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ENVIRONMENTAL IMPLICATIONS OF HOUSEHOLD CONSUMPTION EXPENDITURES IN METRO MANILA

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1. Introduction

The purpose of this study is to determine the impact of household consumption expenditures on the environment in the National Capital Region (NCR, Metro Manila). Specifically, we establish the consumption patterns of households in general, and across income strata in NCR using data from the 1994 Family Incomes and Expenditures Survey (FIES). Then, we look into the induced domestic (NCR) output, employment generation and environmental burden arising from the production and consumption of households in Metro Manila using two Input-Output (IO) models, (1) the conventional IO and (2) the environment-augmented IO. Third, we simulate the impact of some policies on consumption and the environment in Metro Manila.

The contribution of personal consumption expenditures (PCE) on environmental degradation cannot be underestimated because it makes up for 68% of total final demand (TFD) in the entire Philippines, and 61% of TFD of the NCR. It affects the environment through two channels- (1) through actual consumption (ex. solid and human wastes, pollution from private vehicles), and this impact highly depends on the level of income and consumption patterns; and (2) through the production of these consumer goods, and this impact depends on the level and pattern of production and related demand for natural resources, or intersectoral linkages among the production sectors in the economy. Higher income levels shift consumption towards private transport, leisure and tourism, and result in higher demand for energy and land, increased use of packaged goods and greater waste production. Henceforth, this study on the environmental implications of household consumption expenditures attempts to inquire into the congruency between consumption levels and patterns with sustainable economic development.

The most recent and relevant study related to the IO analysis of environmental impact in the Philippines was the one undertaken by Orbeta (1999), which uses national estimates of the

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environmental impact of economic activities in terms of natural resource depreciation and depletion, air and water damages, air and water waste disposal services and direct nature services, as well as specific environmental variables derived from the results of USAID-funded ENRAP (Environmental & Natural Resources Accounting Project) projects.[1] Aside from providing estimates on the total environmental burden of economic activities in the entire Philippines, it also shows that endogenizing the household sector significantly increased all types of environmental damages.

Orbeta's study, as well as this study, took off from the IO modeling work of Mendoza (1996), which simulated alternative economic policies, using two types of IO- the conventional 11-sector IO model and the environment–augmented, endogenized household (or closed) IO model for the entire Philippines for 1988. It was found out that (1) households generate more significant damages through air than water pollution.[2] If the household consumption response is incorporated to changes in labor income, this leads to greater increases in air residuals, waste disposal services and pollution damages than in the corresponding water variables; (2) greater increase in the final demand of the resource-based forestry and mining and quarrying sectors, relative to other production sectors, results in greater environmental damages. This is due to high natural resource depreciation and water waste disposal services multipliers in these sectors; (3) the net social benefits (defined as the difference between the damage pollution inflicts and the abatement cost of pollution) of controlling air pollution may be greater than the net social benefits of controlling for water pollution. In this paper, we test the robustness of these findings for Metro Manila.

Another point of view from which environmental damage due to consumption is assessed is through the input approach in which impacts on energy, materials and land are identified. Using this approach, Topke (2001) addressed the central issue of whether consumption patterns in rich countries have changed in a less environmentally damaging direction. He concluded that historical changes in the composition of consumptions "seem to have done very little to counterbalance the environmental effects of growth," and asserted that there has been no unanimous consensus as to whether economic growth has detrimental effects on the environment. He identified the most energy intensive sectors (transport (excluding private consumption of petrol), foods and beverages and tobacco) and the least energy intensive sectors (housing, including appliances but excluding its direct energy consumption, such as heating and electricity consumption). Moreover, as income increases, decreases in energy intensities are greatest for clothing and housing and the least for service and health.

Rothman (1998), on the other hand, assessed the relationship between consumer expenditures and growth in income. It was found out that all categories of consumer goods, except food, increased with growth in income, but the composition changes due to differences in relative growth rates. The main shifts in the composition of consumption are reflected in the replacement of categories of consumer goods with high environmental impact with other categories of high environmental impact, implying that changing consumption patterns due to higher income has not contributed to making consumption more environment-friendly; and the increase in share of housing and household equipment and transport, including petrol, has resulted in even more environmentally-harsh effects of income growth.

Unfortunately, there have been very few studies, and none in Metro Manila, which tackle the issue of the extent of environmental destruction implied by private consumption patterns in urban centers in developing countries. This paper hopes to contribute to the literature by providing an initial assessment of the environmental impact of PCE in Metro Manila.

This paper is organized as follows: In section 2, we discuss our analytical framework in conducting this research. Section 3 will describe the data used in this study. In section 4, we will present and analyze our results. The final section will give the summary and conclusions of this study.

2. Analytical Framework

2.1. Consumption Expenditure Patterns

In order to establish the consumption expenditure pattern of households, we use the concept of consumption propensities. The share of the xth expenditure item (x=1,2,…26) to total consumption expenditures in the representative *ith* family member, which is the propensity to consume for that item, is computed using equation (1).

$$s_x^i = \frac{e_x^i}{\sum_{x=1}^{26} e_x^i} \qquad (1)$$

where s_x^i is the per capita share of the *xth* item to total consumption expenditures and e_x^i is the per capita amount of money spent on the *xth* item. (For a list of the 26 FIES items, refer to Appendix A) If we divide the sample into deciles, from the poorest 10% to the richest 10% of the population based on annual per capita or household income, then we can also determine the consumption pattern based on income. We can identify the items in which urban households, on the average, spend a relatively big or small portion of their income. The findings will also give us some insights on the environmental implication of changing consumption patterns arising from higher income.

2.2. Input-Output Analysis

2.2.1. The Conventional Input-Output Model

IO analysis is a popular tool that can be implemented in order to measure the impact of final demand components, which, in our case is the PCE, on gross output and the returns to value-added components, particularly employment generation, given the economic structure of the economy. Since in the IO transactions table, the economy is disaggregated into *n* production sectors, we can also identify the sectors which are highly favored or disfavored by any economic policy through intersectoral linkages. Equation (2) shows the simplified relationship between gross output and the exogenous final demand components in the conventional IO transactions table.[3]

$$X = [I - A]^{-1} Y \tag{2}$$

where X is vector of gross output, A is the technical coefficient matrix, and I is an identity matrix. Y is total final demand equal to $[F_D + E - M]$, where F_D is final domestic demand (consisting of PCE, investments and government expenditures), E is exports and M is imports – all of which are exogenous to the system. $[I - A]^{-1}$ is the Leontief inverse matrix, in which the sectoral column sum will be the multiplier, or the increase in output of the sector due to a one peso increase in final demand. It indicates strength of intersectoral linkages between that sector and the other sectors in the IO table.

The impact on the target variables, V, comprising of employment generation and the environmental variables, can be summarized in the multiplier matrix and is shown in equation (3). Here, v is the matrix of coefficients for the target variables.

$$V = v \times [I - A]^{-1} \tag{3}$$

2.2.2. The Environment-Augmented (EA) Input-Output Table

In order to account for the impact of economic activities on the environment, we will follow the methodology of ENRAP (Mendoza, 1996) and make the following modifications to the conventional IO model. We call our modified model the environment-augmented IO (EAIO):

1. *Inclusion of Environmental Impact Variables*

a. *Environmental waste disposal services (ES)* are entered as negative inputs or as additional rows in the conventional IO table. Environmental waste disposal services for air and water are the abatement costs that should be incurred if air or water pollutions are to be reduced by 90%. They can be considered as the imputed economic value of the pollutants/ residuals generated from the production process.

b. *Environmental damages (ED)* are deducted from the total output of the respective sectors, and thus are entered as an additional column (elements are with negative values) in the conventional IO table. Environmental damages comprise the health and non-health impact of air and water pollution, which are considered "undesired" output of the production process.

c. The values of *natural resource depreciation (NR)*, or in physical terms, natural depletion, for forests, fisheries, minerals and soils, are subtracted from the output of the agricultural and forestry sectors.[4]

d. *The benefits received from recreational activities involving nature (direct nature services or DNS)* are estimated and included as additional output for the services sector. These include the benefits derived from the use of parks, bathing beaches, swimming pools and forests for amusement and recreation.

e. *"Net environmental benefits (NEB)"* are included as an accounting balancing entry and computed as in equation (4):

$$NEB=|ES|-|ED|+DNS \quad (4)$$

|ES|-|ED|, or the difference between the abatement cost of pollution and the resulting damages when pollution is not controlled, can be interpreted as the net social cost of polluting. A positive value implies that it will be more expensive to control pollution than the damage it will currently inflict in the society.

f. Since households are considered as one sector, *household environmental coefficients*, which account for the amount of air and water pollution and damages as well as natural resource depletion imposed by households during the *actual consumption*, are also included. This impact through the actual consumption channel will further highlight the role of households in environmental destruction.

2. *Endogenizing the Household Sector*

As mentioned above, in conventional IO, we only look at the total output induced by the first-round change in any final demand components. During the production of the induced output, however, income is generated and again spent by households on consumption of goods, which in turn again generates income and then are partly spent as PCE. The full-round (total) impact can thus be estimated by closing the model with respect to households or by "endogenizing households" inside the A-matrix. Thus, the PCE from labor income (Labor PCE), showing the money flows *from* consumers (as purchases of goods of the n sectors) is added as the *(n+1)*th column (H_c column). Labor income, showing the money flows *to* consumers is moved inside the A-matrix as the *(n+1)*th row. (H_r row.)[5] The *(n+1, n+1)* th element is therefore the household purchase of labor services, which we will assume here to be equal to zero.[6] In this framework, we now have a "consumption" sector in addition to the conventional n production sectors. The final demand matrix, Y^*, will only include the remaining PCE arising from income from other value-added components.

The environment-augmented A-matrix will then be a partitioned matrix as shown in equation (5).

$$\begin{bmatrix} X \\ --- \\ X_{n+1} \end{bmatrix} = \begin{bmatrix} I-A & | & -H_c \\ --- & | & --- \\ -H_r & | & 1 \end{bmatrix}^{-1} \begin{bmatrix} Y^* \\ --- \\ Y^*_{n+1} \end{bmatrix} \tag{5}$$

The last column in the environment-augmented Leontief inverse matrix will then be the expected increase in gross output due to a one peso increase in final demand arising from increase in labor income. The gross outputs derived in this "closed with respect to household" model are higher than in the conventional IO analysis because it includes the additional output necessary to satisfy the expected increase in consumer spending arising from household income. We also derive for the impact multipliers, interpreted as the change in the impact variable (in this case, employment and the environmental variables) arising from an increase in final demand by one peso, using equation (6).

$$\begin{bmatrix} V \\ --- \\ V_{n+1} \end{bmatrix} = v \times \begin{bmatrix} I-A & | & -H_c \\ --- & | & --- \\ -H_r & | & 1 \end{bmatrix}^{-1} \tag{6}$$

From the IO model, we can now decompose the environmental impact of a peso increase in household consumption through the production channel, as follows:

(1) First-round direct environmental impact due to the production of the initial increase in PCE.

(2) First-round, indirect environmental impact due to the total (intermediate) output required to produce the initial increase in PCE, and this can be attributed to the intersectoral linkages among the sectors. The stronger the interlinkage, the higher the impact on gross output, labor income, and consequently, on the environmental variables.

(3) Full-round, indirect impact due to additional PCE arising from the increase in labor income generated by the initial increase in PCE. The higher the share of labor income on PCE, and the higher the share of a sector to household PCE, the stronger is the third impact, and consequently, the stronger is its environmental impact.

In analyzing the environmental impact of PCE through the production channel, the IO that is closed with respect to household model is justifiable because we are now able to account not only for the value of environmental variables arising from the first-round PCE but also from its succeeding rounds as income earned from the first round is put back to the system in the form of labor income. Consequently, we can get a better estimate of the total environmental burden imposed by households.

2.3. Policy Simulation

The first-round, direct and indirect impact of a change in final demand on gross output and the impact variables in the conventional IO model can be estimated using equations (7) and (8) respectively.

$$\Delta X = [I - A]^{-1}[\Delta Y] \quad (7)$$

$$\Delta V = v\Delta X = v[I - A]^{-1}[\Delta Y]$$

(8)

where △ represents a change. The middle term in equation (5) is used to evaluate the impact of a change in *gross output*, while the right-hand side equation is used to evaluate the impact of any change in *final demand*.

For the IO model closed with respect to household, we use equations (9) and (10):

$$\Delta\begin{bmatrix} X \\ --- \\ X_{n+1} \end{bmatrix} = \begin{bmatrix} I - A & | & -H_c \\ --- & | & --- \\ -H_r & | & 1 \end{bmatrix}^{-1} \Delta\begin{bmatrix} Y^* \\ --- \\ Y^*_{n+1} \end{bmatrix} \quad (9)$$

$$\Delta\begin{bmatrix} V \\ --- \\ V_{n+1} \end{bmatrix} = v \times \begin{bmatrix} I - A & | & -H_c \\ --- & | & --- \\ -H_r & | & 1 \end{bmatrix}^{-1} \Delta\begin{bmatrix} Y^* \\ --- \\ Y^*_{n+1} \end{bmatrix} \quad (10)$$

3. Description of Data

To determine the household consumption pattern of residents of the National Capital Region (NCR), we use raw data from the Family Incomes and Expenditures Survey (1994), in which there are 504 sample households from NCR, stratified according to NCR regional income deciles.

For the input-output analysis, the intraregional, non-competitive IO Use Table for NCR (1994) (in thousand pesos and in current producers' prices) extracted by Secretario (2002)[7] (Appendix B) was used. It has data for 11 sectors, two types of imports (domestic and international), and four primary inputs such as compensation of employees, depreciation, indirect taxes less subsidies and other value-added. The final demand components are PCE, government consumption expenditures (GCE), gross fixed capital formation (GFCF), inventories, and foreign and domestic imports and exports. For the structural analysis of the intraregional IO Table for NCR for 1994, see Kim and Secretario (1999, 2001).

