CHILEAN AGRICULTURE AND MAJOR ECONOMIC REFORMS: GROWTH, TRADE, POVERTY AND THE ENVIRONMENT

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Abstract *- This study examines the Chilean experience of economic and trade reforms, deregulation and privatization beginning in the 1970s, and their effect on the agricultural sector from the 1980s to the present. Especially interesting is the interaction between the sectoral, macroeconomic and institutional reforms that influenced the incentive structure in factor markets. This study presents an interpretation of the principal impacts of the reforms and how they contributed to changes in the level and composition of production, the significant reduction in rural poverty, and rural-urban migration. The greater orientation toward the production of exportables encouraged by economic reforms contributed significantly to rural employment and incomes, and was also associated with a reduction in agro-chemical use relative to production value.*

Key-words - CHILE, AGRICULTURAL POLICY, REFORMS, AGRICULTURAL EXPORTS, TRADE LIBERALIZATION, RURAL POVERTY, RURAL URBAN MIGRATIONS.

JEL Classification: Q12, Q13, Q17, Q18.

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INTRODUCTION

This paper reviews the Chilean experience with broad policy reforms that began during the 1970s and the effects of these reforms on the agricultural sector. Of particular interest are those policies (sectoral and macroeconomic) and elements of the institutional framework that influence both the incentive framework facing the agriculture sector, and factor markets. Have price policies aimed specifically at the agricultural sector been less influential than economy-wide policies such as macroeconomic policies, deregulation and privatization? To what extent has the expansion of the export agricultural sector been the unintended result of economic reforms?

Part I discusses the recent history of agricultural policies in Chile. Among the earliest reformers, Chile began radical structural and sectoral policy changes oriented toward open trade, privatization and economic deregulation approximately two years following the end of the Allende regime in 1973[1]. But beginning the story of agricultural policies at an early date is not merely interesting, but indispensable: the major reforms affecting agriculture during the 1990s and early 2000s were extensions of an earlier profound shift in the government's approach to the economy generally and agriculture specifically. To understand the tendency and motivation of recent policy changes one should appreciate the radical reforms toward open markets that began thirty years ago following an earlier period of interventionism and a drastic re-structuring of the sector during the late 1960s and early 1970s. Part 2 presents an interpretation of the main impacts of the reforms and other changes in the policy environment on production. Emphasis is placed on indicators of sectoral performance, productivity and agro-chemical use. Part 3 discusses the social effects of agricultural reforms in regards to rural poverty and rural-urban immigration. Finally, concluding remarks are presented.

1. A SHORT HISTORY OF AGRICULTURAL POLICIES IN CHILE

1.1. Controlled markets: 1950 to 1974

During the administration of President Alessandri, between the late 1950s and the mid-1960s, the three main goals of economic policy important to agriculture were the control of inflation, the reduction of the budget deficit, and the improvement of net foreign exchange earning. To stabilize prices the

[1] The history of agricultural policies for the period 1960-1984 is well documented in Hurtado, Valdés and Muchnik (1990), a synthesis of which appears in Valdes, Hurtado and Muchnik (1991). For a history of land policies during the period 1973-1980, see Jarvis (1985). See Odepa (2001) for a presentation of the current government strategy towards agriculture.

government had a policy of fixing both nominal farm prices for essential products (wage goods: wheat, bread, beef, milk, rice, sugar, and oilseeds, among others), nominal exchange rates, and marketing margins at the retail level. There were export prohibitions of certain products (wheat, flour, lamb, and others) but export promotion of fruits. After a brief attempt at trade liberalization, at the end of 1961, tariffs were increased, import quotas and licenses revived. For agriculture there were differentiated tariffs and prior deposits for imports on products and agrochemicals and machinery. There were, in addition, development programs, particularly for livestock, with subsidies for milk producers, state aid in the construction of slaughter houses, and other investment incentives. The rationing of beef (so-called meatless days) and the prohibition of the slaughter of young and pregnant cattle were mandated. Subsidized credit rates and subsidies on railway transportation for wheat, cattle and forages were established. In 1960 a marketing board (ECA) for purchases and sales was established, beginning with wheat and byproducts, later with the authority to extend operations to all products in an attempt to guarantee a "normal supply" of products. The board also gained a monopoly on imports.

