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Economic Incentives for Increased Milk Production in The Dominican Republic

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Introduction

Livestock production (beef, milk, broilers and eggs) constitutes an important food resource for the population of The Dominican Republic; in fact, this country is a net exporter of beef, self sufficient in eggs but a deficit producer of milk. Domestic demand for milk has been increasing rapidly during the past years (4 percent annually) due to an average annual population increase of 2.9 percent, a high positive income elasticity of demand at low Dominican income levels and increasing real incomes. Domestic milk production has failed to keep pace with the domestic demand, and because of this imbalance the imports of milk have increased (Table 1).

The use of increasingly limited foreign exchange to import milk came under heavy questioning in the mid-1970s because of 1) the post-1974 weakening of world prices for sugar, a crop which traditionally has accounted for about 50 percent of The Dominican foreign exchange earnings, and (2)the continuing rapid rise in petroleum import costs.

Input prices have become a disincentive for producers in recent years. In 1970, the price of feed concentrates for animals was RD$3.38 per hundred

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pounds. One wheat quintal of "Afrechop"[1] was RD$2.25 and a common fertilizer was RD$57 per ton. In 1979 these inputs were sold at RD$6.25, $3.00 and $68, respectively. Moreover, electricity rates increased 60 percent during the same period . These input increases without any accompanying increases in producer prices have forced production costs up and obviously caused profits to decline. In 1982, a vociferous majority of dairy spokesmen defined the two main issues of the dairy industry as low returns and lack of incentives that might promote new livestock farms or increase the productivity of the existing farm.

Current information on imports of powdered milk and processed milk products is very limited. The SEA estimated that during the early 1970s approximately 20 to 25 percent of total milk consumed was imported. The value of dairy imports in 1977 was US$1.56 million and consisted largely of 3.2 million kilograms of powdered milk. In 1980, INESPRE imported US$1.2 million of dairy products. Trends for the remainder of the decade indicate that at least 20 percent of the total milk consumed in Dominican Republic will be imported. Import targets for milk are based upon expectations of domestic supplies. However, the level of these imports has depended upon the importance of different policymaker's objectives. For example, a low level of planned imports which could save foreign exchange has been the goal of several administrations. Nevertheless, imports still have not been displaced by an increase in domestic milk production.

The government has designed an agricultural price policy which seeks to stimulate the production of domestically consumed food crops in addition to the more traditional goal of stabilizing prices. To implement this policy a

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[1] This is the main concentrate used to feed livestock in the Dominican Republic.

specialized institution (Instituto de Estabilizacion de Precios - INESPRE) has responsibility for producer and consumer protection in the production and marketing of primary goods.

INESPRE controls retail milk prices and has kept them low in recent years, ostensibly to protect low income families. However, the price controls have had a harmful effect on milk production. Many producers have abandoned dairy farming because it is not profitable and others claim that the unfavorable price-cost ratios have not allowed them to invest in productivity-increasing inputs. As a result of lobbying efforts by milk producers, INESPRE in late 1970 announced a 30 percent increase in the retail milk price. It also took two additional steps aimed at benefitting low income consumers and at reducing the production depressing effects of continued imports of powdered milk which were being dumped by exporting countries at less than their cost of production. The first step was to make available at concessionary prices to low income consumers a low fat blend of fresh and reconstituted milk. The second step was to place the importation of powdered milk under the control of INESPRE, which was directed to coordinate the imports with its overall programs of marketing and price control.

Milk production is also affected by distortions in relative prices due to the over-valuation of the Dominican Peso, officially US 1.00 = RD 1.00, while in the "black market" a rate of US$1.00 = RD 1.57 in 1983 implied an exchange rate over-valuation of 57 percent or more. The exchange rate over-valuation constitutes an implicit income transfer from one group to another in the whole society. There is an implicit subsidy on imports because the monetary board determines which imports can enter the country at the official rate. Higher milk prices might be preferable to imports of powdered milk that are subsidized through an over-valued official exchange rate.

Objectives

The overall objective of this study is to identify and measure the major economic incentives and disincentives resulting from policies affecting the Dominican dairy industry.

Research studies on the elements affecting livestock production in the Dominican Republic have recently focused on economic aspects, animal health, labor, etc. Most of these studies, however, did not consider the effect of price control policy in agriculture as a factor discouraging production and subsidizing consumption. Quezada in 1981 analyzed the economic policies that have affected the rural sector of the Dominican Republic. Although Quezada concluded that there are many distortions caused by price policy and explored the implications of market intervention policies in agriculture, he did not try to quantify the effect of these policies on the price system. Furthermore, Quezada did not include the dairy industry in his study.[2]

Analytical Framework

Price intervention is widely used in developing countries.Governments use market intervention as a way to achieve desired consequences in terms of economic efficiency. Based on the principle that the price system should serve national goals, many countries have used various systems of subsidies and taxes to intervene in markets over the years. Market distortions arising from this intervention, however, are not easy to identify and measure. The main difficulty is that market intervention policies often occur under constraints of many pre-existing distortions. In all cases they affect the pricing system and the first logical step of any attempt at designing new market price policies is measuring the net effect of current policies.

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2 Quezada's econometric model analyzed the price intervention for six commodities: corn, rice, beans, peanuts, wheat and sugar cane.