Perhaps the greatest barrier in evaluating the environmental impact of economic activities is in the extraction of the coefficients for the environmental variables mentioned above. For our purpose, we re-aggregated the estimated national coefficients derived from various studies under the Philippine Environment and Natural Resource Accounting Project (ENRAP) and compiled in Orbeta (1999) for an economy disaggregated into 40 sectors and the household sector, for either 1988, 1990 or 1992.[8]

4. Presentation and Analysis of Results

4.1. Consumption Expenditure Patterns

First, we discuss the composition of consumption expenditures in comparison with the national levels based on FIES data. Consistent with national trends, food expenditures consume the biggest portion of the per capita expenditures in Metro Manila (NCR) at 52.7% (see Figure 1 and Table 1 below). Cereals got the highest share among the food items (22.29%), followed by meat at 7.36% of total per capita expenditures. Since food expenditures consume more than half of total consumption expenditures, it is important to relate food consumption patterns to the environment. Studies show that food consumption patterns indirectly contribute to problems like acidification, climate change, waste generation, energy use, land conversion, soil erosion, pesticide and fertilizer use. These effects take place through the process of consumer choice related to food categories as in meat, dairy products, fruits, cereals etc., packaging, growing method (organic, intensively grown produce etc), food state (frozen, tinned, fresh, pre-prepared), source of food and seasonality. For example, the increased use of highly processed prepared food is related to the increased proportion of containers and packaging in household waste. This leads to an increase in usage of metals, plastics and other synthetic materials in household waste that require appropriate collection, recycling and disposal methods (waste disposal services).

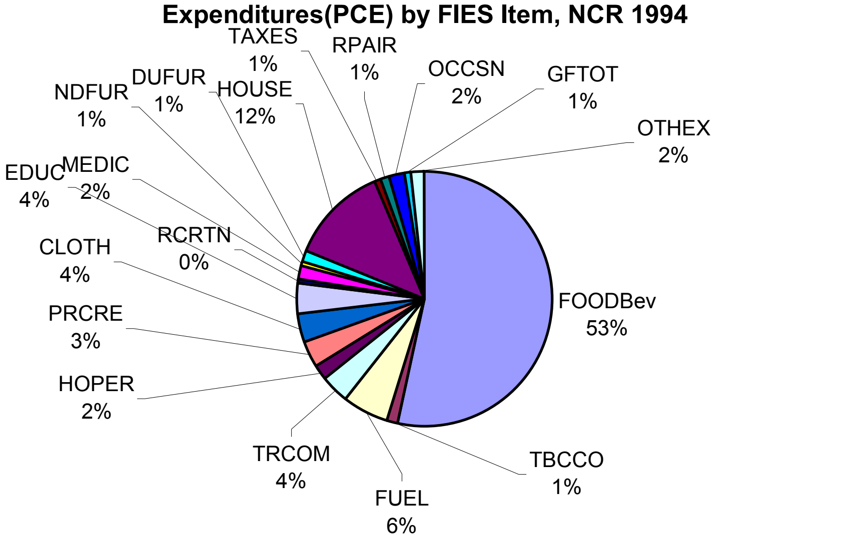
On the other hand, expenditures on non-food items comprise 47.3% of the total per capita expenditure, with high percentages spent on housing (12.5%), fuel (5.95%), education (3.89%), and transportation and communication (3.58%). When compared to consumption expenditure shares for the entire Philippines, the Metro Manila consumption expenditure shares in non-food items, particularly for FIES items related to the services sector – namely personal care items, household repairs, household operations and personal recreation, as well as expenditures on nondurable items, exceeded national averages. If expenditures on service sectors emit relatively higher air and water pollution and deplete natural resources than the other production sectors, then such consumption pattern magnifies the propensity of the Metro Manila economy to adversely affect the environment. Although expenses on education in Metro Manila exceeded national averages, educational services have relatively lower energy and material intensity (see Topke, 2001) so that higher than national average expenditures in this sector are less harmful to the environment.

Second, we tried to align the expenditure items in FIES with the production sectors in the IO Table (Secretario, 2002). To be able to do this, we first grouped the sectors into food and non-food sectors. Table 2 shows the allocation of consumption expenditures by Metro Manila households across production sectors. The light manufacturing sector is composed of the following sub-sectors: food manufactures, beverage industries, tobacco manufactures, textile manufactures, footwear & wearing apparel, wood and wood products, furniture & fixtures, paper and paper products, publishing and printing, and leather & leather products. On the other hand, the heavy manufacturing sector is composed of rubber products, chemical and chemical products, products of petroleum and coal, non-metallic mineral products, basic metal industries metal fabrication, machineries, electrical machinery, transport equipment and miscellaneous manufactures. All other services sector consists of the trade sector, finance, insurance & real estate sector; and private services. The expenditures by the government are classified in the IO separately as government consumption expenditures (GCE).

Relating this PCE pattern to the environment, it is noteworthy that the services sector, which, according to Topke (2001), has the lowest material intensity among sectors (Topke, 2001), consumes the biggest portion of Metro Manila PCE (53.93%). However, the sector which has the second biggest share to total PCE, the light manufacturing goods (manufacturing 1) sector (28.45%), is composed of very environment-unfriendly sectors like food manufactures, wood and wood products paper and paper products, chemical and chemical products, products of petroleum and coal, non-metallic mineral products and basic metal industries (see Orbeta, 1999). It is also important to point out that the electricity, gas and steam sector and the transportation and storage sectors, which are thought to be the highest emitters of air pollution, take up only 1.10% and 3.72% of total PCE in Metro Manila.

Third, to be able to provide us with some insights on the impact of income on PCE and on the environmental variables, we also derived for the per capita consumption patterns in Metro Manila stratified according to income. The dramatically declining values for the average propensity to consume (APC) on food items (Table 3) from the first (0.6821) to the tenth (0.3275) income deciles affirms the widely accepted fact that as an individual moves into higher income brackets, the portion of expenditures allocated to food diminishes and is reallocated to non-food items. Of the food FIES items, cereals consistently took up the largest portion of food expenditures across income brackets, although its share diminishes as income increases, from a high of 56% of food expenditures in the first decile to a low of 25% of food expenditures in the tenth decile. The same declining trend can be detected in expenditures on root crops. Among the food items, the reallocation of expenditures on meat did not have a consistently upward trend in expenditure share but it had a substantial share of 21% of food expenditures in the 10th decile in contrast to its minimal 9% share in the lowest income bracket. Those food items which experienced almost consistently constant shares across income deciles are: fruits, fish and marine products, food not elsewhere classified, and alcoholic beverages.

Figure 1. Allocation of Personal Consumption Expenditures(PCE) by FIES Item, NCR 1994



Source: Authors' calculations from Family Income and Expenditures Survey, 1994.

With regards to nonfood items, expenditures linearly went up with increases in income as far as percentage share of total expenditures are concerned. The fuel (FUEL) sector always occupied a significant share of overall expenditures across income deciles, from the first decile's value of 7.34% of total expenses, to 5.95% in the highest income decile. Those nonfood items whose share of total expenditures increased with increases in income are: durable furniture (DUFUR), housing-related expenditures (HOUSE), taxes (TAXES), gifts to others (GIFTOT) and other expenditures (OTHEX).

We also note that as income increases, nonfood expenditures are reallocated to other FIES items with environmental consequences such as transportation and communication (TRCOM) and household operations (HOPER). This, to some extent, supports Rothman's (1998) findings that changing consumption patterns due to income have not made consumption more environment-friendly. Moreover, housing expenditures consistently increased as income level increased. This reflects the shift in the emphasis of Metro Manila residents from consuming services with no expected future returns to those with significant returns on their expenditures. It must be noted that percentage shares of expenditures for education (EDUC) and household operations (HOPER) linearly increase from first to fifth or sixth deciles, but take on an irregular pattern from the 6th or seventh decile upward.

Trends in Metro Manila consumption show that there has been increasing consumption of energy through growth in stock of durable goods. The increasing proportion of income allotted to durable goods like radio, television, refrigerator, washing machine, microwave ovens, has led to environment-unfriendly ways of disposal of these items and generation of wastes. Moreover, durable goods include appliances, the energy intensities of which depend on the technology embodied in them. Pollutants such as CO2 and SOx vary directly with amount of energy consumed while emissions of NOx, CO and VOC are also technology dependent. Newer technologies may result in reduced energy (fuel) consumption, but they do not necessarily translate reduction in energy use. Some measures to reduce household fuel consumption have transferred pollution problems, such as insulation of buildings that impairs indoor air quality. However, other things being equal (mix of energy sources, technology), reduced total energy use can generally be expected to alleviate environmental pressures at all stages of the fuel cycle.

Another non-food item whose share is relatively small across income brackets but has important impact on the environment is the recreation sector. This includes travel activities related to tourism. While tourism and leisure activities will have potential negative impact on the environment, it has also stimulated improved protection of the natural environment, landscapes, and historic sites. On the other hand, the negative impact of leisure and tourism activities on the environment includes high energy consumption and the degradation of natural resources such as water, soil, landscape and habitat. Many environmental costs are incurred in the need to lay utility services, to provide additional infrastructure and to organize waste disposal.

In this section, we have analyzed the consumption patterns in NCR across consumption items and across incomes. We have seen that households, through their actual consumption, are vital sources of environmental degradation. Moreover, our findings here significantly imply that environmental degradation is related to income level. In the next section, we will attempt to make a more systematic assessment of the relationship among consumption expenditures, income and the environment by using IO analysis.

4.2. The Environment-Augmented IO Table (EAIO)

4.2.1. The Environmental Coefficients

Here, we briefly comment on the estimated environmental input per peso of production (or the coefficients) for each sector in physical terms or in peso values. We summarize the results in Tables 4-7.

First, for environmental adjustments (see Tables 4a and 4b), the resource-based sectors, obviously, have very high natural resource depreciation coefficients, and among them, production in the fisheries sector imposed the highest natural resource depreciation in 1994.[9] Since these sectors' share in total production in NCR is minimal, we can expect that any increase in production within NCR will not result in considerable natural resource depreciation within the region, although it will have adverse impact on the natural resources of the source (exporter) regions. For air pollution, which is measured by the health and non-health damages imposed by polluted air, its coefficient is highest for sector 4 (0.00184), although total air damages are highest in manufacturing 1 (101 million pesos), manufacturing 2 (61 million pesos), all other services (42 million pesos) and construction (31 million pesos), primarily because total NCR outputs in these sectors are relatively high. Health and non-health damages arising from water pollution are exceptionally high in the all other services (28 million pesos) and manufacturing 1 (18 million pesos) sectors, the top two sectors in which PCE shares are very high. Moreover, the marginal propensities to consume for goods in these sectors are considerably high so that any increase in income will lead to considerable air and water pollution (damages) in NCR.

When total damages (in thousand pesos) imposed by air and water pollution are compared, our results show that in general, air pollution damages are higher compared to water pollution damages (except for the all other services sector), but this cannot be entirely attributed to the production and consumption structure in NCR, but to some extent on the unavailability of complete data on these damages. Based only on the data on hand, the all other services sector emits greater amount (in thousand pesos) of water than air pollution, suggesting that emphasis should be given to water pollution control in this sector, perhaps by requiring firms to implement production processes that reduce contaminated water as byproduct. In contrast to this, the light manufacturing (mnfg-1) and heavy manufacturing (mnfg-2) sectors emit greater air than water pollution and thus require that the government must prioritize the implementation of policies concerned with the reduction of air, rather than water pollution in these sectors.

Regarding specific air emission residuals, the results expressed in physical terms are shown in Tables 5a and 5b. We can identify the production processes in sectors 4 (mining and quarrying) and 7 (electricity, gas and steam) as the foremost emitters of air residuals in terms of emission per thousand pesos of output. Mining and quarrying has particularly high emission coefficients for particulate matters (PM, 0.0282 mt/thousand pesos), volatile oxygen compound (VOC, 0.0055 mt/thousand pesos), and carbon monoxide (CO, 0.00326 mt/thousand pesos); while electricity, gas and steam sector have high input coefficients for sulfur oxide (Sox, 0.0063 mt/thousand pesos) and nitrogen oxide (NOx, 0.00104 mt/thousand pesos). For total air emission residuals, however, the light manufacturing and all other services sectors have high volume of air residuals (particularly VOC and CO) (in metric tons), and again, we can attribute this to the very high amount of total output in these sectors. The transportation and storage sector also has considerable air emission residuals of NOx (9,451 mt), VOC (15,752 mt) and CO (46,626 mt) because of this sector's high emission coefficients of these environmental variables.

Next, we also summarize in Tables 6a and 6b the sectoral emission of water effluents and discharge measured in physical terms of biochemical oxygen demand 5 (BOD5)[10], suspended solids (SS), total suspended solids (TDS), oil, nitrogen (N) and phosphorus (P). Again, the two manufacturing sectors and the all other services sectors have high emission levels of water pollutants in NCR. The all other services sector has high emission coefficients for BOD5 and oil; and the high total output in this sector has reinforced its very high negative impact on water resources reflected in BOD5, SS, N and P. Increasing final demand in the services sector will surely aggravate the water quality situation in NCR, unless policies reducing the emission of the abovementioned substances are reinforced by the government or placed upon the initiative of the producers in this sector.

Finally, using the results in Tables 7a and 7b, we evaluate the necessary environmental waste disposal services (ES) to eliminate water and air pollution, as measured by the abatement cost to reduce air and water pollution by 90%, and the net environmental benefit. In terms of ES, the coefficients appear to be very high in the forestry (0.00366/thousand pesos for air and 0.41331/thousand pesos for water) and mining and quarrying (0.01532/ thousand pesos for air and 0.17275/thousand pesos for water) sectors. However, in terms of their implied negative impact on the environment of NCR, they seem to be of minimal concern as production in these sectors in NCR is very minimal. Nevertheless, the total abatement cost for air and water pollution in the services and the manufacturing-1 sectors is enormous, and any attempt to effectively reduce these negative environmental effects would require stricter environmental rules in these two sectors. Finally, the net environmental benefit, or net social cost of polluting, which is one indicator (albeit inaccurately) for the "wisdom" of imposing pollution reduction policies, is positive for all sectors, implying that at this stage, it will be more expensive to spend for the abatement cost of pollution rather than the estimated damage it will inflict in terms of health and non-health damages. This finding, however, must be taken cautiously because a possible reason for this trend is the very limited scope or weak methodology of assessing health and non-health damages brought about by air and water pollution.

In summary, we have seen that although the light manufacturing, heavy manufacturing and services sectors generally have low environmental coefficients, they impose relatively high environmental burden on the economy of NCR because of the high shares of production in this sectors to total production. Incidentally, these sectors are also where the bulk of private consumption (PCE) is spent so that the negative environmental impact of household consumption channeled through the production sectors on the environment will also be significantly strong.

4.2.2. Endogenization of the Household Sector

We closed the IO table with respect to household by distributing the labor income among the 11 sectors, assuming that all income from labor is spent on PCE. Based on our computations, the adjustment factor or proportionality constant for household income, computed as aggregate labor income/aggregate PCE is 0.65, which is interpreted as the share of labor income to total PCE. As also shown above, PCE in the all other services sector as well as the manufacturing 1 sector comprise the bulk of PCE from labor income (Table 8).