In 1965 during the Frei Montalva administration a more explicit agricultural policy was formulated oriented toward self-sufficiency and the coordination of relative prices to increase overall production. The interventionist price regime intensified in the direction of production and consumption patterns. There were restrictive tariffs, fixed prices for consumers and minimum prices for producers, fixed marketing margins for the major staple crops, export quotas, licenses and prohibitions and quotas on wheat, flour, milk, beef. Prohibitions on slaughter and the consumption of meat on certain days were intensified. Tax rebates (up to 30% of the fob price) on certain exports were introduced (fruits and lamb). Previous interventions in input markets continued, and, to avoid over-evaluation, a crawling peg system for exchange rates was adopted.

To encourage production, the government recognized the importance of relative prices: the prices of farm products were allowed to rise more quickly than non-agricultural goods. To diminish marketing margins, the government intervened in marketing channels, increasing storage and processing facilities, improving transport systems, holding food security stocks of staples, and operating marketing boards to support the prices of wage goods. Of course, a tension emerged between the objective of increasing production through higher prices and raising rural relative to urban wages, and the objective of restraining wages in the non-agricultural sector.

1.2. Land reform and the final days of control

The previous land reform program of the Alessandri years was small in scale, based on voluntary sales at market prices, and oriented towards the promotion of small-scale farms. By contrast, under the Frei administration, a

massive land reform was introduced in 1967 based on expropriations, with partial compensation determined by the state, and oriented toward the establishment of large, cooperative farms (*los asentamientos*). There was no intention of subdivision and the creation of small private farms. A private producer was subject to expropriation with greater than 80 hectares of irrigated land (or its equivalent).

During the Allende years (1971-1973), the expropriation-based land reform program was strengthened, reaching 40% to 50% of farmland resources (as measured by productive equivalents), and the farm production model was based on semi-collectivized, large operations[2]. The interventionist economic policy intensified, inflation accelerated, and, given the logic of the prevailing economic model, the government responded with even more severe price controls. Intense inflation and price controls led to food shortages and black markets. The government reacted with an attempt to monopolize the markets for fertilizer, wheat, maize, milk, sugar, and other products. In the area of foreign trade, the government accentuated the protectionism of the previous administration, fixing the nominal exchange rate, and the state's import monopoly, and export controls became stricter.

1.3. The move toward markets

Confronted with hyperinflation, large deficits in internal and external accounts, and a large part of the economy generally (including agriculture) in state hands, the military government beginning in late 1973 radically changed economic and agricultural policies towards market-based resource allocations. The role of the government in the economy was reduced, trade liberalized and private property rights strengthened. During the first phase of reforms, between 1973 and 1983, general economic reforms were put into effect quickly and sector-specific reforms were deferred. Macroeconomic stabilization and the maintenance of the credibility of reforms were key considerations.

In agriculture, reforms affected land markets, reduced government involvement in services. Input and product markets were privatized. Especially important, the new land policy was to provide unrestricted access to land ownership with private property rights protected. Individual land titles were distributed to beneficiaries of the previous land reform program. Relative to the previous decade, government expenditures on agriculture fell dramatically: in real terms, during the period 1980-1983, the government spent one-third of the amount spent on the sector during the period 1965-1974 (Valdés, Hurtado and Muchnik,

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[2] The approach to farm production under the Chilean agrarian reform began with a Yugoslav model and moved to the increasingly centralized model seen in the Soviet Union. For a discussion of the details of Chile's agrarian reform, see Valdés (1978) and Jarvis (1985) and the citations therein.

1991, pp. 125-130). In 1975, the government entered into a new experiment in trade liberalization, and marketing board and price control agencies (ECA and DIRINCO) were closed. Except for wheat, milk and oilseeds, most of the previous price controls were lifted. Legal ceilings on interest rates were raised and then removed, and preferential rates for agriculture were abolished.