Given this, it is surprising that little attention has been paid to researching the effects of administered agricultural prices, taxes and subsidies on the pattern of production and consumption. In this analysis, it is assumed that there is one good (milk and its subproducts) for local consumption. Milk producers, however, receive for their product a price well below its opportunity (border) value.[3]

Different measures will be utilized to quantify the effects of market distortions on the dairy industry. Four basic coefficients will be estimated. The Nominal Protection Coefficient (NPC), the Effective Protection Coefficient (EPC), the Domestic Resource Costs (DRC) and the Comparative Advantage Coefficient (CV).[4]

International border prices will be used as a point of reference for the NPC and the EPC due to the fact that in small countries, like the Dominican Republic, border prices represent the true opportunity costs of the country's trade. Also, border prices reflect distortions between existing prices and the opportunity cost determined by international trade.

Nominal Protection Coefficient

The Nominal Protection Coefficient (NPC) of any commodity measures the distortions between the price of the product actually received by producers (P^d) and the border price for the same product (P^b).

$$NPC_i = \frac{Pi^d}{Pi^b} \qquad (1)$$

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[3] The concept of border price expresses the price of the item considered in terms of its international value. For an importing country (case of the Dominican Republic for milk) the border price used is the CIF price of bringing milk to the point of entrance into the country (31, p. 33).

[4] These measures have also been used by others in six country case studies (Argentina, Egypt, Kenya, Pakistan, Thailand and Yugoslavia) of prices, taxes and subsidies which formed part of a wider World Bank research project that commenced in late 1971.

The attractiveness of the NPC measure is based on three main factors: (1) the simplicity of the approach, 2) the intuitive interpretation of the distortion measures as equivalent tariffs, and 3) the relationship between these measures and the opportunity cost of foreign exchange ("the shadow exchange rate") equivalent and the opportunity cost of foreign exchange determined by the exchange rate. NPC's larger than one (> 1) indicate protection to the product. The amount of protection is equivalent to the NPC values minus one. NPC values less than one (< 1) indicates that the product has been taxed. The tax is equivalent to one minus the value of the coefficient.

Effective Protection Coefficient

The Effective Protection Coefficient (EPC) measures the net effect of protective measures not only on traded outputs but also on traded inputs or, to put it in another way, on the value added. It provides a more complete estimate of the impact of market distortions on the incentives offered to producers of the product relative to those in the rest of the economy.

Since discrepancies between domestic and international prices occur on traded inputs for final as well as intermediate goods, values added per output unit rather than prices, are used to compute EPC. The general formula is:

$$EPC = \frac{\text{value added in commodity at domestic price}}{\text{value added in commodity at border price}}$$

This ratio can also be put in percentage form:

$$EPC = \frac{Va^d - Va^b}{Va^b} \times 100 \qquad (2)$$

where:

Va^d = value added per unit of output at domestic price

Va^b = value added per unit of output at border price

Value added is obtained, in both cases, by subtracting the input value used in the production process from the price of the product at domestic and then at border prices.

The interpretation of EPC is straightforward:

EPC > 1 Means that, at the existing official exchange rate, protection measures provide a positive incentive to produce the commodity or carry out the activity under consideration. In other words, it indicates that the activity has been protected.

EPC < 1 Indicates that protective measures discriminate against the commodity in question. In fact, the non-tradable production factors have received a payment below what they would receive in the absence of government intervention.

EPC < 0 Signifies an absolute loss of foreign exchange to the economy.

Domestic Resource Cost

The DRC is obtained by computing the cost of foreign exchange earned for exports. Traded final goods are evaluated at border prices. Non-traded goods are decomposed into traded inputs and non-traded primary factors (domestic resources). DRC's are then computed as the ratio between the cost of domestic resources (evaluated at accounting prices) and net foreign exchange earnings (value of traded output minus value of traded inputs).

The DRC can be interpreted as a ratio between the cost of a dollar earned or saved through domestic production and an accounting rate of exchange:

$$DRC = \frac{\sum_{J=K+1}^{J} a_{i_j} \, MPP_J^{Y} \, P_Y^{b}}{P_i^{b} - \sum_{J=1}^{k} (a_{i_j} \, P_j^{b})} \qquad (3)$$

where

a_{i_j} = quantity of jth input used to produce one unit of the ith output.

MPP_j^{Y} = marginal physical product of jth factor in its best alternative use (Y).

P_y^{b} = border price of Y.

j = 1,2...K inputs of directly traded goods plus the traded elements of non-traded goods after decomposition.

j = K+1...j = inputs of primary, non-traded factors include those obtained as a result of decomposition of nontraded goods.

P_i^{b} = border price of the output/input for the ith commodity of jth input.

P_j^{b} = foreign price of the jth input.

According to the creators of the DRC measure, the cost of foreign exchange criterion "clearly measures comparative advantage" at the core of this criterion. However, there are two basic value estimates: the accounting prices of domestic resources and the accounting exchange rate to be used to convert these prices to units of international currency.

The previous equation gives a pure number that is the border price value of the resources in their (weighted) average alternative use per unit of the resources of border price value in their present use. If the number is > 1,

it tells us that the resources would be put to better use in an alternative way. If it is < 1 it tells us that this is a relatively solid use of resources.

