**By Energy Intensity (ΔEI)**	**Total sector change (ΔCO2)**	**By Activity (ΔCO2A)**	**By Structure (ΔCO2S)**	**By Energy Intensity (ΔCO2EI)**	**By Carbon Index (ΔCO2CI)**
Sugar	7.14	35.02	-36.76	8.87	27.41	227.31	-238.59	57.60	-18.91
Beverages	3.99	3.51	0.84	-0.36	174.73	160.08	38.54	-16.62	-7.27
Tobacco	0.07	0.15	-0.08	0.00	-53.95	21.55	-11.73	0.44	-64.20
Paper and pulp	13.14	11.20	-0.05	1.99	524.82	479.58	-2.28	85.34	-37.83
Chemicals	189.03	73.51	39.06	76.46	3,525.81	1,706.81	906.78	1,775.19	-862.98
Fertilizers	5.35	2.75	2.08	0.52	393.30	77.12	58.13	14.62	243.42
Rubber	0.95	1.14	0.53	-0.71	-413.77	140.54	65.94	-88.38	-531.87
Glass	11.74	9.66	-0.03	2.12	370.50	323.92	-1.15	71.04	-23.31
Cement	40.42	26.49	11.32	2.61	1,595.33	1,097.23	468.74	108.20	-78.84
Iron and Steel	33.12	56.98	-13.59	-10.26	1,325.28	2,233.98	-532.84	-402.47	26.61
Automotive	3.18	4.10	-0.99	0.07	-968.42	650.16	-156.60	10.34	-1,472.32
Others	98.69	72.03	0.12	26.55	12,063.15	2,779.89	4.53	1,024.54	8,254.19
Sums	**406.82**	**296.53**	**2.43**	**107.85**	**18,564.18**	**9,898.16**	**599.48**	**2,639.85**	**5,426.69**

Table A.2 Results of the decomposition analysis, 1982-2010

Subsector	**Energy**				**CO_2 Emissions**				
	Total sector change (ΔE)	**By Activity (ΔEA)**	**By Structure (ΔES)**	**By Energy Intensity (ΔEI)**	**Total sector change (ΔCO2)**	**By Activity (ΔCO2A)**	**By Structure (ΔCO2S)**	**By Energy Intensity (ΔCO2EI)**	**By Carbon Index (ΔCO2CI)**
Sugar	-50.08	37.35	24.35	-111.78	-56.18	326.95	213.14	-978.41	382.15
Beverages	12.45	9.59	1.16	1.70	606.09	444.01	53.57	78.78	29.72
Tobacco	0.18	0.30	-0.37	0.26	-2.74	17.84	-22.47	15.72	-13.83
Paper and pulp	7.35	22.71	-55.69	40.32	317.15	960.89	-2,355.74	1,705.76	6.24
Chemicals	-105.89	139.58	144.18	-389.66	-713.84	3,471.21	3,585.68	-9,690.27	1,919.54
Fertilizers	-7.44	3.18	-3.40	-7.22	-357.95	134.19	-143.45	-305.23	-43.47
Rubber	3.35	2.83	-8.45	8.97	133.68	145.28	-433.61	460.05	-38.04
Glass	19.20	23.08	-10.54	6.67	401.75	704.46	-321.87	203.44	-184.29
Cement	28.81	60.03	63.33	-94.55	2,573.13	2,810.46	2,965.22	-4,426.71	1,224.16
Iron and Steel	35.54	104.10	-75.43	6.86	-116.87	3,664.11	-2,654.93	241.56	-1,367.62
Automotive	-1.62	6.55	8.75	-16.92	-228.82	636.44	850.58	-1,644.96	-70.89
Others	394.00	233.81	-20.67	180.86	34,535.51	16,642.35	-1,471.40	12,873.70	6,490.86
Sums	**335.85**	**643.11**	**67.22**	**-374.49**	**37,090.90**	**29,958.19**	**264.72**	**-1,466.55**	**8,334.55**