As part of the early introduction of a radical trade liberalization program, almost all non-tariff barriers were eliminated and tariffs on most imports were reduced rapidly. A uniform tariff equivalent was introduced, beginning at 90% in 1975, falling to 20% in 1977 and to 10% in 1979. Export restrictions were eliminated and the crawling peg system for exchange rates, begun in the Frei Montalva administration (but ended by Allende), was again put in place until 1979 when a fixed exchange rate system was reintroduced.

There were several delays in the implementation of reforms, which affected adversely the agricultural sector. There was a slow elimination of price controls for some products, and reform of land and water rights took longer than expected. Reforms of labor markets (the removal of wage indexation, and the introduction of flexibility in the stevedore market) were also postponed. There were also the privatization and deregulation of airlines and telecommunications, which generated significant improvement in the quality of services and reductions in costs. This was particularly important for the agricultural export sector, especially for producers and exporters of perishables.

As will be discussed in the following section in reference to productivity growth, the necessary conditions to stimulate private investments were evidently inadequate. Between 1978 and 1982 Chilean farmers were at a disadvantage with the then-prevailing exchange rate appreciation and reduced world commodity prices. During this period, the question reemerged of the possible special treatment to the agricultural sector, when farm lobbies representing import-competing activities sought selective protection. As a general observation, there appears to be a strong correlation between a stronger Chilean peso and political pressures on the part of farm lobbies for greater protection.

1.4. The second phase of reform

A second phase of reforms began in 1984, following a deep recession. The government reversed the currency appreciation with nominal devaluations and restrictions on short-term capital inflows. In addition, a price stabilization mechanism was established for importables, wheat, sugar and oilseeds, based on a variable levy, commonly referred to as price bands. A scheme of minimum customs valuations for milk and derivatives was introduced. The government's policies succeeded in raising the real exchange rate between 1984 and 1991, when a new episode of currency appreciation began, again creating political tension in the farm sector. For producers of importing competing products, the

decline in profitability became even more pronounced when Chile joined Mercosur as an associate member obligated to grant trade preferences to Argentina, Brazil, Paraguay and Uruguay, countries competitive in wheat, maize, oilseeds and beef.

2. PRODUCTION EFFECTS OF CHANGES IN THE POLICY ENVIRONMENT

2.1. Sectoral performance

Chile was the earliest adopter of market-oriented, open-economy reforms in the developing world. Its macroeconomic structural reforms begin in earnest in 1975-1976, following the economic crisis left by the Allende experiment. The policy environment immediately following the change in government was one of returning to a more tranquil macroeconomic state. We consider the year 1974 to be prior to the introduction of true market-oriented reform process. Although the bulk of trade reforms was implemented between 1976 and 1978, Chile did experience phases of policy innovation. For example, until 1982 wages were fully linked to the consumer price index, for both the private and public sector; after 1983 there were a number of adjustments aimed at stabilizing farmer prices for wheat, sugar and oil seeds; and in 1991 the country expanded its credit and extension assistance to small farmers (Hurtado, Valdés and Muchnik, 1990; de la Cuadra and Hachette, 1991).