The Comparative Advantage Coefficient

The Comparative Advantage Coefficient (CV) is the ratio between a given DRC and the exchange rate which is regarded as a proper measure of the equilibrium ratio between the non-tradeable and tradeable components of the economy. If CV turns out to be larger than one it signifies that the activity studied requires more resources to generate (or save) one unit of foreign exchange than the average productive activity in the economy. If CV is below one it indicates that the activity can produce (or save) foreign exchange more efficiently than the average productive activity in the economy.

Source of Data

The focus of this study is on raw fluid milk, the most important product of the Dominican dairy sector. Powdered milk, cheese and butter are left out because of data limitations.

This research required personal interviews with people such as: livestock farmers, retailers, farmers' associations and consumers involved in the whole dairy sector. It also required the use of published data from current sources such as the FAO Production Yearbook. Production levels, imports and exports were obtained from bulletins such as El Boletin de Cuentas Nacionales del Banco Central and government reports on imports of agricultural products. Production cost data was obtained from a 1977 study realized by the Asociacion de Productores de Leche(APROLECHE). Using this data, the economic effects of milk price policies in the Dominican Republic will be estimated for four selected groups of farms located in the Central and North regions for the year 1977.

Effective Protection Coefficients are obtained deriving value added which is the value of the output at any point in the production distribution process during the period under consideration less the value of purchased inputs in the same period, less depreciation estimated. Since value added is a residual concept, what is purchased and its value added will vary according to the time period being considered.

Domestic resource cost is calculated through data mentioned before in formula No. 3 (border prices, domestic prices, and inputs used in the production process). However, inputs here refer to non-tradeable inputs (capital, land and labor). From farm budgets it is possible to calculate the cost of each factor discounting the depreciation costs.

Results

It is well known that governments intervene in agricultural prices in many ways and for assorted reasons. For example, product price supports in high income countries maintain farm incomes and often lead to surpluses which in turn are exported to developing country markets on concessionary terms, further depressing domestic farm prices in the importing countries. Intervention also occurs in the form of agricultural inputs being subsidized or taxed. The magnitude of the effects of these policies on Dominican milk production, income distribution between producers and consumers or even rural employment has not been fully investigated.

Similarly, government intervention also results from the desire to achieve internal price stability. Policymakers often insulate domestic prices from unstable world market prices by establishing stabilization authorities such as INESPRE. These institutions are often given monopoly power over imports of some price-controlled goods, which have been used not only for price stabilization but for obtaining government revenues.

There are three ways in which governments can intervene to alter market incentives for milk production or agricultural production in general: (1) Government economic policies that are neutral with respect to the opportunity cost of agricultural production, (2) policies where agricultural production is overvalued and (3) policies where agricultural production is undervalued. The first classification is met for very few countries while many developing countries such as the Dominican Republic fall in the third category where price controls often undervalue agricultural output resulting in under-production.

Nominal Protection Coefficient (NPC)

The NPC provides a measure of the disparities between domestic market prices and international prices using a ratio of the domestic price actually received by producers (P^d) and the border price for the same product (P^b) converted at the official exchange rate. Any departure of the NPC from one estimates the subsidy or tax implicitly given to (levied against) the product as a consequence of government intervention.

Ideally, to estimate NPCs one should have cross-sectional and time series data to calculate NPCs for different farms and time periods. Due to data limitations, such calculations cannot be performed; however, the NPCs are estimated in two ways.

1) The NPCs are estimated by farm size and region for the year 1977. This method allows the identification of any difference in the effect of market distortions on farms of different size and on dairy operators in various regions.

(2 For the years 1977 to 1979, in which only the national price of raw milk was available, the NPCs are calculated as estimates of market distortions for the average producer in the country.

For the farm size analysis, the domestic price of milk was obtained from a production cost study realized by the Asociacion de Productores de Leche (APROLECHE) in 1977. This study was used because of the comprehensive data base available for the 33 surveyed dairy farms. These farms are located in two main milk producing regions of the country (Central and North) and are classified according to their production level (Table 2). The APROLECHE study was compared with another production cost study carried out by Grullon and Romero in 1980. The objective for making this comparison was to determine the accuracy of the information given in the APROLECHE study since this institution represents a producers group who might inflate costs to obtain a price increase. However, the comparison showed that both studies found similar unitary costs to produce a quart of raw milk. In fact, for those small farms producing less than 500 quarts of milk per day APROLECHE estimated a unitary cost of RD$0.31. For the same sized farm Grullon and Romero computed a unitary cost of RD$0.32. For large farms producing more than 1200 quarts of milk per day APROLECHE obtained a unitary cost of RD$0.22 and Grullon and Romero obtained a unitary cost of RD$0.18. Both studies arrived at the conclusion that costs tend to decrease as the size of farm increases. The APROLECHE study was also selected instead of the Grullon and Romero study because the former gives more detailed information about fixed and variable costs. This data is required to compute the EPC and DRC coeffficients. Also, the APROLECHE study gives more information in terms of location and size of dairy farms. It is important to point out that although both studies

arrive at similar unitary costs, the fact that the APROLECHE study was done for 1977 while the Grullon and Romero study was completed in 1980 indicates that the production costs of the APROLECHE study could be inflated.