ENRAP studies have evaluated the environmental coefficients of the household sector. The values for the Labor PCE (last column) estimated by ENRAP and shown in Table 9 are *direct effects* arising from *actual consumption*. Compared to those of the production sectors, coefficients for air pollution damages, PM, VOC, CO, BOD and P are very high. In terms of total values, the direct impact of household consumption arising from labor income is very high for almost all environmental variables. This again confirms our view that the household sector imposes considerable environmental burden, not only through the production of the goods and services it consumes, in the course of actual consumption.

The complete environment-augmented IO (EAIO) for NCR in 1994 is shown in Table 10. In contrast to the environment-adjusted IO for the entire Philippines, the total output adjustment is positive, implying that the gross output of NCR is higher when the environmental variables are incorporated in the IO table. This can be attributed to the very low natural resource depreciation and the extremely high direct environmental services in NCR. One possible extension of this study, however, is to measure the impact of NCR's production and consumption structure on other regions' environment, or the feedback and spillover effects, using intraregional IO Use Table for NCR.

We also present the A-matrix and the Leontief inverse matrix in Tables 11a and 11b. In NCR, the output multipliers, or the amount of gross output due to a peso increase in any of the final demand components, are high in all other services (1.86), and transportation and communications (1.77). This suggests that an increase in final demand in these sectors will have relatively higher impact than those spent in the rest of the sectors because of their strong intersectoral linkages. In contrast, any increase in final demand in the fisheries and the electricity, gas and steam sectors do not induce considerable gross NCR output because they use minimal amount of intermediate inputs from other NCR sectors. The total multiplier, which adds the output and the labor income multipliers are higher in the environment-augmented IO model because the indirect impact due to consumption arising from induced labor income is also put into account (see Table 11c). The difference between the multipliers in the conventional IO and the environment-augmented IO is high in sectors 11 (all other services), 10 (transportation and storage), and 8 (waterworks and supply) The labor income multiplier, 1.31, can be interpreted as follows: The independent increase in household labor income by 1 peso will generate 1.31 pesos worth of labor income as the initial increase in labor income is spent on private consumption.

The multipliers for the impact variables, computed using equation (6), are shown in Tables 12a, 12b and 12c. Again, the multipliers for the environment-augmented IO are higher compared to the multipliers in the conventional IO analysis, simply because they now contain the environmental impact arising from subsequent consumption due to labor income that is generated by the initial increase in final demand. In this section, we will focus our discussion on the environmental impact multipliers for the environment-augmented IO model. A high multiplier for a sector implies that a thousand peso increase in final demand for this sector will have the highest amount of environmental impact measured in metric tons.

From Table 12a, we observe the following: First, household consumption multipliers have very high environmental impact multipliers. This implies that as households increase their consumption, its huge negative impact on the environment is unavoidable. At the same time, households can play an important role in environmental protection, not by reducing (actual) consumption per se, but more importantly, by reducing the emission coefficients for air and water pollutants through improving the waste disposal and packaging systems and employing more environment-friendly energy-use technologies in cooking, transportation and other household activities.

Second, the multipliers in the all other services sector are generally low compared to those of other sectors (except for VOC, CO, and oil) although the employment generation (labor income) multiplier is the highest among all sectors. This is an indication that there is minimal trade-off between employment generation and environmental destruction in this sector. Therefore, policies that will raise final demand in the services sector can be tapped for sustainable economic development in this region.

Third, we observe that the manufacturing sectors do not have extraordinarily high environmental multipliers, but at the same time, their impact on employment generation is also low so that encouraging further final demand in NCR for goods in these sectors will not be as effective as raising final demand in the other services sector if the region wants to achieve economic development and environmental well-being at the same time.

4.3. Impact of PCE on Output, Labor Income and the Environmental Variables

In this study, we are concerned with the impact of household consumption, so we isolate the impact of PCE in 1994 on gross domestic output, labor income and on the environment for the same year. To be able to grasp the magnitude of PCE in NCR based on data from the IO table (Secretario, 2002), and to understand its role in environmental degradation, we show sectoral PCEs as percentages of total PCE, total final demand, and total output in Table 13. The total PCE (excluding PCE on imported goods) for NCR in 1994 is 292.7 billion pesos, comprising 35% of the region's total final demand and 26.6% of its total output. PCE comprises around 79%-100% share to total final demand in the agricultural sectors (sectors 1, 2, and 4), and household utilities (sectors 7 and 8). Almost half of the output in the light manufacturing sector (mnfg-1) goes to PCE, while a third of transportation and storage and all other services sectors are demanded by households. Ceteris paribus, the higher is the share of PCE to total sectoral final demand, the higher will be its share to that sector's income and environment damage.

4.3.1. Induced NCR Output

By multiplying sectoral PCE with the Leontief inverse matrix from the two IO models (conventional and environment-augmented) (equations 7 and 9), we derive for the induced gross output in NCR arising from PCE. From the results shown in Table 14, we observe that the bulk of induced PCE in both models go to (1) the all other services sector (46.22% and 39.18%, respectively) which accounts for expenditures on private services, education and health services, housing (ownership of dwellings) and insurance, and (2) the manufacturing-1 sector (36.09% and 30.59%), which includes processed food and beverages, personal care goods and clothing. Moreover, the value for HH, which is the induced output from changes in labor income due to the initial rise in PCE, is high at 15% of total output. We can attribute the strong effect of PCE on the services, manufacturing-1 and HH sectors on their strong intersectoral linkage, revealed by their multipliers, and high initial PCEs, implied by household consumption patterns.

In order to evaluate how much gross output is induced by the PCEs, we divide the induced sectoral output by the initial PCE, and the values obtained can be interpreted as the TOTAL sectoral output induced by the increase not only in PCE for that specific sector but in also from increases in PCEs in other sectors. Note that the values here are not the same as the sectoral output multipliers. The results are presented in Table 15. We have seen that for the conventional IO, the ratio is highest in the electricity, gas and steam (2.58), waterworks and supply (1.96), and heavy manufacturing (1.73) and lowest in crops, livestock and poultry (1.00) and fishery (1.00). High ratios would either imply high initial PCE for that sector or strong linkage with other sectors. The same trend is detected in the environment-augmented IO.

When we compare the results from the two models, we detect a much greater impact in the environment-augmented model, because it captures the additional induced effects of household income generation through compensation to labor and the resulting consumer expenditures produced by the various sectors. It must be noted that the ratio between the induced outputs in the two models is 1.31 for each sector, which means that the environment-augmented model induces 31% more gross output than the conventional IO model, and is also equal to the labor income multiplier in Table 11c. However, the ratio when all sectors are aggregated becomes 1.54, and the difference, obviously, is that which can be attributed to the full-round impact of PCE from labor income.

4.3.2. Employment Generation

The labor income coefficients represent the labor income received by the household per peso worth of sectoral output, and by multiplying these values with the respective induced gross output (equations 8 and 10), we can determine the direct and indirect amount of employment generation. For the model using conventional IO, PCE in 1994 in NCR generated a total of 68,844 million pesos of labor income, the bulk of it coming from the other services sector (sector 11- 47,295 million pesos) and the light manufacturing sector (sector 5-12,346 million pesos) (see Table 16). It is not surprising that the induced labor income in the all other services sector is extraordinarily high, because this sector does not only comprise almost half of total PCE, but more importantly, this sector has very high labor input coefficient (0.26717) and high labor income multiplier (0.32784 for the conventional IO model and 0.42865 for the environment-augmented model). This finding implies that if the government aims to generate more employment, increasing final demand in the all other services sector is an effective economic policy. In contrast to this, PCE in the light manufacturing sector generates also relatively high employment basically because its share to total PCE is high, and not because the labor input in this sector is high. Encouraging people, therefore, to spend on goods in this sector will not be as effective as increasing demand in the all other services sector if the objective is to raise employment. Finally, as expected, the model with endogenized household generates employment higher than that the conventional model by 31%, as shown in Table 18.

4.3.3. Impact on Environmental Variables

In Tables 16, 17 and 18, we also present the impact of PCE on the environment using the conventional and the household-augmented IO models, calculated using equations (8) and (10). For air residuals and water effluents, the values are shown in physical terms (metric tons) while the rest are in thousand pesos. For reference, we also include the total output due to PCE (bottom row) and the total labor income it generated per sector. We can interpret the values in Table 16 as the first-round impact of household consumption (PCE) on each environmental variable channeled through the production sectors, since the initial PCE directly and indirectly generates the production of sectoral gross domestic output. The values in Table 17 are interpreted as the full-round, total environmental impact of initial PCE, which also include the effect due to the household sector's consumption response to changes in labor income. The last column of Table 17 represents the environmental impact during the process of actual consumption of households.

By comparing the results, we observe that the values in Table 17 are larger than their corresponding values in Table 16, proving that if we are to measure the impact of household expenditures, we must include the succeeding rounds of PCE induced by the initial increase in labor income. This therefore justifies our use of the IO model that is closed with respect to household. In the following analysis on the environmental burden due to PCE, we will therefore refer to the results in Table 17.

First, on the sectoral level and in general, PCEs on the manufacturing and services sectors have the strongest impact on the environment, primarily because their shares to total PCE and their impact multipliers are high. Second, the other services sector emits the highest levels of the water residuals and effluents (except TDS). The light manufacturing sector sector induced the highest levels of air residuals: PM (68,678 mt), NOx (21,688 mt), VOC (18,073 mt) , as well as TDS (518,703 mt). For SOx, electricity, gas and steam sector emitted the highest level. On the other hand, resource-based sectors (1-4) as well as the water works and supply sector seem to have minimal impact because their productions are done outside NCR, and thus, their environmental impact are also not accounted in our intraregional IO model.

Third, the consumption activities of households PCE in Metro Manila emit considerable amounts of air residuals (PM, NOx, VOC and CO) and water effluents (BOD5, SS, N and P) compared to the production sectors (Table 17, last column) which are highly not in proportion to the share of PCE to total final demand. This can be attributed to high rates of PCE on highly-pollutive consumer items.[11] This suggests that policies encouraging households to reduce the consumption of highly-pollutive goods can considerably improve the environment.

Fourth, the impact of household consumption is extremely high in terms of CO and BOD, the major indices for air and water residuals respectively. In the case of Metro Manila, it is not only the popular use of oil-based vehicles (especially private vehicles) but also the traffic congestion which generate such high rate of CO emission. Therefore, encouraging people to use bicycles or walk, decongesting traffic, and imposing stricter rules on vehicle maintenance are important elements of the campaign towards the reduction of CO emission in NCR. Water contaminated with human and solid wastes would encourage the existence of microorganisms that will raise the biochemical demand for oxygen (BOD). High levels of BOD imply that households must be encouraged to refrain from indiscriminate disposal of wastes in water bodies, directly or indirectly, and that the government must improve the water sewerage system in the city.

Fifth, natural resource depreciation does not seem to be a major environmental problem in the NCR, as indicated by the minimal impact of PCE, in both the conventional and the household-augmented models, on NR depreciation. This can be attributed to the following observations: (1) the domestic output of the resource-based sectors (sectors 1-4) are minimal compared to the other sectors (most of them are imported from other regions or from abroad), (2) direct and labor-income household consumption on the output of the resource-based sectors are also very small.

Sixth, the HH(CE) sector also contributes considerably to air and water pollution as measured by the cost of health and non-health damages arising from unclean air or water. Total air pollution due to PCE arises mainly from the household (363 million pesos) and manufacturing (59 million pesos), while water pollution induced by PCE is relatively high in the household (188 million pesos) and the services (111 million pesos) sectors. It must be noted also that households inflict greater air than water damages. On the other hand, the cost of water waste disposal services (4,694 million pesos) is higher than air waste disposal services (1,654 million pesos), which can again be attributed to the following reasons: (1) higher estimated impact coefficients for water compared to air ES, or (2) higher PCEs on items that require more water than air ES, or (3) inadequate measurement and data.

4.4. Policy Simulation

In order to give us some insights on the impact of government policies on the environment through the consumption channel, we perform simulation exercises under three policies in which PCE may change, thus affecting the production of gross output and the generation of employment and environmental damages (see Table 19):

Policy 1. Increase in the minimum daily wage by 25 pesos.

In the Philippines, the minimum wage rates are fixed by law after consultations among the government, employers and trade unions, and are based on regional standard of living and productivity. The minimum daily wage in Metro Manila effective November, 2000 is 250 pesos.

National labor unions and workers' welfare groups have been vocal about wages not being able to catch up with inflation, and the government has approved a 10 % increase (25 pesos). Assuming fixed prices and unitary propensities to consume out of income, this type of policy will be translated into increase in PCE. The total increase in PCE (including domestic and foreign import components) is computed as follows:

25 pesos x 3.603 million wage earners[12] x 301 days[13] = 27,112,575 pesos

This amount is then distributed among the NCR production sectors, imported domestic and imported foreign sectors. PCE on imported domestic and on foreign goods amount to 11.8% and 6.1%, respectively, so only 22,259,273 million pesos worth of PCE are used for goods produced within NCR. We then distribute this amount among the 11 NCR sectors based on their shares to total PCE and use the data to estimate the impact on gross domestic output, labor employment and environmental variables.

Policy 2. Outmigration

Overpopulation is one of the serious problems in urban centers in developing countries, and this can be attributed not only on the high birth rates, but more significantly, on the high rates of in-migration from the rural areas. Nakanishi (2001) noted that while net in-migration takes place between NCR and the other regions in the Philippines, only migration from NCR to Southern Tagalog or Calabarzon area (composed of Southern Tagalog provinces of Cavite, Laguna, Batangas, Rizal and Quezon) displayed net out-migration within the period 1985-1990 at the rate of 16.2 per 1,000 persons, or 1.62%. For a rough estimate, we translated it into a 1.62% uniform decrease in sectoral PCE.[14]

Policy 3. Transportation Color Coding System

The color-coding scheme in NCR aims to reduce traffic volume by 20% daily, by prohibiting private vehicles whose plate number ends with two particular digits from traveling in all thorough fares from 7 a.m. to 7 p.m. However, there are exemptions granted from this ban which results to 10% to 15% traffic volume reduction. Among those exempted are public utility vehicles, ambulances, vehicles of doctors etc. Since private vehicles compose 70% of total vehicles traveling in Metro Manila, we estimate that around 10.5% reduction in traffic is estimated to be achieved through the color-coding scheme.[15] In this paper, we assume that this is translated into a 10.5% decrease in PCE for road transport sector, but no change in PCE in the transport manufacturing sector.