Table 1: Performance indicators for Chilean agriculture: 1960-2001

	1960-70	*1971-73*	*1974*	*1975-83*	*1984-89*	*1990-98*	*1999-01*
GDP growth rate (%)	4,1	1,1	2,5	1,7	7,5	7,3	2,0
Agriculture production value growth rate (%)	2,4	-5,5	19,2	2,1	4,7	3,9	1,7
Agriculture GDP growth rate (%)	2,2	-6,5	26,8	2,2	8,0	2,5	4,0
Agriculture share of total GDP	8,2	7,5	5,7	7,2	8,1	8,3	8,6
Rural population (% of total)	28,4	23,5	22,2	19,5	17,2	15,8	14,2
Rural labor force (% of total)	27,2	23,5	22,8	21,3	19,5	18,8	14,4
Agriculture exports index (1961=100)	107	126	249	966	2456	6622	9877
Agriculture imports index (1961=100)	122	211	540	417	238	701	927
Agriculture imports plus exports per total GDP (%)	10,1	16,9	36,2	33,3	31,0	59,8	83,6
Agriculture export growth rate (%)	4,4	-8,9	149,8	23,0	19,6	12,3	4,8
Agriculture import growth rate (%)	3,7	23,2	120,0	4,4	-4,6	18,0	-6,4
Value added per worker (constant 1995 US$)	2512	2513	2,5	1,7	7,5	7,3	2,0

Source: World Development Indicators.

For data pertaining to Chilean agriculture, one may distinguish between three sub periods following the years of heavy government intervention. Following the Allende government, the Chilean agricultural sector and exports grew at a strikingly high rate (Table 1). This was simply a result of the end of an exceptionally unstable and interventionist economic and political environment, unparalleled outside of Cuba and the Sandinista years in Nicaragua. If one were

to take 1974 as the beginning of the reforms, the growth rates (overall and in exports) attributable to the reform would be much higher. More appropriately, the liberalized market regime began in 1975. Between 1975 and 1983, average overall growth rates for agriculture returned to the average level of the 1960s. Export growth rates, however, increased considerably. After 1983, overall sectoral growth increased faster than the general economy, leading to an increasing sectoral contribution of total GDP.

Table 2: Average annual export value (1000 US$ fob)

Period	*All crops and livestock*	*Forestry*[1]	*Fruits*[2]	*Wine*[3]	*Fisheries*[4]	*Fisheries*[5]
1960-1970	31,777.6	11,659.9	4,114.5	977.6	13,462.0	n.a.
1971-1973	37,289.7	23,467.0	9,809.3	2,323.0	19,992,0	n.a.
1974	73,943.0	90,320.0	11,298.0	3,818.0	35,231.0	n.a.
1975-1983	286,850.2	229,918.3	97,315.0	11,861.9	152,784.6	259,698.9
1984-1989	729,399.0	428,674.5	336,412.5	18,515.2	372,883.8	618,050.2
1990-1998	1,966,464.9	990,414.3	534,475.4	215,237.6	576,761.3	1,421,281.8
1999-2001	2,995,183.0	1,285,781.0	679,286.3	581,828.0	-	-

Average annual growth rates

Period	*All crops and livestock*	*Forestry*[1]	*Fruits*[2]	*Wine*[3]	*Fisheries*[4]	*Fisheries*[5]
1960-1970	4.4	19.7	16.4	25.5	38.9	n.a.
1971-1973	-8.9	2.4	13.2	16.6	7.8	n.a.
1974	149.8	247.7	4.9	44.8	159.1	n.a.
1975-1983	23.0	16.0	41.5	22.9	38.3	23.4
1984-1989	19.6	15.9	14.2	25.7	9.9	14.0
1990-1998	12.3	9.3	6.7	35.8	2.9	7.9
1999-2001	4.9	7.4	3.2	8.2	-	-

[1] Includes industrial round wood, pulp and + particles, sawn wood, wood-based panels, and wood fuel; [2] Includes apples and grapes; [3] Included all wines; [4] Includes only salmon, fish meal; [5] Included all fish products. Source: Odepa.

The main impact of liberalization on agriculture was to alter the composition of production and trade. As might have been expected, the subsectors of exportables – fruits, vegetables and forestry – increased in importance, while livestock and field crops (primarily wheat) declined (see also, de la Cuadra and Hachette, p. 264). As Table 2 indicates, following reform there was an increase in export growth rates across the board, although there has been a slowing of growth recently. Following the reforms, yearly growth rates averaged 10% or greater for two decades. Wine production and export growth rates continue to increase, while the expansion of fruits has slowed, due primarily to a decrease in world prices for the bulk of the fruit exports. It is very likely that fruit production and exports could expand at a faster rate if world prices were to recover their former levels. How has Chile's agricultural sector performed relative to other Latin American countries? Compared to the agricultural sectoral and export

growth rates for several countries in terms of the year in which policy reforms began. Chile's agricultural sector out-performed those of other countries in the region, due in part to the country's relatively early start of economy-wide and sectoral policy reforms.