Border prices were obtained from a time series of average U.S. milk prices that reflected how much the Dominican Republic would pay for raw milk if it were purchased from the United States. The costs of freight, insurance and other transportation costs are aggregated to the FOB prices to obtain border prices (CIF).

The results shown in Table 3 indicate that milk has been subject to a variable and sizeable "tax" on the four groups of farms studied. It is important to highlight that the term tax here is not defined in accounting terms but as a measure of discrimination through government intervention in the market. All the NPCs are below one for the four groups of farms, indicating that milk production has been heavily taxed.

It can be observed that large farms in the Central region have an NPC of 0.59 or a tax of 41 percent. The reason for this is that producers in this region receive a lower milk price than those located in the Northern region.[5] Furthermore, they face different consumers. In fact, consumers of the Central region (which includes the capital and other important cities) are more aware of milk quality than the consumers of the Northern region. Almost all milk consumed in the capital is pasteurized milk. The preferences of urban consumers force producers to sell their raw milk to the pasteurizer plants.

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[5] Although the price of raw milk should be the same for all regions, the low demand for raw milk in urban centers may lower its price.

Results are similar for the North region. Large farms have an NPC of 0.68 signifying a tax of 32 percent. However, it is important to point out that consumers of this region come mainly from rural areas and consume raw milk rather than processed milk. This allows producers to sell milk directly to consumers, most of the time at a higher price than processors pay. Also these producers have the advantage of being located on the best land in the country. Small farms in this region presented a higher tax (NPC of 0.60 and consequently a tax of 40 percent) than large farms.

When NPCs are calculated from the time series data, the results are quite similar. For all three years studied, the NPC is significantly below one, indicating that milk production was taxed throughout the whole country with a level of tax being around 40 percent for 1977-79 (Table 4).

After analyzing the NPC results for raw milk, a second output alternative was computed using whole milk powder. The objective of this alternative is to compare the NPC of reconstituted powdered milk with the NPC for raw fluid milk in order to test for possible bias in the border price estimating procedure for raw fluid milk. Since powdered milk and fluid milk are measured in different units, a conversion factor was used to reconstitute a pound of powdered milk to a quart of fluid milk.[6] Domestic powdered milk prices were obtained from the CODAL balance sheet, due to the fact that CODAL is the only dairy firm producing powdered milk in the Dominican Republic. Powdered milk border prices were taken from the U.S. dairy market statistics.

NPC results for whole milk powder are given in Table 5. For the three years studied, the NPCs were below one, similar to the NPC results obtained for raw milk which implies that powdered milk is also a taxed output. For

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[6] To make one pound of whole milk powder, 7.34 pounds of whole milk is required. A more detailed description of the methodology used to reconstitute powdered milk to fluid milk is given in Ortiz de Dominguez.

1977 the NPC for powdered milk was 0.59, or a tax of 41 percent; for 1978 the tax increased to 46 percent although it decreased to 41 percent in 1979. Since the estimated NPCs for raw milk and powdered milk are about the same, the border price estimating procedure for raw milk does not appear to be unreasonable.

Effective Protection Coefficient (EPC)

Since the NPC merely expresses the effect of price intervention on the price of milk, it is a partial measure that does not take into account the effects of intervention on input markets. The EPC, on the other hand, provides a fuller measure of the impact of market distortions on the incentive and disincentive offered to milk producers relative to those in the rest of the economy. The EPC is designed to capture the net effect of government intervention on output and input markets. As the EPC requires the estimation of a farm budget in order to define input/output relationships, it is more difficult to compute than the NPC. Value added rather than prices are used to compute effective protection rates.[7]

The EPC is computed for different farm sizes permitting one to appreciate the different farming systems. From the farm budgets defined in the APROLECHE study it was possible to derive the average cost of the main inputs used in the production of raw milk. The cost of inputs at domestic prices was taken directly from those farm budgets. Border prices were derived on the basis of the CIF price of each component. It is important to point out that small farms make extensive use of molasses which is a highly subsidized input for milk producers. For instance, a gallon of molasses is sold to cattle

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[7] Value added is defined as the value of the output at any point in the production-distribution process of any period, less the value of the purchased inputs in the same period.

raisers by the government through the Consejo Estatal del Azucar (CEA) for five cents while in the industrial market the price is 29 cents.

The EPC results for the four groups of farms studied need to be read as a reasonable approximation to the economic conditions prevailing in the milk producing sector (Tables 6 to 9). The largest level of discrimination (tax) was found in the group of large farms located in the Central and North regions. The EPC of large farms of the central region was 0.60 which means that the government market intervention has prevented producers from receiving the full benefits of their activities. The implicit tax losses for producers caused by marketing intervention is about 40 percent. For the same size of farm in the North region, this "tax" is only 9 percent. The difference in the effect of regulations on these two regions can be explained in part by the natural advantages (better land and natural conditions) and by the price received by each farm. The value added of farms in the North is significantly higher than the value added of farms in the Central region. This implies that the factors of production (land, labor and capital) are better paid in the North region than in the Central region. In fact, small farms located in the North region have an EPC of 1.17 implying that milk production in this region has been protected.