This policy has important repercussions on the transport sector, which in turn has significant effects on the environment. The effect of the transport sector depends on the transport mode, its energy efficiency and the rate of increase in related trafficked volumes like passenger and freight volume. In relation to consumption on transportation, transport trends are closely related to the increased time spent on leisure activities and to current patterns of urbanization. The predominance of private vehicles has led to increased pollution which occurs when road traffic and congestion occurs. Transport infrastructure leads to fragmentation of natural habitats and vehicles entail waste management issues.

The results, calculated using equations (7) to (10), are presented in Tables 20 and 21.We predict that the size of the environmental impact per peso of change in PCE in policies 1 and 2 will be the same in absolute values (but opposite signs) because in both policies, there are uniform and proportional increase in PCE for all sectors. Changes are greatest in the all other services and manufacturing-1 sectors, and are least in the agricultural (1-4) sectors. Incorporating the household sector and the environmental variables in the IO model will result in higher environmental impact for all policies.

The third policy, which is an example of a simulation exercise in which the initial impact is confined to selected sectors, will give us some assessment of the effectiveness of the color-coding system as an environmental policy in NCR. First, the change in PCE due to this scheme is minimal because it makes up for a very small portion of total PCE, and its output multiplier is relatively small compared to the other sectors. Consequently, its negative impact on both unemployment and the environmental variables is also small. When we incorporate the household in the analysis, the impact dramatically increased for all production sectors, again highlighting the role of additional PCE arising from the labor income generated from the initial increase in PCE, as well as the amount of environmental destruction imposed by the actual consumption by households. However, it must be also noted that such policy may have other impacts (favorable or otherwise) on the environment which are not yet accounted for in our analysis (due to lack of data).[16]

5. Summary and Conclusions

This study highlighted the role of household consumption in environmental degradation in the National Capital Region (NCR, Metro Manila). It looked into the matter by first establishing the consumption patterns of NCR households, across consumption items and across incomes and giving a descriptive analysis of how they were linked to environmental degradation. It was found out that in terms of Family Income and Expenditures Survey (FIES) classification, on the average, NCR households spent slightly bigger shares on food than non-food items. Food is largely produced by the light manufacturing sector (processed cereals, meat and other food products, and beverages), while non-food items are highly concentrated in the all other services sector (private services, finance, trade, etc.) and light manufacturing (clothing and personal care). We also found significant differences in the consumption trends among households in different income deciles, with shares of non-food items increasing and the composition of non-food expenditures changing as income increases. In section 3, we discussed how these consumption patterns would affect the environment.

We also attempted to measure the extent in which households, through their personal consumption expenditures (PCE), affect specific environmental variables such as natural resource depreciation, air and water (pollution) damages, air and water waste disposal services, direct nature services (all expressed in monetary values) as well as air (PM, SOx, NOx, VOC, CO) and water residuals (BOD5, SS, TDS, Oil, N and P), by using the Input-Output methodology. We extracted the environment-augmented intraregional noncompetitive intraregional IO Use Table for NCR using the conventional IO Table for NCR and national environmental coefficients from ENRAP.

In the environment-augmented IO model, households affect the environment in two channels (1) through the production of consumption goods, and (2) through the actual consumption of these goods. The production of consumption goods will have environmental implication through (1) the first-round, direct impact due to the initial production of the consumption goods; (2) the first-round, indirect impact due to the production of the intermediate inputs necessary to produce the consumption goods; and (3) the full-round indirect impact due to the subsequent consumption of goods arising from the additional labor income earned by households in the production of the initial consumption goods, which is estimated by closing the IO with respect to household. On the other hand, the environmental damages directly arising from actual consumption of goods are assessed by using the environmental impact multipliers.

It was found out that the environment-augmented IO analysis produced higher values for gross output, employment generation and environmental impact compared to those derived from the conventional IO methodology, because of the endogenization of the household and inclusion of environmental coefficients for the household itself.

The all other services and the light manufacturing sectors have the highest shares to total PCE, and as such, we examined how they will affect NCR's gross output, employment and the environment, by looking at their respective multipliers and total impact levels. The environmental impact multipliers in the all other services sector are generally low compared to those of other sectors (except for VOC, CO, and oil) although the output and employment generation (labor income) multipliers are very high, thus policies that will raise final demand in the services sector can be tapped for sustainable economic development in this region. On the other hand, the manufacturing sectors do not have relatively high intraregional environmental and employment generation multipliers, so that encouraging further final demand in NCR for goods in these sectors will have less impact within the region than raising final demand in the all other services sector.

Household's actual consumption had considerably high contribution to total environmental damage, and this can be attributed to this sector's high emission coefficients for environmental residuals. Therefore, an effective environmental policy would require implementation of policies that target the households, such as stricter waste management rules, water sewerage system and efficient energy (fuel)-use household activities.

Finally, we also estimated the impact of three government policies, namely, the increase in minimum wages, outmigration and the transport color-coding system. The first two policies will result in opposite but the same absolute level of gross output, employment generation and environmental burden per peso change in PCE. It was found out that the impact on production, employment and the environment is higher in the environment-augmented IO model compared to the conventional IO model. The transport color-coding system in Metro Manila would have minimal effect because of this sector's low share to total PCE in NCR and weak interlinkage with other sectors.

Endnotes:

[1] For a brief introduction on ENRAP, see Department of Environment and Natural Resources (1996).
[2] Care must be taken in interpreting this result because of incomplete information needed in evaluating these damages.
[3] We impose the assumptions of constant returns to scale, which imply fixed prices and no substitution among alternative inputs.
[4] Market-valuated NRs are included in the impact analysis as natural resource depreciation.
[5] It must be noted that labor income is not the only source of change in PCE in the Philippines. International remittances can also be a considerable source of increase in PCE.
[6] This is due to lack of data and/or its inclusion in the other services sector.
[7] Note that the sectoral classification in this paper is not a conventional one, but is instead re-disaggregated and align with the available environmental data from ENRAP.
[8] For a summary of the sources of these data, see Carlos, (2001a) and (2001b).
[9] This finding should be interpreted with care because although fisheries is natural resource intensive, the intermediate inputs originating from NCR are not from the resource-based sectors and comprise only about 20% of total inputs. Therefore, the bulk of the natural resource depreciation/depletion is transferred to other regions.
[10] BOD (Biological oxygen demand), on the other hand, is an indicator of the capacity of organisms to live in bodies of water surrounding NCR.
[11] It must be noted, however, that we are just looking at the impact due to PCE. In general (considering all final demands), it is possible that the productive sectors emit more if the output induced by other final demand components are high.
[12] The number of workers includes both the skilled and unskilled workers. Data for unskilled laborers, who benefit more than the skilled laborers, are not available.
[13] 301 workdays = 365 days – (52 restdays + 10 holidays + 2 special days) (from Amante, 2002)
[14] We assume uniform consumption patterns among the migrants.
[15] Based on interview with Metro Manila Development Authority (2002).
[16] An example of a positive impact of being able to divert time spent in traffic to productive economic activities.

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Table 1. Ratio of Per Capita Expenditures per FIES Item to Total Expenditures in NCR, 1994 and Ratio of NCR Expenditures to National Expenditure per FIES Item

Code	FIES ITEM	Share to NCR's Total Per Capita Expenditures	NCR/National Ratio
CEREAL	Cereals	0.2229	1.1060
ROOTS	Rootcrops	0.0157	1.6265
FRUITS	Fruits and Vegetables	0.0531	1.1037
MEAT	Meats	0.0736	1.1730
DAIRY	Dairy Products	0.0291	0.8668
FISHM	Fish and Marine Products	0.0488	0.5717
COFCT	Coffee, Cocoa and Tea	0.0118	0.7641
NONAL	Non-alcoholic Beverages	0.0101	0.8239
FDNEC	Food Not Elsewhere Classified	0.0451	0.8592
FDOUT	Food Outside Home	0.0115	0.3677
ALBEV	Alcoholic Beverages	0.0104	0.9468
TBCCO	Tobacco	0.0141	0.8044
FUEL	Fuel, Light and Water	0.0595	1.0138
TRCOM	Transportation and Communication	0.0358	0.9963
HOPER	Household Operations	0.0194	0.8126
PRCRE	Personal Care and Effects	0.0350	1.0711
CLOTH	Clothing, Footwear and Other Wear	0.0353	1.0124
EDUC	Education	0.0389	1.4901
RCRTN	Recreation	0.0043	1.3738
MEDIC	Medical Care	0.0177	0.9676
NDFUR	Non-durable Furnishings	0.0057	1.6442
DUFUR	Durable Furniture and Equipment	0.0135	0.8705
HOUSE	Housing Expenditures	0.1247	1.1680
RPAIR	House Maintenance and Minor Repairs	0.0122	1.2734
OCCSN	Special Family Occasions	0.0187	0.8067
GFTOT	Gifts and Contribution to Others	0.0090	1.0868
OTHEX	Other Expenditures	0.0165	1.4329
TAXES	Taxes	0.0078	1.0666

Source: Authors' calculations from Family Incomes and Expenditures Survey, 1994.

Table 2. Shares of Food and Non-Food Items to Total PCE

Code	Sectors	Food	Non-Food	Total
1	Crops, livestock & poultry incl agricl. services	0.0340	0.0000	0.0340
2	Fishery	0.0171	0.0000	0.0171
3	Forestry	0.0000	0.0000	0.0000
4	Mining and quarrying	0.0000	0.0002	0.0002
5	Manufacturing - 1	0.2333	0.0512	0.2845
6	Manufacturing - 2	0.0000	0.0737	0.0737
7	Electricity and gas and steam	0.0000	0.0110	0.0110
8	Waterworks and supply	0.0000	0.0018	0.0018
9	Construction	0.0000	0.0012	0.0012
10	Transportation and storage	0.0000	0.0372	0.0372
11	All other services	0.0363	0.5030	0.5393
All	All sectors	0.3207	0.6793	1.0000

Source: Authors' calculation from Secretario (2002)

Table 3. Average Propensity to Consume on Food and Non-Food Across Income Deciles, NCR (1994)

Food Items

Decile	FOOD	CEREAL	ROOTS	FRUITS	MEAT	DAIRY	FISHM	COFCT	NONAL	FDNEC	FHOME	FDOUT
1	0.6821	0.3859	0.0198	0.0600	0.0594	0.0166	0.0506	0.0084	0.0046	0.0587	0.6639	0.0183
2	0.6633	0.3774	0.0340	0.0579	0.0590	0.0208	0.0495	0.0080	0.0061	0.0468	0.6594	0.0039
3	0.6228	0.3224	0.0207	0.0538	0.0757	0.0280	0.0484	0.0103	0.0076	0.0497	0.6166	0.0063
4	0.5979	0.2783	0.0180	0.0594	0.0781	0.0316	0.0491	0.0125	0.0135	0.0510	0.5916	0.0064
5	0.5180	0.2263	0.0167	0.0510	0.0677	0.0327	0.0512	0.0099	0.0097	0.0476	0.5126	0.0054
6	0.5348	0.2004	0.0136	0.0630	0.0851	0.0350	0.0531	0.0143	0.0112	0.0493	0.5250	0.0097
7	0.4844	0.1750	0.0142	0.0574	0.0777	0.0313	0.0569	0.0137	0.0102	0.0440	0.4804	0.0040
8	0.4577	0.1601	0.0101	0.0506	0.0713	0.0346	0.0468	0.0152	0.0120	0.0432	0.4438	0.0138
9	0.4510	0.1333	0.0098	0.0488	0.0886	0.0361	0.0463	0.0151	0.0147	0.0404	0.4331	0.0179
10	0.3275	0.0843	0.0074	0.0363	0.0675	0.0219	0.0392	0.0095	0.0088	0.0282	0.3031	0.0245
All	0.5217	0.2229	0.0157	0.0531	0.0736	0.0291	0.0488	0.0118	0.0101	0.0451	0.5102	0.0115

Non-Food Items

Decile	ALBEV	TBCCO	FUEL	TRCOM	HOPER	PRCRE	CLOTH	EDUC	RCRTN	MEDIC	NDFUR	DUFUR	HOUSE	TAXES	RPAIR	OCCSN	GFTOT	OTHEX
1	0.0062	0.0097	0.0734	0.0220	0.0218	0.0195	0.0234	0.0227	0.0005	0.0263	0.0045	0.0017	0.0592	0.0014	0.0066	0.0041	0.0041	0.0108
2	0.0070	0.0142	0.0755	0.0323	0.0220	0.0263	0.0335	0.0231	0.0009	0.0103	0.0036	0.0012	0.0610	0.0021	0.0013	0.0081	0.0054	0.0092
3	0.0123	0.0139	0.0628	0.0315	0.0201	0.0295	0.0391	0.0280	0.0027	0.0104	0.0049	0.0085	0.0824	0.0030	0.0074	0.0064	0.0058	0.0083
4	0.0113	0.0207	0.0578	0.0338	0.0196	0.0319	0.0362	0.0205	0.0047	0.0181	0.0071	0.0078	0.0831	0.0037	0.0127	0.0146	0.0073	0.0112
5	0.0099	0.0117	0.0575	0.0340	0.0212	0.0388	0.0414	0.0448	0.0032	0.0159	0.0050	0.0162	0.1139	0.0053	0.0194	0.0205	0.0054	0.0179
6	0.0102	0.0151	0.0610	0.0423	0.0195	0.0344	0.0324	0.0323	0.0048	0.0179	0.0054	0.0102	0.1269	0.0062	0.0120	0.0157	0.0091	0.0099
7	0.0138	0.0179	0.0491	0.0294	0.0162	0.0404	0.0391	0.0404	0.0032	0.0168	0.0050	0.0135	0.1390	0.0052	0.0126	0.0483	0.0122	0.0135
8	0.0099	0.0153	0.0591	0.0334	0.0169	0.0463	0.0386	0.0551	0.0061	0.0126	0.0059	0.0212	0.1574	0.0086	0.0088	0.0191	0.0071	0.0211
9	0.0126	0.0132	0.0547	0.0327	0.0196	0.0413	0.0376	0.0455	0.0073	0.0272	0.0082	0.0171	0.1440	0.0132	0.0192	0.0198	0.0107	0.0250
10	0.0092	0.0095	0.0525	0.0591	0.0182	0.0357	0.0310	0.0633	0.0071	0.0187	0.0059	0.0291	0.2249	0.0218	0.0170	0.0213	0.0181	0.0301
All	0.0104	0.0141	0.0595	0.0358	0.0194	0.0350	0.0353	0.0389	0.0043	0.0177	0.0057	0.0135	0.1247	0.0078	0.0122	0.0187	0.0090	0.0165

Note: Refer to Table 1 for FIES items.