2.2. Factor use and productivity

During the Frei-Montava and Allende years there were large injections of government funds into the reform sector, including a large public investment program and subsidies on credit and input use (Hurtado, Valdés and Muchnik, 1990). After an initial gain in production value and labor productivity, the agricultural sector began to deteriorate, falling in 1973 to levels of 1965. Following 1973, agricultural sectoral value added per worker showed an immediate recovery (Table 1). Although the recovery of the sector was remarkable considering the initial conditions (e.g., 48% of the agricultural land in productive-capacity equivalents had been expropriated), the immediate response of agricultural growth rates to market-oriented reforms might be characterized as "too low" (Barahona and Quiroz, 1988)[3] given the increases in relative prices to producers which followed. After two years of declines in production and labor productivity in 1983 and 1984 (associated with exchange rate increases discussed in the following section), there appears a radical increase in the growth rate of production and labor productivity beginning in 1985. This growth is obviously correlated with an increased use of fertilizers per hectare (more on this below), an expansion of irrigated area, increased machinery (Figure 1), and an introduction of new varieties and the adoption of non-traditional crops.

Increases in land productivity were also notable. Agriculture and forestry occupies slightly less than a third of Chile's continental surface of 75 million hectares (Table 3). Total land in agriculture and forestry has declined by nearly 10% since 1965. Cropland (under production and not in use) has not only declined in absolute terms but also percentage terms. Land in natural prairies and forests increased as a percentage of all land use, but also declined in absolute terms. Despite a decline in cropland hectares, Chile attained high rates of production growth following the mid-1980s, attributable to increases in non-land input use, especially fertilizers. Moreover, as Arnade (1998) and Gardner (1995) suggest, Chile also experienced a post-reform gain in overall productivity, linked to improved varieties, changes in crop mix toward higher valued products, better irrigation methods and other innovations. A simple regression analysis of aggregate production value on input use for the period 1961-1998 indicates that there may have indeed been a large gain in overall productivity following the

[3] For more on the question of the aggregate agricultural supply response to incentives in Chile, see the comments by Jarvis (1988) on the piece by Barahona and Quiroz, and the follow-up discussion by Quiroz, Barahona and Valdés (1988) and Jarvis (1988).

initiation of reforms in 1974-1975[4]. There appears to be less evidence for a shift in the annual rate of overall productivity gain following 1974, and the data suggest that the notable gains in production following the initial phase is explained by increased input use alone[5].

Figure 1: Evolution of factor use in Chilean agriculture

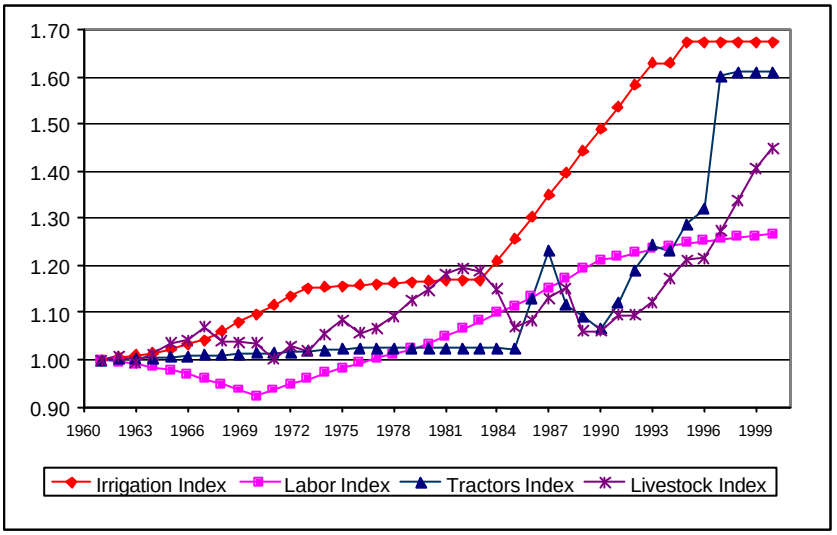


Table 3: Distribution of agricultural and forestry land use, 1965, 1976 and 1997 (%)