	Table A.3.- Absolute values for several indicators, 1974					
Subsector	**Activity: Total Manufactures GDP (2008 millions pesos)**	**Structure: GDPi/GDP**	**Energy: Subsector Energy Consumption (PJ)**	**Energy Intensity: Energy consumption/GDP (PJ /2008 millions pesos)**	**Subsector CO_2 emissions (kg/PJ)**	**Carbon Index: CO_2/E**
Sugar	759,788.62	0.02	85.31	0.00739	562.97	6.60
Beverages	759,788.62	0.04	7.05	0.00023	324.92	46.10
Tobacco	759,788.62	0.01	0.35	0.00003	86.00	246.40
Paper and pulp	759,788.62	0.03	22.34	0.00095	972.86	43.55
Chemicals	759,788.62	0.02	107.66	0.00670	2,803.13	26.04
Fertilizers	759,788.62	0.01	4.65	0.00095	60.82	13.08
Rubber	759,788.62	0.02	2.43	0.00015	602.51	248.05
Glass	759,788.62	0.01	19.09	0.00215	650.26	34.06
Cement	759,788.62	0.01	49.00	0.00641	2,061.28	42.07
Iron and Steel	759,788.62	0.05	128.59	0.00362	5,029.71	39.11
Automotive	759,788.62	0.06	8.90	0.00018	2,180.48	244.97
Others	759,788.62	0.72	137.78	0.00025	2,661.02	19.31
Sums	**-**	**1.00**	**573.14**	**-**	**17,995.96**	**-**

	Table A.4.- Absolute values for several indicators, 1982					
Subsector	**Activity: Total Manufactures GDP (2008 millions pesos)**	**Structure: GDPi/GDP**	**Energy: Subsector Energy Consumption (PJ)**	**Energy Intensity: Energy consumption/GDP (PJ /2008 millions pesos)**	**Subsector CO_2 emissions (kg/PJ)**	**Carbon Index: CO_2/E**
Sugar	1,126,962.09	0.01	92.45	0.00816	590.38	6.39
Beverages	1,126,962.09	0.04	11.03	0.00023	499.65	45.28
Tobacco	1,126,962.09	0.01	0.42	0.00003	32.04	76.12
Paper and pulp	1,126,962.09	0.03	35.47	0.00102	1,497.68	42.22
Chemicals	1,126,962.09	0.03	296.68	0.01010	6,328.94	21.33
Fertilizers	1,126,962.09	0.01	10.00	0.00102	454.11	45.41
Rubber	1,126,962.09	0.03	3.38	0.00011	188.74	55.79
Glass	1,126,962.09	0.01	30.83	0.00234	1,020.76	33.11
Cement	1,126,962.09	0.01	89.41	0.00667	3,656.61	40.90
Iron and Steel	1,126,962.09	0.04	161.71	0.00337	6,355.00	39.30
Automotive	1,126,962.09	0.06	12.08	0.00018	1,212.06	100.32
Others	1,126,962.09	0.72	236.47	0.00029	14,724.17	62.27
Sums	**-**	**1.00**	**979.95**	**-**	**36,560.14**	**-**

	Table A.5.- Absolute values for several indicators, 2010					
Subsector	**Activity: Total Manufactures GDP (2008 millions pesos)**	**Structure: GDPi/GDP**	**Energy: Subsector Energy Consumption (PJ)**	**Energy Intensity: Energy consumption/GDP (PJ /2008 millions pesos)**	**Subsector CO_2 emissions (kg/PJ)**	**Carbon Index: CO_2/E**
Sugar	2,016,704.40	0.01	42.37	0.00143	534.20	12.61
Beverages	2,016,704.40	0.05	23.49	0.00025	1,105.73	47.08
Tobacco	2,016,704.40	0.01	0.60	0.00006	29.30	48.48
Paper and pulp	2,016,704.40	0.01	42.82	0.00285	1,814.83	42.38
Chemicals	2,016,704.40	0.05	190.79	0.00199	5,615.11	29.43
Fertilizers	2,016,704.40	0.00	2.56	0.00027	96.16	37.61
Rubber	2,016,704.40	0.00	6.73	0.00072	322.42	47.91
Glass	2,016,704.40	0.01	50.03	0.00277	1,422.50	28.43
Cement	2,016,704.40	0.02	118.23	0.00267	6,229.74	52.69
Iron and Steel	2,016,704.40	0.03	197.25	0.00351	6,238.13	31.63
Automotive	2,016,704.40	0.13	10.46	0.00004	983.24	94.02
Others	2,016,704.40	0.68	630.47	0.00046	49,259.67	78.13
Sums	**-**	**1.00**	**1,315.80**	**-**	**73,651.04**	**-**