Source: Authors' calculations from FIES (1994)

Table 4a. Enivronmental Adjustment Coefficients, Philippines

SECTOR	OUTPUT COEFFICIENT				Total Output
	NR Depn	Air Damages	Water Damages	Nature Services	
1	(0.00203)	0.00000	(0.00104)	0.00000	**393,691**
2	(0.07886)	0.00000	0.00000	0.00000	**429,522**
3	(0.03746)	(0.00010)	(0.01530)	0.00000	**0**
4	(0.00595)	(0.00243)	0.00000	0.00000	**305,131**
5	0.00000	(0.00033)	(0.00006)	0.00000	**308,018,607**
6	0.00000	(0.00036)	(0.00001)	0.00000	**170,985,694**
7	0.00000	(0.00036)	0.00000	0.00000	**21,567,663**
8	0.00000	0.00000	0.00000	0.00000	**3,173,820**
9	0.00000	(0.00058)	0.00000	0.00000	**53,936,712**
10	0.00000	(0.00015)	0.00000	0.00000	**63,008,581**
11	0.00000	(0.00009)	(0.00048)	0.00487	**476,586,253**
CE (HH)	0.00000	(0.00404)	(0.00209)	0.00000	**191,905,356**

Table 4b. Estimated Total Environmental Adjustment, NCR (1994)

SECTOR	OUTPUT ADJUSTMENT (Thousand Pesos)				Total Adjustment
	NR Depn	Air Damages	Water Damages	Nature Services	
1	(799)	0	(409)	0	**(1,209)**
2	(33,872)	0	0	0	**(33,872)**
3	0	0	0	0	**0**
4	(1,816)	(741)	0	0	**(2,557)**
5	0	(101,646)	(18,481)	0	**(120,127)**
6	0	(61,555)	(1,710)	0	**(63,265)**
7	0	(7,764)	0	0	**(7,764)**
8	0	0	0	0	**0**
9	0	(31,283)	0	0	**(31,283)**
10	0	(9,451)	0	0	**(9,451)**
11	0	(42,893)	(228,761)	2,320,975	**2,049,321**
CE (HH)	0	(775,298)	(401,082)	0	**(1,176,380)**

Note: The values in Table 2b are calculated by multiplying respective values in Table 2a with total output of NCR (1994).

Source: Authors' Calculations from Orbeta (1999).

Table 5a. Air Emission Residuals and Discharge Coefficients, Philippines

SECTOR	AIR EMISSION RESIDUAL COEFFICIENT (mt/'000 pesos)					Total Output
	PM	SOx	NOx	VOC	CO	
1	0.00000	0.00000	0.00001	0.00001	0.00003	**393,691**
2	0.00000	0.00006	0.00012	0.00004	0.00011	**429,522**
3	0.00012	0.00006	0.00015	0.00013	0.00079	**0**
4	0.00282	0.00083	0.00066	0.00055	0.00326	**305,131**
5	0.00038	0.00014	0.00012	0.00010	0.00058	**308,018,607**
6	0.00042	0.00018	0.00013	0.00009	0.00054	**170,985,694**
7	0.00042	0.00603	0.00104	0.00003	0.00007	**21,567,663**
8	0.00000	0.00000	0.00000	0.00001	0.00000	**3,173,820**
9	0.00068	0.00003	0.00007	0.00007	0.00040	**53,936,712**
10	0.00017	0.00009	0.00015	0.00025	0.00074	**63,008,581**
11	0.00011	0.00001	0.00002	0.00005	0.00011	**476,586,253**
CE (HH)	0.00470	0.00005	0.00036	0.01040	0.03189	**191,905,356**

Table 5b. Estimated Total Air Emission Residuals, NCR (1994)

SECTOR	TOTAL AIR EMISSION RESIDUALS (in metric tons)				
	PM	SOx	NOx	VOC	CO
1	0	0	4	4	12
2	0	26	52	17	47
3	0	0	0	0	0
4	860	253	201	168	995
5	117,047	43,123	36,962	30,802	178,651
6	71,814	30,777	22,228	15,389	92,332
7	9,058	130,053	22,430	647	1,510
8	0	0	0	32	0
9	36,677	1,618	3,776	3,776	21,575
10	10,711	5,671	9,451	15,752	46,626
11	52,424	4,766	9,532	23,829	52,424
CE (HH)	901,955	9,595	69,086	1,995,816	6,119,862

Note: The values in Table 3b are calculated by multiplying respective values in Table 3a with total output of NCR (1994).

Source: Authors' Calculations from Orbeta (1999).

Table 6a. Water Effluent Emissions and Discharge Coefficients, Philippines

SECTOR	WATER EFFLUENT RESIDUAL COEFFICIENT (mt/'000 pesos)						Total Output
	BODs	SS	TDS	OIL	N	P	
1	0.00577	0.60577	0.00000	0.00000	0.00317	0.00004	**393,691**
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	**429,522**
3	0.08473	16.81562	0.00000	0.00000	0.06518	0.00103	**0**
4	0.00000	1.67715	0.00000	0.00000	0.00000	0.00000	**305,131**
5	0.00031	0.00031	0.00287	0.00003	0.00000	0.00000	**308,018,607**
6	0.00005	0.00007	0.00011	0.00001	0.00000	0.00000	**170,985,694**
7	0.00000	0.00496	0.00002	0.00000	0.00000	0.00000	**21,567,663**
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	**3,173,820**
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	**53,936,712**
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	**63,008,581**
11	0.00267	0.00207	0.00000	0.00009	0.00007	0.00002	**476,586,253**
CE (HH)	0.01156	0.00523	0.00000	0.00000	0.00092	0.00037	**191,905,356**

Table 6b. Estimated Total Water Efflunet Emissions and Discharge, NCR (1994)

SECTOR	TOTAL WATER EFFLUENT RESIDUAL (in metric tons)					
	BODs	SS	TDS	OIL	N	P
1	2,272	238,486	0	0	1,248	16
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	511,751	0	0	0	0
5	95,486	95,486	884,013	9,241	0	0
6	8,549	11,969	18,808	1,710	0	0
7	0	106,976	431	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	1,272,485	986,534	0	42,893	33,361	9,532
CE (HH)	2,218,426	1,003,665	0	0	176,553	71,005

Note: The values in Table 4b are calculated by multiplying respective values in Table 4a with total output of NCR (1994).

Source: Authors' Calculations from Orbeta (1999).

Table 7a. Environmental Waste Disposal Services (ES) and Net Environmental Benefits (NEB), Philippines

SECTOR	OUTPUT COEFFICIENTS (per 1,000 pesos)			Total Output
	ES (AIR)	ES(WATER)	NEB	
1	(0.00014)	(0.01569)	0.01479	**393,691**
2	(0.00134)	0.00000	0.00134	**429,522**
3	(0.00366)	(0.41331)	0.40157	**0**
4	(0.01532)	(0.17275)	0.18564	**305,131**
5	(0.00317)	(0.00045)	0.00323	**308,018,607**
6	(0.00204)	(0.00020)	0.00187	**170,985,694**
7	(0.00069)	0.00000	0.00033	**21,567,663**
8	(0.00002)	0.00000	0.00002	**3,173,820**
9	(0.00208)	0.00000	0.00150	**53,936,712**
10	(0.00286)	0.00000	0.00271	**63,008,581**
11	(0.00058)	(0.00584)	0.01072	**476,586,253**
CE (HH)	(0.00848)	(0.03574)	0.03809	**191,905,356**

Table 7b. Estimated Total Environmental Waste Disposal Services (ES) and Net Environmental Benefits (NEB), NCR (1994)

SECTOR	Estimated Total ES and NEB (in 1,000 pesos)		
	AIR ES	WATER ES	NEB
1	-55	-6,177	5,823
2	-576	0	576
3	0	0	0
4	-4,675	-52,711	56,645
5	-976,419	-138,608	994,900
6	-348,811	-34,197	319,743
7	-14,882	0	7,117
8	-63	0	63
9	-112,188	0	80,905
10	-180,205	0	170,753
11	-276,420	-2,783,264	5,109,005
CE (HH)	-1,627,357	-6,858,697	7,309,675

Note: The values in Table 5b are calculated by multiplying respective values in Table 5a with total output of NCR (1994).

Source: Authors' Calculations from Orbeta (1999).

Table 8. Sectoral PCE due to Labor Income, NCR (1994)

CODE	SECTOR DESCRIPTION	Sectoral PCE due to Labor Income (A)	Share to Household's PCE due to Labor Income
1	Crops, livestock & poultry	258,101	0.0013
2	Fishery	281,591	0.0015
3	Forestry	0	0.0000
4	Mining and quarrying	64,114	0.0003
5	Manufacturing - 1	77,143,935	0.4020
6	Manufacturing - 2	10,901,790	0.0568
7	Electricity and gas and steam	2,637,005	0.0137
8	Waterworks and supply	538,493	0.0028
9	Construction	1,382,689	0.0072
10	Transportation and storage	10,334,067	0.0539
11	All other services	88,363,571	0.4605
ALL	All Sectors	191,905,356	1.0000

Notes: Column (A) is computed by multiplying original sector PCE by the proportionality constant, 0.6556.
Column (A) appears as the 12-th sector (Labor PCE (HH)) in the EAIO Table.
Column (B) is computed by dividing sectoral PCE due to labor income to total PCE due to labor income.

Source: Authors' Calculations

). Summary of Impact Variable Coefficients

Impact Variable	Sector 1	2	3	4	5	6	7	8	9	10	11	Labor PCE
Residuals												
PM	0.00000	0.00000	0.00012	0.00282	0.00038	0.00042	0.00042	0.00000	0.00068	0.00017	0.00011	0.00470
Sox	0.00000	0.00006	0.00006	0.00083	0.00014	0.00018	0.00603	0.00000	0.00003	0.00009	0.00001	0.00005
Nox	0.00001	0.00012	0.00015	0.00066	0.00012	0.00013	0.00104	0.00000	0.00007	0.00015	0.00002	0.00036
VOC	0.00001	0.00004	0.00013	0.00055	0.00010	0.00009	0.00003	0.00001	0.00007	0.00025	0.00005	0.01040
CO	0.00003	0.00011	0.00079	0.00326	0.00058	0.00054	0.00007	0.00000	0.00040	0.00074	0.00011	0.03189
BODs	0.00577	0.00000	0.08473	0.00000	0.00031	0.00005	0.00000	0.00000	0.00000	0.00000	0.00267	0.01156
SS	0.60577	0.00000	16.81562	1.67715	0.00031	0.00007	0.00496	0.00000	0.00000	0.00000	0.00207	0.00523
TDS	0.00000	0.00000	0.00000	0.00000	0.00287	0.00011	0.00002	0.00000	0.00000	0.00000	0.00000	0.00000
Oil	0.00000	0.00000	0.00000	0.00000	0.00003	0.00001	0.00000	0.00000	0.00000	0.00000	0.00009	0.00000
N	0.00317	0.00000	0.06518	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00007	0.00092
P	0.00004	0.00000	0.00103	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002	0.00037
Labor Income CE	0.14044	0.13135	0.00000	0.16737	0.08932	0.08441	0.10672	0.22076	0.11558	0.21002	0.26717	0.00000
Environmental Variables												
NR Depn	-0.00203	-0.07886	-0.03746	-0.00595	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Air Damages	0.00000	0.00000	-0.00010	-0.00243	-0.00033	-0.00036	-0.00036	0.00000	-0.00058	-0.00015	-0.00009	-0.00404
Water Damages	-0.00104	0.00000	-0.01530	0.00000	-0.00006	-0.00001	0.00000	0.00000	0.00000	0.00000	-0.00048	-0.00209
Nature Services	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00487	0.00000
ES(air)	-0.00014	-0.00134	-0.00366	-0.01532	-0.00317	-0.00204	-0.00069	-0.00002	-0.00208	-0.00286	-0.00058	-0.00848
ES(water)	-0.01569	0.00000	-0.41331	-0.17275	-0.00045	-0.00020	0.00000	0.00000	0.00000	0.00000	-0.00584	-0.03574
NEB	0.01479	0.00134	0.40158	0.18564	0.00324	0.00187	0.00033	0.00002	0.00150	0.00272	0.01071	0.03809

Source: Authors' calculations from Orbeta (1999)

Table 10. Environment-Augmented Non-Competitive Intra-Regional Input-Output Table, NCR (1994)

(Thousand Pesos in Current Producers' Prices)

CODE	SECTOR DESCRIPTION	1	2	3	4	5	6	7	8
1	Crops, livestock & poultry incl agricl. services	0	0	0	0	0	0	0	0
2	Fishery	0	0	0	0	0	0	0	0
3	Forestry	0	0	0	0	0	0	0	0
4	Mining and quarrying	0	0	0	1,788	0	154,879	0	0
5	Manufacturing - 1	39,952	22,733	0	3,117	30,964,274	2,827,977	14,347	3,152
6	Manufacturing - 2	10,610	3,666	0	12,334	6,434,257	20,003,019	385,777	27,167
7	Electricity and gas and steam	2,613	2,484	0	5,307	5,674,005	2,375,109	280,855	103,210
8	Waterworks and supply	67	291	0	801	132,452	4,839	0	0
9	Construction	130	1,235	0	3,370	189,401	83,388	66,011	235
10	Transportation and storage	19,576	8,997	0	9,401	8,197,750	3,095,854	99,753	6,329
11	All other services	24,630	16,231	0	32,244	23,502,563	15,347,619	2,116,129	132,827
HH	Labor Income	55,290	56,419	0	51,070	27,511,316	14,432,847	2,301,703	700,637
TII	**Total Intermediate Inputs**	**97,578**	**55,639**	**0**	**68,361**	**75,094,703**	**43,892,685**	**2,962,871**	**272,920**
DMP	Domestic Imports (Inflows)	43,408	53,636	0	28,881	94,055,805	13,886,108	4,924,294	91,805
FMP	Foreign Imports	13,453	5,192	0	30,595	31,081,367	58,134,038	4,862,689	78,917
TM	**Total Imports**	**56,861**	**58,829**	**0**	**59,475**	**125,137,172**	**72,020,147**	**9,786,983**	**170,722**
CE	Compensation of Employees	55,290	56,419	0	51,070	27,511,316	14,432,847	2,301,703	700,637
DPN	Depreciation	29,501	37,393	0	26,233	8,883,734	5,774,109	2,334,237	754,971
IT-S	Indirect Taxes less Subsidies	8,345	11,689	0	6,766	10,588,842	2,500,974	450,283	5,161
OVA	Other Value Added	146,116	209,553	0	93,225	60,802,840	32,364,933	3,731,586	1,269,409
TPI	**Total Primary Inputs**	**239,252**	**315,055**	**0**	**177,294**	**107,786,732**	**55,072,863**	**8,817,809**	**2,730,178**
TI	**TOTAL INPUTS**	**393,691**	**429,522**	**0**	**305,131**	**308,018,607**	**170,985,694**	**21,567,663**	**3,173,820**
NR	**Natural Resource Depreciation**	(799)	(33,872)	0	(1,816)	0	0	0	0
ES(air)	**Environmental Waste Services (air)**	(55)	(576)	0	(4,675)	(976,419)	(348,811)	(14,882)	(63)
ES(water)	**Environmental Waste Services (water)**	(6,177)	0	0	(52,711)	(138,608)	(34,197)	0	0
NEB	**Net Environmental Benefit**	5,823	576	0	56,645	994,900	319,743	7,117	63
TEI	**Total Environmental Inputs**	**(1,208)**	**(33,872)**	**0**	**(2,557)**	**(120,127)**	**(63,265)**	**(7,765)**	**0**
Adj. TI	**ADJUSTED TOTAL INPUTS**	**392,483**	**395,650**	**0**	**302,574**	**307,898,480**	**170,922,429**	**21,559,898**	**3,173,820**

TID : Total Intermediate Demand
PCE : Private Consumption Expenditures
GCE : Government Consumption Expenditures
GFCF : Gross Fixed Capital Formation
CS : Change in Stocks (Inventories)
FXP : Foreign Exports
DXP : Domestic Exports (Outflows)
TFD : Total Final Demand
TO : Total Output

Source: Authors' calculations from Secretario (2002) and Orbeta (1999).