The last case to analyze are the small farms situated in the Central region for which a negative EPC was obtained (-0.42). This signifies that these farms have suffered an absolute loss of foreign exchange. These farms depend heavily on concentrate and molasses for feeding cows, since the pasture produced on the amount of land producers own is small.[8]

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[8] Production costs used for the EPC show that producers are spending their money mainly on concentrates, molasses and equipment. If the prices of these inputs increase, the value added also will increase and the results would be a lower EPC. Consequently, the subsidy required to get the same income will be greater.

In general terms, the EPC results suggest that price intervention in milk production is considerable for the four groups of farms analyzed. The results also demonstrate that large producers are taxed more than small ones, except those located in the Central region. The extensive use of the highly subsidized input (molasses) has allowed small farms in the North to be less affected by the restrictions on the price of the final product.[9]

On the other hand, the importance of intermediate inputs in milk production is illustrated by the considerable difference between the NPC and EPC average values: The NPC estimates are above 0.60 and EPC below 0.60. This implies that milk producers are negatively affected by government interventions not only on the output market but also in input markets.

The negative effect of government intervention has caused a lower level of milk production, which seems to be contrary to the explicit interventions for controlling the market. The good intentions of protecting the consumer of milk from high prices is creating a problem that was supposed to be solved. When the price of milk is kept low, consumers are prevented from getting their demand satisfied at the regulated price. The market intervention policy should be revised; the situation calls for a more liberal policy in order to reduce the tax.

Domestic Resource Cost (DRC)

The economic incentives discussed previously (NPCs and EPCs) measured the extent of the tax or subsidy to which milk production is subject as a result of government intervention in price. The DRC, in fact, tells us how

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[9] This should be taken with skepticism. There are some doubts that all molasses bought by milk producers have been used in milk production. A "black market" for molasses may have evolved between milk producers and rum producers, for instance.

much the nontradeable factors of production (land, labor and capital mainly) have been paid, above or below their opportunity cost. Nevertheless the EPC, by its nature, cannot give any information on the advisability, of promoting or taxing the activity analyzed in the whole economy. In order to answer this question it is necessary to examine the real cost of production to the domestic economy of the milk production. This task is accomplished by using the coefficient denominated: Domestic Resource Cost (DRC). The DRC is a ratio between the cost of dollars earned or saved through domestic production and an accounting rate of exchange. In general, the computation of DRC involves two basic estimates of values: 1) the accounting prices of domestic resources and 2) the accounting exchange rate to be used to convert these prices into units of international currency.

The definition of the DRC suffers from the problem of defining which resources are domestic and which are foreign. A more important point is the dichotomy existing between traded and non-traded resources in the valuation of inputs and outputs. The DRC can be computed by several formulas.[10] The one used in this study was defined earlier. The DRC derived here has to be read as an approximation of the ideal formula. Basic data to compute DRC coefficients comes from the farm budget information used in NPC and EPC estimation. In this particular case the analysis is focused on the social convenience of milk production. The derivation of the DRC is approached in two ways. The first considers the situation given the official exchange rate of RD$1.00 = US$1.00 while the second considers the situation at the prevailing open market exchange rate. The reason for calculating the second DRC

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[10] For more information about the DRC derivation formula, see reference |15|, pp. 17-20.

is to observe the local cost of resources if these inputs were purchased at the exchange rate of the parallel market.

The Comparative Advantage Coefficient (CV)

The CV is the ratio between a given DRC and an exchange rate which is regarded as a proper measure of the equilibrium rate between the nontradeable and tradeable components of the economies. The (CV) calculation permits us to explore the social convenience of milk production by expressing the DRC's in terms of "comparative advantage" (CV).

Tables 10 to 13 show the results obtained for the DRC in the four groups of farms. For large farms in the Central and North regions, the value of the DRC was significantly below one (0.39 and 0.88, respectively). Given the fact that milk has been considered as an importable good, obtaining a DRC below one demonstrates the advisability of stimulating milk production. Moreover, when the situation is considered at the official exchange rate, the value taken by the DRC is the same as the one of comparative advantage (CV = DRC/Exchange rate = CV = DRC/1 = DRC). This implies that for large farms the CV is below one, indicating a comparative advantage in milk production for those farms; the lower the CV the higher the comparative advantage (Table 14). By promoting milk production on large farms, policymakers would be promoting savings of foreign exchange in an efficient way.

The situation, however, is quite different when one considers farms of small size. It turns out, these farms are inefficient because they require more resources to save one unit of foreign exchange than the average activity in the economy. As was indicated earlier in this chapter, the small farms of the Central region presented a negative value added at border prices signifying a net transfer of foreign exchange from the Dominican Republic to the rest of the world. For the small farms of the North region the DRC was found

to be 2.18 which indicates that those farms show a certain inefficiency, being highly subsidized by the government through molasses sales which were well below the world market price. Thus, the values of the DRC indicate a comparative disadvantage for smaller sized farms. The Dominican Republic will be better off stimulating those farms to reallocate resources to a more profitable alternative rather than subsidizing their inefficient milk production.

DRC and CV results indicate that the Dominican Republic has a comparative advantage in producing milk on large farms and consequently it would be advisable to stimulate milk production on them.

Use of the market exchange rate rather than the official exchange rate does not change the analysis. Since the market exchange rate has been above the official rate since 1960, the CV coefficient will be lower than previous estimates. This implies that when using the market exchange rate, the Dominican Republic has a more favorable comparative advantage in stimulating milk production on large farms. In the case of small farms it is still disadvantageous but lower in magnitude than at the official exchange rate (See Table 13). In other words, the comparative advantage of milk production would increase if the government eliminated the overvaluation of the domestic currency.