	1965	1976	1997
Total agricultural and forestry land (millions of hectares)	30.6	28.8	27.1
Type of land use (%)			
Crop land	14.5	11.5	8.5
Annual and permanent	5	4.9	5.2
Improved grazing land	3.4	2.1	1.7
Without use	5.4	4.5	1.6
Other uses (natural prairies, forest, etc.)	85.5	88.5	91.5

Source: Agricultural census, 1965, 1976 and 1997.

[4] The point estimate for a positive productivity shift post 1974 is 0.157 (16%) with a standard error of 0.072 (p-value of 0.036). This is a shift upward in the productivity trend measured by a simple year index over the entire period of estimation, estimated to be 2.3% per year.

[5] We should underline that these are tentative results and that much work is yet to be done regarding the connection between structural reforms and productivity gains.

2.3. Changes in incentives

The effects of policy regimes can be usefully broken into direct effects due to sectoral policies (price and border protection, and subsidies) and indirect effects due to economy-wide policies. With respect to sectoral policies, prior to 1974 Chile favored export-oriented crops (apples and grapes) and most import-competing crops (beef, maize, milk sugar beets and wheat) (see Valdés, 1996.) Immediately following 1974, the nominal protection for exportables fell to very low rates, and since the initiation of the second phase of reforms in the early 1980s, nominal protection rates (NPRs) have been effectively zero. For import-competing crops the story is notably different. The NPRs for milk and wheat were relatively high in the decade of the 1960s. (Measured NPRs during the Allende years are not very meaningful, given the regime of price controls, hyperinflation, shortages and rampant black markets.) NPRs were relatively high during the 1984-1989 period due to the government's response (price bands[6] for wheat, sugar and oilseeds, minimum milk import prices) to the strain on the traditional farm sector arising from low international prices and a strong appreciation of the currency between 1979 and 1982. Although there was depreciation in the late 1980s, protections remained. During the 1990s, the currency again appreciated, and the already-instituted price bands cushioned traditional producers[7].

Analyzing the decomposition for real domestic prices for selected Chilean agricultural products for the period from 1960 to 1993 or 1995, Valdés and Foster (2002) find that for the period 1975-1983 the average 0.18% decline in the real price of milk is the result of a 2.39% decrease in the real border price, a 46.47% increase in the real exchange rate and a 44.26% decrease in price supports. There were increases in real domestic prices for fruits and wheat during the initial phase of reforms, 1975-1983. During this period there was a decline in the real domestic prices for beef and milk. This initial phase witnessed on average significant decreases in the real border prices of most products, except grapes. What benefited producers was an increase in the real exchange rate on average, although there was notable volatility and a decline in the real exchange rate in 1979-1981, when the nominal rate was fixed at 39 pesos per dollar as part of the government's stabilization program. In December 1977 a uniform 10% tariff was established as a goal to be reached in June 1979 (de la Cuadra and Hachette, 1991), and on average, except for wheat, producers faced falling tariffs during the initial phase. A general conclusion is that producers, facing lower real border prices and lower tariffs nevertheless on average

[6] Price bands establish price floors and ceilings on import prices based on a moving average of international references prices.

[7] The high NPRs during 1984-1989 for beef can be attributed to the restriction on imports from countries with foot-and-mouth disease. Chile had attained disease-free status in the early 1980s.

benefited during the initial eight years of reform principally due to the support provided by a favorable movement in the exchange rate.