9	10	11	Labor PCE (HH)	TID	TID + Labor PCE	PCE (orig)	PCE(New)	GCE	GFCF
0	0	0	258,101	**0**	**258,101**	393,691	135,590	0	0
0	0	0	281,591	**0**	**281,591**	429,522	147,931	0	0
0	0	0	0	**0**	**0**	0	0	0	0
49,887	0	781	64,114	**207,335**	**271,450**	97,796	33,682	0	0
632,215	558,146	15,810,065	77,143,935	**50,875,977**	**128,019,912**	117,670,640	40,526,705	0	295,056
5,686,031	2,291,253	12,161,651	10,901,790	**47,015,764**	**57,917,554**	16,628,924	5,727,134	0	19,250,556
181,785	386,428	8,287,608	2,637,005	**17,299,404**	**19,936,409**	4,022,326	1,385,321	0	0
42,010	74,482	1,881,370	538,493	**2,136,311**	**2,674,805**	821,385	282,891	0	0
76,713	96,637	2,236,968	1,382,689	**2,754,086**	**4,136,775**	2,109,069	726,380	0	44,999,956
2,040,603	1,634,295	5,838,024	10,334,067	**20,950,583**	**31,284,649**	15,762,953	5,428,887	0	2,145,034
6,202,169	9,536,254	64,990,657	88,363,571	**121,901,325**	**210,264,895**	134,784,386	46,420,816	92,721,539	21,864,619
6,234,060	13,233,167	127,328,848		**191,905,356**	**191,905,356**				
14,911,412	**14,577,494**	**111,207,123**	**191,905,356**	**263,140,785**	**455,046,141**	**292,720,692**	100,815,336	**92,721,539**	**88,555,220**
4,753,146	12,738,595	23,212,445		**153,788,123**	**153,788,123**	42,090,539	42,090,539	0	12,961,508
7,093,318	6,032,720	25,169,394		**132,501,683**	**132,501,683**	21,732,835	21,732,835	0	81,903,557
11,846,464	**18,771,315**	**48,381,839**		**286,289,806**	**286,289,806**	**63,823,374**	63,823,374	**0**	**94,865,064**
6,234,060	13,233,167	127,328,848		**191,905,356**	**191,905,356**	0	0	0	0
1,706,345	7,587,227	20,925,303		**48,059,052**	**48,059,052**	0	0	0	0
801,939	1,393,591	13,838,207		**29,605,798**	**29,605,798**	0	0	0	0
18,436,493	7,445,787	154,904,934		**279,404,877**	**279,404,877**	0	0	0	0
27,178,836	**29,659,773**	**316,997,291**		**548,975,083**	**548,975,083**	**0**	0	**0**	**0**
53,936,712	**63,008,581**	**476,586,253**	**191,905,356**	**1,098,405,674**	**1,290,311,030**	**356,544,066**	**164,638,710**	**92,721,539**	**183,420,285**
0	0	0	0	**-36,487**	**(36,487)**				
(112,188)	(180,205)	(276,420)	(1,627,357)	**-1,914,294**	**(3,541,651)**				
0	0	(2,783,264)	(6,858,697)	**-3,014,957**	**(9,873,654)**				
80,905	170,753	5,109,005	7,309,675	**6,745,530**	**14,055,205**				
(31,283)	**(9,452)**	**2,049,321**	**(1,176,379)**	**1,779,792**	**603,413**				
53,905,429	**62,999,129**	**478,635,574**	**190,728,977**	**1,100,185,466**	**1,290,914,443**				

CS	FXP	FMP	DXP	DMP	TFD	TO	Modified TO	TO Adj	CODE
0	0	0	0	0	**135,590**	**393,691**	**392,482**	(1,209)	1
0	0	0	0	0	**147,931**	**429,522**	**395,650**	(33,872)	2
0	0	0	0	0	**0**	**0**	**0**	-	3
0	0	0	0	0	**33,682**	**305,131**	**302,574**	(2,557)	4
690,834	42,811,958	0	95,674,141	0	**179,998,695**	**308,018,607**	**307,898,480**	(120,127)	5
204,839	44,061,769	0	43,823,842	0	**113,068,140**	**170,985,694**	**170,922,429**	(63,265)	6
0	245,933	0	0	0	**1,631,254**	**21,567,663**	**21,559,899**	(7,764)	7
0	68,572	0	147,552	0	**499,016**	**3,173,820**	**3,173,820**	-	8
0	403,935	0	3,669,666	0	**49,799,937**	**53,936,712**	**53,905,429**	(31,283)	9
0	10,337,084	0	13,812,927	0	**31,723,932**	**63,008,581**	**62,999,130**	(9,451)	10
0	55,391,267	0	49,923,117	0	**266,321,358**	**476,586,253**	**478,635,574**	2,049,321	11
					0	**191,905,356**	**190,728,976**	(1,176,380)	HH
895,673	**153,320,519**	**0**	**207,051,245**	**0**	**643,359,533**	**1,290,311,030**	**1,290,914,443**	**603,413**	**TII**
385,831	0	0	0	-209,226,001	**-153,788,123**	**0**			DMP
159,948	0	-236,298,022	0	0	**-132,501,683**	**0**			FMP
545,780	**0**	**-236,298,022**	**0**	**-209,226,001**	**-286,289,806**	**0**			**TM**
0	0	0	0	0	**0**	**191,905,356**			CE
0	0	0	0	0	**0**	**48,059,052**			DPN
0	0	31,645,725	0	0	**31,645,725**	**61,251,523**			IT-S
0	0	0	0	0	**0**	**279,404,877**			OVA
0	**0**	**31,645,725**	**0**	**0**	**31,645,725**	**388,715,452**			**TPI**
1,441,453	**153,320,519**	**-204,652,298**	**207,051,245**	**-209,226,001**	**388,715,452**				**TI**

Table 11a. A-Matrix, Environment-Augmented IO Table, NCR (1994)

CODE	SECTOR DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	Labor PCE (HH)
1	Crops, livestock & poultry incl agricl. services	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00134
2	Fishery	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00147
3	Forestry	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	Mining and quarrying	0.00000	0.00000	0.00000	0.00586	0.00000	0.00091	0.00000	0.00000	0.00092	0.00000	0.00000	0.00033
5	Manufacturing - 1	0.10148	0.05293	0.00000	0.01021	0.10053	0.01654	0.00067	0.00099	0.01172	0.00886	0.03317	0.40199
6	Manufacturing - 2	0.02695	0.00854	0.00000	0.04042	0.02089	0.11699	0.01789	0.00856	0.10542	0.03636	0.02552	0.05681
7	Electricity and gas and steam	0.00664	0.00578	0.00000	0.01739	0.01842	0.01389	0.01302	0.03252	0.00337	0.00613	0.01739	0.01374
8	Waterworks and supply	0.00017	0.00068	0.00000	0.00262	0.00043	0.00003	0.00000	0.00000	0.00078	0.00118	0.00395	0.00281
9	Construction	0.00033	0.00288	0.00000	0.01104	0.00061	0.00049	0.00306	0.00007	0.00142	0.00153	0.00469	0.00721
10	Transportation and storage	0.04973	0.02095	0.00000	0.03081	0.02661	0.01811	0.00463	0.00199	0.03783	0.02594	0.01225	0.05385
11	All other services	0.06256	0.03779	0.00000	0.10567	0.07630	0.08976	0.09812	0.04185	0.11499	0.15135	0.13637	0.46045
HH	Labor Income	0.14044	0.13135	0.00000	0.16737	0.08932	0.08441	0.10672	0.22076	0.11558	0.21002	0.26717	0.00000

Note: This is the A-matrix in the environment-augmented IO.

Table 11b. Leontief Inverse Matrix, Environment-Augmented IO Table, NCR (1994)

CODE	SECTOR DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	Labor PCE (HH)
1	Crops, livestock & poultry incl agricl. services	1.00034	0.00028	0.00000	0.00039	0.00025	0.00024	0.00025	0.00042	0.00032	0.00048	0.00057	0.00175
2	Fishery	0.00037	1.00031	0.00000	0.00043	0.00027	0.00027	0.00028	0.00046	0.00035	0.00053	0.00063	0.00192
3	Forestry	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	Mining and quarrying	0.00015	0.00011	0.00000	1.00608	0.00011	0.00112	0.00011	0.00015	0.00115	0.00020	0.00022	0.00056
5	Manufacturing - 1	0.23740	0.16009	0.00000	0.15645	1.20427	0.11223	0.09542	0.15226	0.13353	0.18758	0.24658	0.61742
6	Manufacturing - 2	0.06375	0.03486	0.00000	0.08271	0.04982	1.15632	0.04360	0.04323	0.15007	0.08417	0.07894	0.12857
7	Electricity and gas and steam	0.02058	0.01581	0.00000	0.03207	0.03005	0.02542	1.02258	0.04537	0.01714	0.02357	0.03749	0.04642
8	Waterworks and supply	0.00207	0.00211	0.00000	0.00487	0.00198	0.00159	0.00154	1.00196	0.00278	0.00395	0.00704	0.00720
9	Construction	0.00370	0.00548	0.00000	0.01506	0.00331	0.00322	0.00572	0.00380	1.00486	0.00635	0.01020	0.01391
10	Transportation and storage	0.07617	0.04069	0.00000	0.05860	0.04716	0.03797	0.02198	0.02792	0.06249	1.05868	0.05054	0.10241
11	All other services	0.25149	0.18266	0.00000	0.31790	0.22261	0.23779	0.23509	0.24519	0.30072	0.40604	1.43134	0.79072
	Output Multiplier	**1.65601**	**1.44238**	**1.00000**	**1.67457**	**1.55984**	**1.57617**	**1.42658**	**1.52076**	**1.67340**	**1.77155**	**1.86356**	**1.71089**
HH	**Labor Income Multiplier**	**0.25342**	**0.20882**	**0.00000**	**0.29293**	**0.18527**	**0.18283**	**0.18985**	**0.31524**	**0.23693**	**0.35898**	**0.42865**	**1.30751**
	Total Multiplier	**1.90943**	**1.65121**	**1.00000**	**1.96750**	**1.74510**	**1.75900**	**1.61643**	**1.83599**	**1.91033**	**2.13053**	**2.29221**	**3.01840**

Note: This is the inverse matrix of (I-A) in the environment-augmented IO.

Table 11c. Gross Output and Labor Income Arising from the Endogenization of the Household Sector, NCR (1994)

CODE	SECTOR DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	Labor PCE (HH)
1	Crops, livestock & poultry incl agricl. services	0.00034	0.00028	0.00000	0.00039	0.00025	0.00024	0.00025	0.00042	0.00032	0.00048	0.00057	0.00175
2	Fishery	0.00037	0.00031	0.00000	0.00043	0.00027	0.00027	0.00028	0.00046	0.00035	0.00053	0.00063	0.00192
3	Forestry	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	Mining and quarrying	0.00011	0.00009	0.00000	0.00013	0.00008	0.00008	0.00008	0.00014	0.00010	0.00015	0.00018	0.00056
5	Manufacturing - 1	0.11967	0.09861	0.00000	0.13832	0.08749	0.08633	0.08966	0.14886	0.11188	0.16952	0.20241	0.61742
6	Manufacturing - 2	0.02492	0.02054	0.00000	0.02880	0.01822	0.01798	0.01867	0.03100	0.02330	0.03529	0.04215	0.12857
7	Electricity and gas and steam	0.00900	0.00741	0.00000	0.01040	0.00658	0.00649	0.00674	0.01119	0.00841	0.01274	0.01522	0.04642
8	Waterworks and supply	0.00140	0.00115	0.00000	0.00161	0.00102	0.00101	0.00105	0.00174	0.00131	0.00198	0.00236	0.00720
9	Construction	0.00270	0.00222	0.00000	0.00311	0.00196	0.00195	0.00202	0.00335	0.00252	0.00381	0.00455	0.01391
10	Transportation and storage	0.01985	0.01636	0.00000	0.02294	0.01451	0.01432	0.01488	0.02469	0.01855	0.02812	0.03357	0.10241
11	All other services	0.15325	0.12629	0.00000	0.17715	0.11204	0.11057	0.11482	0.19064	0.14328	0.21709	0.25923	0.79072
	Output Multiplier	**0.33160**	**0.27326**	**0.00000**	**0.38328**	**0.24241**	**0.23925**	**0.24844**	**0.41248**	**0.31001**	**0.46972**	**0.56089**	**1.71089**
HH	**Labor Income Multiplier**	**0.05960**	**0.04912**	**0.00000**	**0.06889**	**0.04357**	**0.04300**	**0.04465**	**0.07414**	**0.05572**	**0.08443**	**0.10081**	**1.30751**

Note: This is the difference between the inverse matrix of (I-A) in the environment-augmented IO and the conventional IO.