Conclusions

Domestic milk production has failed to keep pace with the domestic demand and because of this the imports of milk have increased. The SEA estimated that during the early 1970s approximately 20 percent of total milk consumed was imported. Trends for the remainder of the decade indicate that this percentage is going to be increasing (16).

Import targets for milk are set to reduce imports, based upon expected domestic supplies. Nevertheless, the level of these imports has depended upon the objectives of different policymakers.

The main objective of the study reported herein was to identify and analyze the major incentives and disincentives affecting the dairy sector, particularly for fluid raw milk. Three basic coefficients were used to quantify the effects of government intervention in milk production: the Nominal Protection Coefficient (NPC), the Effective Protection Coefficient (EPC) and the Domestic Resource Cost (DRC). In order to analyze the comparative advantage for fluid raw milk, a fourth coefficient, the Comparative Advantage Coefficient (CV), was computed.

The analysis presented shows that price intervention in milk production has been substantial. As a consequence of this the return to primary factors of production (land, labor and capital) has been well below their opportunity costs. An implicit tax on the dairy industry was shown through the calculation of two coefficients, NPC and EPC. The NPC estimation had a discrimination above 40 percent, and EPC presented a discrimination below 40 percent. This implies that milk producers are negatively affected by government intervention not only on the output market but also in the input markets. The problem is more critical for large farms.

DRC and CV coefficients indicate a comparative advantage in milk production for large farms. However, a comparative disadvantage was obtained for small farms. While an important share of the sector's problem arises from economic policies aimed at serving objectives that are largely inconsistent with the milk production growth, all this has caused a growing discomfort over the sector's failure to live up to its acknowledged potential for greatly enhanced production.

The extent of price intervention in milk production has been substantial

Government market intervention has introduced distortions in the milk sector that have had adverse effects upon the efficiency of milk production, trade, investments, resource use and upon income distribution. The objective of this intervention has been to achieve internal price stability, adequate supplies and low consumer prices. As a result of the present pricing policy the government has been discouraging efficient milk producers and protecting the inefficient ones.

Milk production is discouraged while consumption is subsidized

The explicit objectives of increasing farm income and increasing consumer welfare have not been met. Moreover, estimates of the NPC coefficient demonstrate that public policy is discouraging domestic milk production. For the four groups of farms studied NPC's values were significantly below one (0.59, 0.56, 0.68, 0.60, respectively)_. This shows that milk production is taxed at a rate near 40 percent. When NPC's were calculated from the time series data, results were quite similar. The EPC results demonstrate that price intervention in input markets was also considerable. Large producers were more heavily taxed than were small ones, except in the Central region. Intervention in input markets has apparently had a slightly negative effect on the returns to factors of production, a finding which contradicts the widespread belief that input subsidizing compensates, at least partially, the effects of discriminating milk price policies. The negative effect of government intervention has been reflected in a low level of production, which seems to be contrary to the explicit purpose for controlling the market.

The Dominican Republic has a comparative advantage in producing milk on large farms. These results tell us that the country could profitably allocate resources to produce milk on its largest and most efficient farms. However, there is a disadvantage in the case of small farms and policymakers should not encourage milk production on these farms. Small producers should be grouped into cooperatives in order to increase their efficiency.

References

1. Adams, Dale and Graham, Douglas. "A Critique of Traditional Agricultural Credit Projects and Policies." Journal of Development Studies, Vol. 8, No. 8 (1981), pp. 347-366.

2. Asociacion de Productores de Leche. "Comportamiento y Situacion del subsector Producion de Leche in La Republica Dominicana". Santo Domingo. 1979.

3. Balassa, B. and Schydlowsky D. "Domestic Resource Costs and Effective Protection Again." Journal of Political Economy, Vol. 80, No.1, February 1972, pp. 63-69.

4. United States Agency for International Development (USAID). "An Overview of the Food System in the Dominican Republic, Planning Policies and constraints." Prepared by Duty Greene, Jerome Hammond, Terry Roe, Benjamin Senauer and Loraine West. Department of Agricultural and Applied Economics, University of Minnesota, October, 1981.

5. _____, "An Analysis of Foodgrain Price and Trade Policy in the Dominican Republic." Prepared by Benjamin Sanaeur, Terry Roe and Duty Greene, Department of Agricultural and Applied Economics, University of Minnesota, October, 1982

6. World Bank, The. "Methodologies for Measuring Agricultural Price Intervention Effect." Staff Paper No. 394. Washington D.C., June, 1980.

7. Grullon, Dominicano y Romero, Hector. Diagnostico del Subsector Ganadero, Evolucion de la Industria Lechera y su Incidencia en la Economia Dominicana. 1970-80. Thesis Submitted to the Economics Department, Universidad Autonoma de Santo Domingo (UASD), 1981.

8. Kemph, Gary. An Agroeconomic Land Resource Assessment for Rice Production in the Dominican Republic. Ph. D. Dissertation, Michigan State University, 1980.

9. Krueger, A. "Evaluating Restrictionist Trade Regimes: Theory and Measurement." Journal of Political Economy, Vol. 80, No. 1, February 1972, pp. 59-61.