During the second phase of the reform, 1984-1989, real domestic prices declined for all products considered except beef and apples[8]. The declines in real domestic prices for wheat, maize and fruits were in spite of a steady increase in the real exchange rate and are due to a decline in border prices. The large increase in domestic beef prices is principally due to the prohibitions on imports of live cattle and meat on the bone from traditional suppliers, such as Argentina and Uruguay during the 1984-1989 period. This prohibition followed the eradication of foot-and-mouth disease in Chile and the sanitary protections instituted to maintain the country's status as "FMD-free". The 1988-1990 period saw the transition from military to civilian rule. After 1990 there was a cumulative decline in all real domestic farm prices, except for grapes, due to an appreciation of the Chilean currency and, for four of the selected products, due to a decrease in real border prices.

To the extent that the changes in the real domestic prices of these selected products approximate crudely the changes in the returns to farming, one can say that in the case of Chile the main forces behind agriculture's price incentives were beyond the control of sectoral policy. The main factors were the exchange rates and border prices.

2.4. The impact of price changes on agro-chemical use

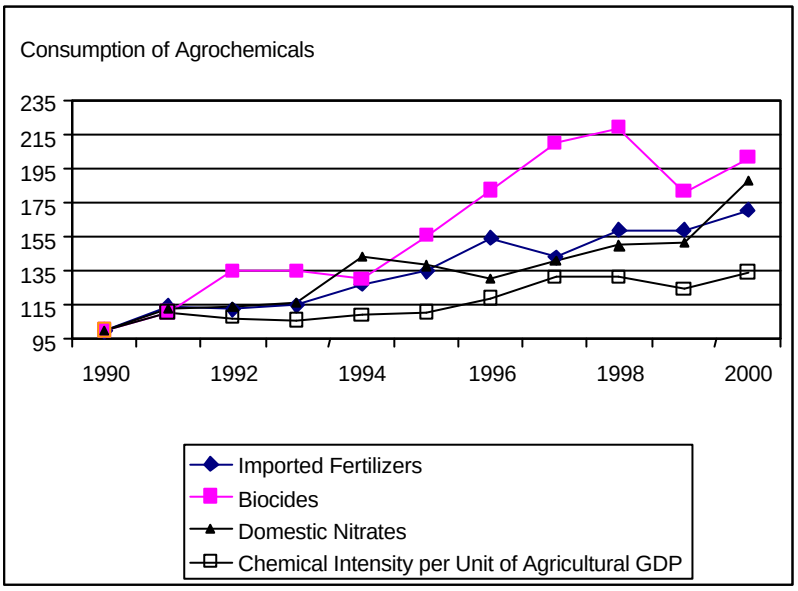
The sector's orientation since the late 1970s toward a more open economy and the changes in price incentives influenced the impact of agriculture on the environment. The demand for chemical inputs by the agricultural sector has been increasing rapidly (Figure 2). By far the fastest growing input has been pesticide which has increased by about 100% over the 1990-2000 period, while the demand for imported and domestic fertilizers have increased by roughly 50% over the same period. Agriculture output over the period increased by about 50%. Thus the consumption of pesticides rose twice as fast as agricultural output. That is, the pesticide/output intensity ratio has also increased rapidly.

A recent study by Lopez and Anríquez (2003) analyzed the response of input demands given the structural changes in the mix of output and the scale of production in the sector during the last two decades. One important conclusion is that this increase was principally due to price effects rather than overall output expansion effects. Changes in output scale explain less than a quarter of the total increase of pesticides and nitrates. The overall output expansion effect has been low as a consequence of the changes in the composition of Chilean agriculture,

8 The data for domestic prices of apples are suspect.

from import competing towards exports. The negative environmental externalities per unit of value added of the export oriented sector have been less, as is indicated by the input demand elasticities with respect to output changes in both export and import-competing sectors (Table 4). In the case of fertilizers, pesticides and other agrochemicals, while chemical use and the chemical intensity per unit of agricultural GDP has increased (Figure 2), the increases are less than they would have been in the case of a similar expansion led by import-competing (traditional) crops.