Source: Authors' calculations

Table 12a. Environmental Multipliers for the Environment-Augmented IO, NCR (1994)

Impact	Sector											
Variable	1	2	3	4	5	6	7	8	9	10	11	Labor PCE
Residuals												
PM	0.00136	0.00109	0.00012	0.00438	0.00140	0.00144	0.00141	0.00161	0.00196	0.00203	0.00233	0.00657
Sox	0.00019	0.00020	0.00006	0.00109	0.00037	0.00039	0.00620	0.00032	0.00020	0.00030	0.00032	0.00047
Nox	0.00018	0.00025	0.00015	0.00085	0.00026	0.00027	0.00116	0.00019	0.00023	0.00035	0.00027	0.00064
VOC	0.00271	0.00225	0.00013	0.00366	0.00208	0.00204	0.00204	0.00333	0.00259	0.00405	0.00458	0.01374
CO	0.00837	0.00693	0.00079	0.01284	0.00670	0.00658	0.00625	0.01022	0.00820	0.01244	0.01406	0.04230
BODs	0.00945	0.00295	0.08473	0.00429	0.00311	0.00284	0.00286	0.00435	0.00359	0.00530	0.00886	0.01743
SS	0.60825	0.00195	16.81562	1.68999	0.00229	0.00372	0.00692	0.00294	0.00411	0.00353	0.00620	0.01091
TDS	0.00069	0.00046	0.00000	0.00046	0.00346	0.00045	0.00030	0.00044	0.00040	0.00055	0.00072	0.00179
Oil	0.00003	0.00002	0.00000	0.00003	0.00006	0.00004	0.00002	0.00003	0.00003	0.00004	0.00014	0.00009
N	0.00342	0.00021	0.06518	0.00029	0.00019	0.00019	0.00019	0.00031	0.00024	0.00036	0.00050	0.00126
P	0.00014	0.00008	0.00103	0.00011	0.00007	0.00007	0.00007	0.00012	0.00009	0.00014	0.00019	0.00050
Labor Income CE	0.25342	0.20882	0.00000	0.29293	0.18527	0.18283	0.18985	0.31524	0.23693	0.35898	0.42865	0.30751
NR Depn	-0.00206	-0.07889	-0.03746	-0.00602	-0.00002	-0.00003	-0.00002	-0.00004	-0.00003	-0.00004	-0.00005	-0.00016
Air Damages	-0.00117	-0.00094	-0.00010	-0.00377	-0.00120	-0.00123	-0.00121	-0.00138	-0.00168	-0.00175	-0.00200	-0.00565
Water Damages	-0.00171	-0.00053	-0.01530	-0.00078	-0.00057	-0.00051	-0.00052	-0.00079	-0.00065	-0.00096	-0.00160	-0.00315
Nature Services	0.00122	0.00089	0.00000	0.00155	0.00108	0.00116	0.00114	0.00119	0.00146	0.00198	0.00697	0.00385
ES(air)	-0.00356	-0.00394	-0.00366	-0.01897	-0.00578	-0.00455	-0.00292	-0.00353	-0.00521	-0.00711	-0.00560	-0.01413
ES(water)	-0.02637	-0.00863	-0.41331	-0.18622	-0.00850	-0.00840	-0.00823	-0.01281	-0.01052	-0.01534	-0.02385	-0.05178
NEB	0.02828	0.01198	0.40158	0.20219	0.01360	0.01237	0.01057	0.01536	0.01486	0.02173	0.03282	0.06096
Output Multiplier	1.65601	1.44239	1.00000	1.67457	1.55984	1.57617	1.42658	1.52076	1.67341	1.77155	1.86356	1.71089

Note: This is the V*inv(I-A) where V is the matrix of environmental variable coefficients in the environment-augmented IO.

Table 12b. Environmental Multipliers for the Conventional IO, NCR (1994)

Impact	Sector											
Variable	1	2	3	4	5	6	7	8	9	10	11	Labor PCE
Residuals												
PM	0.00009	0.00005	0.00012	0.00291	0.00047	0.00052	0.00046	0.00003	0.00077	0.00023	0.00018	0.00000
Sox	0.00010	0.00012	0.00006	0.00098	0.00031	0.00033	0.00613	0.00021	0.00011	0.00017	0.00016	0.00000
Nox	0.00005	0.00014	0.00015	0.00070	0.00017	0.00018	0.00106	0.00004	0.00011	0.00018	0.00006	0.00000
VOC	0.00004	0.00006	0.00013	0.00058	0.00013	0.00012	0.00004	0.00002	0.00010	0.00027	0.00007	0.00000
CO	0.00017	0.00018	0.00079	0.00337	0.00070	0.00067	0.00011	0.00002	0.00054	0.00082	0.00019	0.00000
BODs	0.00607	0.00017	0.08473	0.00038	0.00064	0.00040	0.00032	0.00015	0.00043	0.00051	0.00315	0.00000
SS	0.60613	0.00021	16.81562	1.68754	0.00074	0.00219	0.00534	0.00030	0.00214	0.00053	0.00262	0.00000
TDS	0.00034	0.00018	0.00000	0.00006	0.00321	0.00020	0.00004	0.00001	0.00008	0.00006	0.00013	0.00000
Oil	0.00001	0.00001	0.00000	0.00001	0.00004	0.00002	0.00001	0.00001	0.00002	0.00002	0.00011	0.00000
N	0.00318	0.00000	0.06518	0.00001	0.00001	0.00001	0.00001	0.00000	0.00001	0.00001	0.00008	0.00000
P	0.00004	0.00000	0.00103	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002	0.00000
Labor Income CE	0.19381	0.15971	0.00000	0.22404	0.14170	0.13982	0.14520	0.24110	0.18121	0.27455	0.32784	0.00000
NR Depn	-0.00203	-0.07886	-0.03746	-0.00599	0.00000	-0.00001	0.00000	0.00000	-0.00001	0.00000	0.00000	0.00000
Air Damages	-0.00007	-0.00004	-0.00010	-0.00250	-0.00040	-0.00044	-0.00039	-0.00002	-0.00066	-0.00020	-0.00015	0.00000
Water Damages	-0.00109	-0.00003	-0.01530	-0.00007	-0.00012	-0.00007	-0.00006	-0.00003	-0.00008	-0.00009	-0.00057	0.00000
Nature Services	0.00048	0.00027	0.00000	0.00069	0.00054	0.00062	0.00059	0.00027	0.00077	0.00092	0.00571	0.00000
ES(air)	-0.00082	-0.00168	-0.00366	-0.01580	-0.00378	-0.00258	-0.00087	-0.00012	-0.00265	-0.00323	-0.00097	0.00000
ES(water)	-0.01633	-0.00036	-0.41331	-0.17462	-0.00116	-0.00116	-0.00071	-0.00032	-0.00114	-0.00113	-0.00688	0.00000
NEB	0.01646	0.00225	0.40158	0.18853	0.00497	0.00384	0.00172	0.00066	0.00381	0.00499	0.01283	0.00000
Output Multiplier	1.32441	1.16912	1.00000	1.29129	1.31743	1.33692	1.17814	1.10828	1.36340	1.30184	1.30267	

Note: This is the V*inv(I-A) where V is the matrix of environmental variable coefficients in the conventional IO.

Table 12c. Additional Environmental Impact Arising from the Endogenization of the Household, NCR (1994)

Impact	Sector											
Variable	1	2	3	4	5	6	7	8	9	10	11	Labor PCE
Residuals												
PM	0.00127	0.00105	0.00000	0.00147	0.00093	0.00092	0.00095	0.00158	0.00119	0.00180	0.00215	0.00657
Sox	0.00009	0.00008	0.00000	0.00011	0.00007	0.00007	0.00007	0.00011	0.00009	0.00013	0.00016	0.00047
Nox	0.00012	0.00010	0.00000	0.00014	0.00009	0.00009	0.00009	0.00015	0.00012	0.00018	0.00021	0.00064
VOC	0.00266	0.00219	0.00000	0.00308	0.00195	0.00192	0.00199	0.00331	0.00249	0.00377	0.00450	0.01374
CO	0.00820	0.00676	0.00000	0.00948	0.00599	0.00591	0.00614	0.01020	0.00766	0.01161	0.01387	0.04230
BODs	0.00338	0.00278	0.00000	0.00391	0.00247	0.00244	0.00253	0.00420	0.00316	0.00479	0.00572	0.01743
SS	0.00212	0.00174	0.00000	0.00245	0.00155	0.00153	0.00158	0.00263	0.00197	0.00300	0.00357	0.01091
TDS	0.00035	0.00029	0.00000	0.00040	0.00025	0.00025	0.00026	0.00043	0.00032	0.00049	0.00059	0.00179
Oil	0.00002	0.00001	0.00000	0.00002	0.00001	0.00001	0.00001	0.00002	0.00002	0.00002	0.00003	0.00009
N	0.00024	0.00020	0.00000	0.00028	0.00018	0.00018	0.00018	0.00030	0.00023	0.00035	0.00041	0.00126
P	0.00010	0.00008	0.00000	0.00011	0.00007	0.00007	0.00007	0.00012	0.00009	0.00014	0.00016	0.00050
Labor Income CE	0.05960	0.04912	0.00000	0.06889	0.04357	0.04300	0.04465	0.07414	0.05572	0.08443	0.10081	0.30751
NR Depn	-0.00003	-0.00003	0.00000	-0.00004	-0.00002	-0.00002	-0.00002	-0.00004	-0.00003	-0.00004	-0.00005	-0.00016
Air Damages	-0.00109	-0.00090	0.00000	-0.00126	-0.00080	-0.00079	-0.00082	-0.00136	-0.00102	-0.00155	-0.00185	-0.00565
Water Damages	-0.00061	-0.00050	0.00000	-0.00071	-0.00045	-0.00044	-0.00046	-0.00076	-0.00057	-0.00087	-0.00103	-0.00315
Nature Services	0.00075	0.00062	0.00000	0.00086	0.00055	0.00054	0.00056	0.00093	0.00070	0.00106	0.00126	0.00385
ES(air)	-0.00274	-0.00226	0.00000	-0.00317	-0.00200	-0.00198	-0.00205	-0.00341	-0.00256	-0.00388	-0.00463	-0.01413
ES(water)	-0.01004	-0.00827	0.00000	-0.01160	-0.00734	-0.00724	-0.00752	-0.01248	-0.00938	-0.01422	-0.01697	-0.05178
NEB	0.01182	0.00974	0.00000	0.01366	0.00864	0.00852	0.00885	0.01470	0.01105	0.01674	0.01998	0.06096
Output Multiplier	0.33160	0.27326	0.00000	0.38328	0.24241	0.23925	0.24844	0.41248	0.31001	0.46972	0.56089	1.71089

Note: This is the difference between the multipliers in the environment-augmented IO and the conventional IO.

Source: Authors' calculations

Table 13. Share of Sectoral PCE to Total PCE, Final Demand (TFD), Total Output (TO) and Share of TFD to TO, NCR (1994)

CODE	SECTOR DESCRIPTION	PCE (in 1,000 pesos)	Sectoral PCE/ Total PCE (%)	PCE/TFD (%)	PCE/TO (%)	TFD/TO (%)
1	Crops, livestock & poultry	393,691	0	100	100	100
2	Fishery	429,522	0	100	100	100
3	Forestry	0	0	0	0	0
4	Mining and quarrying	97,796	0	100	32	32
5	Manufacturing - 1	117,670,640	40	46	38	83
6	Manufacturing - 2	16,628,924	6	13	10	73
7	Electricity and gas and steam	4,022,326	1	94	19	20
8	Waterworks and supply	821,385	0	79	26	33
9	Construction	2,109,069	1	4	40	95
10	Transportation and storage	15,762,953	5	37	25	67
11	All other services	134,784,386	46	38	28	74
ALL	**All Sectors**	**292,720,692**	**100**	**35**	**27**	**76**

Source: Authors' Calculations from Secretario, 2002.

Table 14. Induced Sectoral Output due to PCE, NCR (1994)

CODE	SECTOR DESCRIPTION	Initial PCE	% to Total (%)	Induced Output Conventional IO	% to Total (%)	Induced Output Envi. Augmented IO	% to Total (%)
1	Crops, livestock & poultry	393,691	0.13	393,691	0.10	514,311	0.09
2	Fishery	429,522	0.15	429,522	0.11	561,844	0.10
3	Forestry	0	0.00	0	0.00	0	0.00
4	Mining and quarrying	97,796	0.03	127,855	0.03	166,466	0.03
5	Manufacturing - 1	117,670,640	40.20	138,226,905	36.09	180,732,842	30.59
6	Manufacturing - 2	16,628,924	5.68	28,781,853	7.51	37,633,272	6.37
7	Electricity and gas and steam	4,022,326	1.37	10,393,019	2.71	13,588,539	2.30
8	Waterworks and supply	821,385	0.28	1,610,742	0.42	2,106,896	0.36
9	Construction	2,109,069	0.72	3,113,386	0.81	4,069,314	0.69
10	Transportation and storage	15,762,953	5.38	22,927,680	5.99	29,977,629	5.07
11	All other services	134,784,386	46.05	177,024,739	46.22	231,461,423	39.18
HH	Labor Income					90,014,640	15.24
TO	**Total Output**	**292,720,692**	**100.00**	**383,029,392**	**100.00**	**590,827,176**	**100.00**

Note: Values expressed in thousand pesos unless specified.

Source: Author's Calculations

Table 15. Ratio of Induced Gross Output to Initial PCE, NCR (1994)

CODE	SECTOR DESCRIPTION	INITIAL PCE	INDUCED OUTPUT Conventional IO	INDUCED/INITIAL Conventional IO	INDUCED OUTPUT Envi. Aug. IO	INDUCED/INITIAL Envi. Aug. IO
1	Crops, livestock & poultry	393,691	393,691	1.00	514,311	1.31
2	Fishery	429,522	429,522	1.00	561,844	1.31
3	Forestry	0	0	N/A	0	N/A
4	Mining and quarrying	97,796	127,799	1.31	166,466	1.70
5	Manufacturing - 1	117,670,640	138,226,905	1.17	180,732,842	1.54
6	Manufacturing - 2	16,628,924	28,781,905	1.73	37,633,272	2.26
7	Electricity and gas and steam	4,022,326	10,392,900	2.58	13,588,539	3.38
8	Waterworks and supply	821,385	1,610,681	1.96	2,106,896	2.57
9	Construction	2,109,069	3,113,308	1.48	4,069,314	1.93
10	Transportation and storage	15,762,953	22,927,705	1.45	29,977,629	1.90
11	All other services	134,784,386	177,024,896	1.31	231,461,423	1.72
HH	Labor Income	0	0		90,014,640	
TO	**Total Output**	**292,720,692**	**383,029,312**	**1.31**	**590,827,176**	**2.02**

Note: Values expressed in thousand pesos unless specified.