10. Larson, Donald W. and Vogel, Robert C. "Interaction of Price Controls and Credit Policies in Costa Rican Agriculture. E.S.O. 813, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio, November, 1980.

11. Lois Malkum, Jose E. Evolucion, Estructura y Organizacion del Subsector Ganadero en Republica Dominicana, Editora Alfa y Omega, Santo Domingo, Republica Dominicana, 1979.

12. Lutz, Ernest. "Price Distortions in Agriculture and their Effect: An International Comparison." American Journal of Agricultural Economics, Vol. 63, No. 1, 1981, pp. 8-19.

13. _____, and E. Scandizzo. "Price Distortions in Developing Countries. A Bias Against Agriculture." World Bank Reprint Series 175, Washington, D.C., 1982.

14. Muto, Paul, Jr. The Illusory Promise: The Dominican Republic and the Process of Economic Development: 1900-1930. Ph. D. Dissertation, University of Washington, 1976.

15. Ortiz de Dominguez, Amnerys. "Incentives and Comparative Advantage in the Dominican Republic Dairy Industry." Unpublished M.S. thesis. Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1983.

16. Quezada, Norberto. Endogenous Agricultural Price and Trade Policy in the Dominican Republic. Ph.D. Dissertation, Purdue University, August, 1981.

17. Reca, L. and Maffuci, Eugenio. "Guyana: Incentives and Comparative Advantage in the Production of Agricultural Commodities." Inter-American Development Bank, Loan Contract No. 660/ST-GY. Georgetown and Buenos Aires, November, 1982.

18. Secretaria de Estado de Agricultura (SEA), "Plan Presidencial de la Produccion de Leche y Carne." Santo Domingo, Republica Dominicana, 1977-78.

Table 1: Milk Production, Consumption and Imports, Dominican Republic (1970-85) (Millions of Liters)

Year	Production	Consumption	Imports[a/]
1970	223	248	65
1971	248	259	70
1972	251	266	39
1973	252	274	26
1974	303	282	21
1975	263	291	22
1976	284	299	40
1977	247	308	42
1978	278	317	59
1979	289	327	65
1980	297	336	72
1981	305	350	80
1982	313	361	88
	Projections[b/]		
1983	321	372	98
1984	329	383	108
1985	338	396	120

[a/] A conversion factor of 1 kilogram equals 9.46 liters was used to transform imported powdered milk to fluid milk.

[b/] Projections were made holding the per capita fresh milk consumption constant (80.9 liters for 1980) and multiplying it for the projections of population carried out for la Oficina Nacional de Estadisticas (ONE).

Source: Gruillon, D. and H. Romero, "Diagnostico de Subsector Ganadero, Evolucion de la Industria Lechera y su Incidencia en la Economia Dominicana (1970-80)," Thesis submitted to Economics Department, Universidad Autonoma de Santo Domingo (UASD), 1981, p. 15-122.

Table 2: Milk Production by Land Area Used and by Farm Size, Dominican Republic 1977

Region/Size	Area Used (tareas)	Production/Year (1000 quarts)	Production/tarea /year/1000 quarts
Central			
Large Farms[a/]	3,420	708	57
Small Farms[b/]	614	154	69
North			
Large Farms[c/]	3,283	712	49
Small Farms[d/]	706	125	59

[a/] Produce more than 700,000 quarts of milk/year.

[b/] Produce less than 155,000 quarts of milk/year.

[c/] Produce more than 700,000 quarts of milk/year.

[d/] Produce less than 126,000 quarts of milk/year.

Source: APROLECHE. Comportamiento y Situacion del subsector Produccion de leche en La Republica Dominicana, 1979, p. 43. Selected data.

Table 3: NPC for Raw Milk in Central and North Regions, Dominican Republic, 1977

Region/Size	Domestic Prices (RD$10,000 qts.)	Border Prices (RD$/10,000 qts.)	NPC
Central			
Large Farms	2,352	3,964	0.59
Small Farms	2,258	3,964	0.56
North			
Large Farms	2,710	3,964	0.68
Small Farms	2,384	3,964	0.60

Source: Author's estimates.

Table 4: NPC for Raw Milk, Dominican Republic, 1977-79

Years	Domestic Prices (RD$/10,000 qts.)	Border Prices (RD$/10,000 qts.)	NPC
1977	237	396	0.60
1978	237	419	0.57
1979	281	457	0.61

Source: Author's estimates

Table 5: NPC for Whole Milk Powder, Dominican Republic (1977-1979)

Years	Domestic Prices (RD$/10,000 qts.)	Border Prices (RD$/10,000 qts.)	NPC
1977	1560	2639	0.59
1978	1560	2860	0.54
1979	1936	3206	0.60

Source: Author's estimates

Table 6: EPC for Raw Milk on Large Farms of Central Region, Dominican Republic, 1977[a/] (RD$/10,000 quarts)

Number of Farms: 7

Item (Input j)	$A_{ij}P_j{}^d$	$A_{ij}P_j{}^b$
Equipment	101	172
Concentrate	790	1,079
Mineral & Salt	11	19
Molasses	69	570
Veterinary & Medicine	113	192
Fertilizer	143	119
Herbicide	16	19
Fuel	48	23
Utilities	40	68
a) Total Value Inputs/10,000 quarts	1,331	2,261
b) Gross Income/10,000 quarts	2,352	3,964
c) Value Added per 10,000 quarts (b-a)	1,021	1,703

d) EPC = 1021 ÷ 1703 = 0.60

[a/] Large farms produce more than 700,000 quarts of milk/year.

Source: Author's estimates, using the farm budget realized by APROLECHE in 1977.

Table 7: EPC for Raw Milk on Small Farms of Central Region, Dominican Republic, 1977[a/] (RD$/10,000 quarts)

Number of Farms: 2

Item (Input j)	$A_{ij}P_j{}^d$	$A_{ij}P_j{}^b$
Equipment	201	615
Concentrate	387	529
Mineral & Salt	24	73
Molasses	343	2,837
Veterinary & Medicine	228	698
Fertilizer	330	276
Herbicide	16	19
Fuel	142	67
Utilities	38	116
a) Total Value Inputs/10,000 quarts	1,709	5,230
b) Gross Income/10,000 quarts	2,238	3,964
c) Value Added per 10,000 quarts (b-a)	529	-1,266

d) EPC = 529 ÷ 1266 = -0.42

[a/] Small farms produce less than 155,000 quarts of milk/year.

Source: Author's estimates, using the farm budget realized by APROLECHE in 1977.

Table 8: EPC for Raw Milk on Large Farms of North Region Dominican Republic, 1977[a/] (RD$/10,000 quarts)

Number of Farms: 5

Item (Input j)	$A_{ij}P_j{}^d$	$A_{ij}P_j{}^b$
Equipment	140	241
Concentrate	834	1,140
Mineral & Salt	26	45
Molasses	88	728
Veterinary & Medicine	180	310
Fertilizer	172	144
Herbicide	24	46
Fuel	95	28
Utilities	29	50
a) Total Value Inputs/10,000 quarts	1,588	2,732
b) Gross Income/10,000 quarts	2,710	3,964
c) Value Added per 10,000 quarts (b-a)	1,122	1,232

d) EPC = 1122 ÷ 1232 = 0.91

[a/] Large farms produce more than 700,000 quarts of milk/year.

Source: Author's estimates, using the farm budget realized by APROLECHE in 1977.

Table 9: EPC for Raw Milk on Small Farms of North Region, Dominican Republic, 1977[a/] (RD$/10,000 quarts)

Item (Input j)	$A_{ij}P_j{}^d$	$A_{ij}P_j{}^b$
Equipment	177	359
Concentrate	842	1,150
Mineral & Salt	35	71
Molasses	144	1,191
Veterinary & Medicine	166	337
Fertilizer	150	125
Herbicide	5	9
Fuel	102	49
Utilities	15	31
a) Total Value Inputs/10,000 quarts	1,636	3,322
b) Gross Income/10,000 quarts	2,384	3,964
c) Value Added per 10,000 quarts (b-a)	748	642

d) EPC = 748 ÷ 642 = 1.17

[a/] Small farms produce less than 126,000 quarts of milk/year.

Source: Author's estimates, using the farm budget realized by APROLECHE in 1977.

Table 10: DRC: Cost of Non-Tradeable Inputs for Raw Milk, Large Farms, Central Region, Dominican Republic, 1977

Item ($/10,000 quarts)	Cost
1. Labor	261
2. Land	264
3. Capital	133
4. Pasture	7
TOTAL	665

DRC = 665 ÷ 1703[a/] = 0.39

[a/] The denominator of EPC

Source: Author's estimates

Table 11: DRC: Cost of Non-Tradeable Inputs for Raw Milk, Small Farms, Central Region, Dominican Republic, 1977

Item ($/10,000 quarts) Cost	Cost
1. Labor	402
2. Land	434
3. Capital	10
4. Pasture	7
TOTAL	853

DRC = 853 ÷ 12566[a/] = -0.67

[a/] The denominator of EPC

Source: Author's estimates

Table 12: DRC: Cost of Non-Tradeable Inputs for Raw Milk, Large Farms, North Region, Dominican Republic, 1977

Item ($/10,000 quarts)	Cost
1. Labor	385
2. Land	434
3. Capital	147
4. Pasture	117
TOTAL	1033

DRC = 1088 ÷ 1232[a/] = 0.88

[a/]The denominator of EPC

Source: Author's estimates

Table 13: DRC: Cost of Non-Tradeable Inputs for Raw Milk, Small Farms, North Region, Dominican Republic, 1977

Item ($/10,000 quarts)	Cost
1. Labor	516
2. Land	610
3. Capital	268
4. Pasture	6
TOTAL	1400

DRC = 1400 ÷ 642[a/] = 2.18

[a/]The denominator of EPC

Source: Author's estimates

Table 14: Comparative Advantage Coefficient (CV) for Raw Milk, Central and North Regions, Dominican Republic, 1977

Size/Region	DRC	CV (Official Exchange Rate)	CV (Market Exchange Rate)[a/]
	(1)	(2)	(3)
Large Farms			
Central Region	0.39	0.39	0.32
North Region	0.88	0.88	0.72
Small			
Central Region	-0.67	-0.67	-0.55
North Region	2.18	2.18	1.79

[a/] The market exchange rate for 1977 was 22 percent above the official exchange rate.

Source: Author's estimates