Source: Authors' calculations

Table 16. Assessment of the Employment and Environmental Impacts of PCE Using the Conventional IO, NCR (1994)

Impact Variable	Sector 1	2	3	4	5	6	7	8	9	10	11	Total
Residuals						(in total metric tons)						(in metric tons)
PM	0	0	0	361	52,526	12,088	4,365	0	2,117	3,898	19,473	94,828
Sox	0	26	0	106	19,352	5,181	62,670	0	93	2,063	1,770	91,261
Nox	4	52	0	84	16,587	3,742	10,809	0	218	3,439	3,540	38,475
VOC	4	17	0	70	13,823	2,590	312	16	218	5,732	8,851	31,633
CO	12	47	0	417	80,172	15,542	728	0	1,245	16,966	19,473	134,602
BODs	2,272	0	0	0	42,850	1,439	0	0	0	0	472,656	519,217
SS	238,486	0	0	214,432	42,850	2,015	51,549	0	0	0	366,441	915,773
TDS	0	0	0	0	396,711	3,166	208	0	0	0	0	400,085
Oil	0	0	0	0	4,147	288	0	0	0	0	15,932	20,367
N	1,248	0	0	0	0	0	0	0	0	0	12,392	13,640
P	16	0	0	0	0	0	0	0	0	0	3,540	3,556
Labor Employment	55,290	56,419	-	21,399	12,346,012	2,429,476	1,109,143	355,579	359,848	4,815,317	47,295,522	68,844,005
Environmental Variables						(in thousand pesos)						(in thousand pesos)
NR Depn	-799	-33,872	0	-761	0	0	0	0	0	0	0	-35,432
Air Damages	0	0	0	-311	-45,615	-10,361	-3,741	0	-1,806	-3,439	-15,932	-81,205
Water Damages	-409	0	0	0	-8,294	-288	0	0	0	0	-84,972	-93,963
Nature Services	0	0	0	0	0	0	0	0	0	0	862,110	862,110
ES(air)	-55	-576	0	-1,959	-438,179	-58,715	-7,171	-32	-6,476	-65,573	-102,674	-681,410
ES(water)	-6,177	0	0	-22,087	-62,202	-5,756	0	0	0	0	-1,033,824	-1,130,046
NEB	5,823	576	0	23,735	447,855	53,822	3,430	32	4,670	62,363	1,895,935	2,498,241
Total Output due to PCE (in thousand pesos)	393,691	429,522	0	127,855	138,226,905	28,781,853	10,393,019	1,610,742	3,113,386	22,927,680	177,024,739	383,029,392

Note: The values are derived by multiplying V by the induced output due to PCE (=inv(I-A)*initialPCE) in the conventional IO.

Source: Authors' Calculation

Table 17. Assessment of the Employment and Environmental Impacts of PCE Using the Environment-Augmented IO, NCR (1994)

Impact Variable	Sector 1	2	3	4	5	6	7	8	9	10	11	HH	Total
Residuals	(in total metric tons)												(in metric tons)
PM	0	0	0	469	68,678	15,806	5,707	0	2,767	5,096	25,461	423,069	547,053
Sox	0	34	0	138	25,303	6,774	81,939	0	122	2,698	2,315	4,501	123,824
Nox	5	67	0	110	21,688	4,892	14,132	0	285	4,497	4,629	32,405	82,710
VOC	5	22	0	92	18,073	3,387	408	21	285	7,494	11,573	936,152	977,512
CO	15	62	0	543	104,825	20,322	951	0	1,628	22,183	25,461	2,870,567	3,046,557
BODs	2,968	0	0	0	56,027	1,882	0	0	0	0	618,002	1,040,569	1,719,448
SS	311,554	0	0	279,188	56,027	2,634	67,399	0	0	0	479,125	470,777	1,666,704
TDS	0	0	0	0	518,703	4,140	272	0	0	0	0	0	523,115
Oil	0	0	0	0	5,422	376	0	0	0	0	20,832	0	26,630
N	1,630	0	0	0	0	0	0	0	0	0	16,202	82,813	100,645
P	21	0	0	0	0	0	0	0	0	0	4,629	33,305	37,955
Labor Employment	72,230	73,799	0	27,861	16,142,515	3,176,624	1,450,169	465,108	470,335	6,295,962	61,839,317	0	90,013,920
Environmental Variables													0
NR Depn	-1,044	-44,307	0	-990	0	0	0	0	0	0	0	0	(46,341)
Air Damages	0	0	0	-405	-59,642	-13,548	-4,892	0	-2,360	-4,497	-20,832	-363,659	(469,835)
Water Damages	-535	0	0	0	-10,844	-376	0	0	0	0	-111,101	-188,131	(310,987)
Nature Services	0	0	0	0	0	0	0	0	0	0	1,127,217	0	1,127,217
ES(air)	-72	-753	0	-2,550	-572,923	-76,772	-9,376	-42	-8,464	-85,736	-134,248	-763,324	(1,654,260)
ES(water)	-8,070	0	0	-28,757	-81,330	-7,527	0	0	0	0	-1,351,735	-3,217,123	(4,694,542)
NEB	7,607	753	0	30,903	585,574	70,374	4,484	42	6,104	81,539	2,478,952	3,428,658	6,694,990
Total Output due to PCE (in thousand pesos)	514,311	561,844	0	166,466	180,732,842	37,633,272	13,588,539	2,106,896	4,069,314	29,977,629	231,461,423	90,014,640	590,827,176

Note: The values are derived by multiplying V by the induced output due to PCE (=inv(I-A)*initialPCE) in the environment-augmented IO.

Source: Authors' Calculation

Table 18. Employment and Environmental Impacts Induced by PCE from Labor Income, NCR (1994)

Impact Variable	Sector 1	2	3	4	5	6	7	8	9	10	11	HH	Total
Residuals	(in total metric tons)												(in metric tons)
PM	0	0	0	109	16,152	3,718	1,342	0	650	1,198	5,988	423,069	452,226
Sox	0	8	0	32	5,951	1,593	19,269	0	29	634	544	4,501	32,561
Nox	1	16	0	25	5,101	1,151	3,323	0	67	1,057	1,089	32,405	44,235
VOC	1	5	0	21	4,251	797	96	5	67	1,762	2,722	936,152	945,879
CO	4	15	0	126	24,653	4,780	224	0	382	5,217	5,988	2,870,567	2,911,956
BODs	696	0	0	0	13,177	443	0	0	0	0	145,346	1,040,569	1,200,231
SS	73,068	0	0	64,756	13,177	620	15,850	0	0	0	112,684	470,777	750,932
TDS	0	0	0	0	121,992	974	64	0	0	0	0	0	123,030
Oil	0	0	0	0	1,275	89	0	0	0	0	4,899	0	6,263
N	382	0	0	0	0	0	0	0	0	0	3,811	82,813	87,006
P	5	0	0	0	0	0	0	0	0	0	1,089	33,305	34,399
Labor Employment	16,940	17,381	0	6,462	3,796,503	747,148	341,026	109,528	110,487	1,480,644	14,543,794	0	21,169,913
Environmental Variables													
NR Depn	-245	-10,435	0	-230	0	0	0	0	0	0	0	0	-10,910
Air Damages	0	0	0	-94	-14,027	-3,187	-1,150	0	-554	-1,057	-4,899	-363,659	-388,627
Water Damages	-125	0	0	0	-2,550	-89	0	0	0	0	-26,130	-188,131	-217,025
Nature Services	0	0	0	0	0	0	0	0	0	0	265,107	0	265,107
ES(air)	-17	-177	0	-592	-134,744	-18,057	-2,205	-10	-1,988	-20,163	-31,573	-763,324	-972,850
ES(water)	-1,893	0	0	-6,670	-19,128	-1,770	0	0	0	0	-317,910	-3,217,123	-3,564,494
NEB	1,784	177	0	7,168	137,719	16,552	1,055	10	1,434	19,176	583,017	3,428,658	4,196,750
Output due to Labor Income (in thousand pesos)	120,620	132,322	0	38,611	42,505,937	8,851,418	3,195,520	496,155	955,928	7,049,949	54,436,684	90,014,640	207,797,784

Note: This is the difference between the environmental impact from the environment-augmented IO and that of the conventional IO.

Source: Authors' Calculation

Table 19. Policy Scenarios, NCR, 1994
(Thousand Pesos in Current Producers' Prices)

CODE	SECTOR DESCRIPTION	PCE (NCR, 1994)	Policy 1 Minimum Wage	Policy 3 Outmigration	Policy 2 Color-Coding Scheme
1	Crops, livestock & poultry	393,691	28,937	-6,378	0
2	Fishery	429,522	33,389	-6,958	0
3	Forestry	0	0	0	0
4	Mining and quarrying	97,796	6,678	-1,584	0
5	Manufacturing - 1	117,670,640	8,948,228	-1,906,264	0
6	Manufacturing - 2	16,628,924	1,264,327	-269,389	0
7	Electricity and gas and steam	4,022,326	304,952	-65,162	0
8	Waterworks and supply	821,385	62,326	-13,306	0
9	Construction	2,109,069	160,267	-34,167	0
10	Transportation and storage	15,762,953	1,197,549	-255,360	-1,408
11	All other services	134,784,386	10,250,395	-2,183,507	0
TO	**Total Output**	**292,720,692**	**22,259,273**	**-4,742,075**	**-1,408**

Source: Authors' calculations

Scenarios:
1. Increase in minimum wages by 25 pesos.
2. Outmigration: Decrease in NCR population by 1.62%
3. Transportation Color Coding scheme (PCE on road transport (1994) reduced by 10.5%)

Table 20. Impact of Policies on Gross Output, NCR (1994)
(Thousand Pesos in Current Producers' Prices)

A. Conventional IO Model

CODE	SECTOR DESCRIPTION	Policy 1 Minimum Wage	Policy 2 Outmigration	Policy 3 Color-Coding Scheme
1	Crops, livestock & poultry	28,937	-6,378	0
2	Fishery	33,389	-6,958	0
3	Forestry	0	0	0
4	Mining and quarrying	8,955	-2,070	0
5	Manufacturing - 1	10,511,335	-2,239,275	-25
6	Manufacturing - 2	2,188,330	-466,267	-69
7	Electricity and gas and steam	789,359	-168,365	-15
8	Waterworks and supply	122,346	-26,093	-3
9	Construction	236,624	-50,436	-4
10	Transportation and storage	1,742,285	-371,429	-1,451
11	All other services	13,462,148	-2,867,803	-266
	Household (Labor Income)	0	0	0
TO	**Total Output**	**29,123,708**	**-6,205,075**	**-1,833**

B. Environment-Augmented IO Model

CODE	SECTOR DESCRIPTION	Policy 1 Minimum Wage	Policy 2 Outmigration	Policy 3 Color-Coding Scheme
1	Crops, livestock & poultry	38,102	-8,331	-1
2	Fishery	43,447	-9,101	-1
3	Forestry	0	0	0
4	Mining and quarrying	11,893	-2,696	0
5	Manufacturing - 1	13,743,366	-2,927,873	-264
6	Manufacturing - 2	2,861,365	-609,660	-119
7	Electricity and gas and steam	1,032,346	-220,135	-33
8	Waterworks and supply	160,072	-34,130	-6
9	Construction	309,314	-65,923	-9
10	Transportation and storage	2,278,343	-485,638	-1,491
11	All other services	17,601,339	-3,749,675	-572
12	Household (Labor Income)	6,844,500	-1,458,249	-505
TO	**Total Output**	**44,924,086**	**-9,571,412**	**-3,000**

C. Impact of Labor Income on PCE (Environment-augmented-Conventional)

CODE	SECTOR DESCRIPTION	Scenario 1 Minimum Wage	Scenario 3 Outmigration	Scenario 2 Color-Coding Scheme
1	Crops, livestock & poultry	9,165	-1,953	-1
2	Fishery	10,058	-2,143	-1
3	Forestry	0	0	0
4	Mining and quarrying	2,938	-626	0
5	Manufacturing - 1	3,232,031	-688,598	-239
6	Manufacturing - 2	673,034	-143,393	-50
7	Electricity and gas and steam	242,988	-51,770	-18
8	Waterworks and supply	37,726	-8,038	-3
9	Construction	72,691	-15,487	-5
10	Transportation and storage	536,057	-114,209	-40
11	All other services	4,139,191	-881,872	-306
12	Household	6,844,500	-1,458,249	-505
TO	**Total Output**	15,800,379	-3,366,337	-1,167

Source: Authors' calculations

Table 21. Changes in Impact Variables due to Policies, NCR (1994)

Impact	Minimum Wage Increase		Outmigration		Color-coding Scheme	
Variable	conventional	Envi Augmented	conventional	Envi Augmented	conventional	Envi Augmented
Residuals						
PM	7,208	41,594	-1,536	-8,862	-0.3235	-2.8628
Sox	6,933	9,409	-1,478	-2,006	-0.2413	-0.4241
Nox	2,924	6,288	-623	-1,340	-0.2511	-0.4995
VOC	2,405	74,327	-512	-15,836	-0.3856	-5.6968
CO	10,232	231,648	-2,181	-49,354	-1.1576	-17.5086
BODs	39,479	130,741	-8,411	-27,855	-0.7216	-7.4611
SS	67,748	124,847	-14,835	-27,000	-0.7507	-4.9692
TDS	30,424	39,779	-6,481	-8,474	-0.0809	-0.7717
Oil	1,549	2,025	-330	-431	-0.0254	-0.0606
N	1,034	7,650	-221	-1,630	-0.0186	-0.5072
P	270	2,886	-58	-615	-0.0053	-0.1985
Labor Income CE	5,234,732	6,844,442	-1,115,282	-1,458,237	-386.5689	-505.4414
Environmental Variables						
NR Depn	-2,745	-3,575	574	751	0.0004	0.0617
Air Damages	-6,173	-35,723	1,316	7,611	0.2825	2.4647
Water Damages	-7,144	-23,646	1,522	5,038	0.1299	1.3485
Nature Services	65,561	85,719	-13,966	-18,261	-1.2956	-2.7842
ES(air)	-51,801	-125,774	11,039	26,799	4.5443	10.0070
ES(water)	-85,788	-356,822	18,307	76,052	1.5904	21.6056
NEB	189,821	508,929	-40,471	-108,459	-7.0299	-30.5954

Source: Authors' calculations