Figure 2: Consumption of agro-chemicals in Chilean agriculture: 1990-2000



Source: Lopez and Anriquez, 2003.

Table 4: Elasticities of agricultural chemical input demands with respect to exportable and non-exportable agricultural output and own prices

	Exportable Output	Non-Exportable Output	Own-price
Domestic Fertilizers	0.160	0.455	-0.636
Pesticides	0.247	1.007	-0.955
Imported Fertilizers	0.992	0.654	-0.080

Elasticity estimates are the median values of elasticities estimated from 20 demand system specifications, which include various normalizations of time periods, and imposing or not homothetic technology, constant returns to scale, separability, the inclusion of various weather-related dummies. Source: Lopez and Anríquez (2003).

A simulated expansion of both export and traditional agriculture GDP of 4% (which has been about the annual rate of growth of the sector over the last two years) would increase agricultural pesticide use by about 2.8% (an elasticity of pesticide use with respect to aggregate agricultural output of the order of 0.7). A change in the composition of production in favor of the exportable sector would cause a reduction of pesticide consumption. Between 1990 and 2000 the agricultural exportables sector expanded twice as fast as that of traditional outputs. Given the Lopez and Anríquez (2003) econometric results, had both sectors expanded at the same rate (keeping the total rate constant), pesticide use would have risen by 130% instead of by an observed 100%. 60% of this actual increase can be attributable to export crops, because the export sector grew twice as fast[9].

The rise in the pesticide intensity of agriculture is particularly worrisome given that among the three groups of chemical inputs pesticides is the one that could potentially have the most negative health and environmental externalities. The high price responsiveness of pesticide demand found is, however, an indication that the pesticide/output intensity could potentially be reduced through adequate price policies. Although first-best policies call for the use of instruments that directly control emissions, the use of taxes on inputs that are directly related to emissions may be justified under certain circumstances (especially when monitoring and controlling emissions directly is expensive and/or very difficult). What the econometric analysis suggests is that given the high price responsiveness, a modest tax on pesticides could be very effective in reducing the pesticide/output intensity and in thus diminishing one of the most important negative environmental externality of agriculture.

2.4. Changes in the structure of agriculture

Based on1997 agricultural census data, out of an estimated 330 thousand farms in Chile, 100 thousands are classified as subsistence and 176 thousand are classified as small farmers (less than 12 hectares). These two groups use about 23% of farmland, the rest being in medium farms (17,000) and large farms

[9] One could argue that chemical use per hectare might be another agronomic measure for comparing the export-oriented and import-competing agricultural sectors. This would place an emphasis on agriculture's land and chemical use as a technical environmental metric rather than the sector's chemical use in the context of its contribution to national income as an economic metric. If export-oriented crops use chemicals more intensively per hectare than import-competing crops, as might be the case for fruits and vegetables, then the agricultural sector's growth driven by export-orientation would lead to an overall increase in the intensity per hectare of chemical input use. But attempting to attain the same level of the sector's GDP growth through traditional crops, while entailing lower chemical intensity use per hectare, would result in an overall increase in chemical use due to the expansion of total hectares required. This is the implication of the López and Anríquez results discussed in the text.

(9,500) (Muchnik, 2003). The information available (Table 5) shows an apparent movement between 1976 and 1997 toward smaller farms in some regions and an increase in farm sizes in others. This can be fairly reasonably associated with the crop mixes in the various regions. The central regions, which show declines in farm numbers, are the heart of the fruit and wine export sector. These regions have the most sophisticated agricultural economy, and have seen both a decrease in farm numbers and an increase in average farm size. The southern regions, where wheat and other traditional crops and livestock predominate, show increases in number of farms and decreases in farm sizes. Although the farm products of the southern regions, grains, milk and beef, compete with imports, there have been notable gains in productivity, spurred in part by the market-oriented environment introduced by the reforms. These productivity gains have been especially notable in the case of wheat and milk yields. The limited data presented here are consistent with the hypothesis that the productivity gains for traditional products have been available to small and large farmers alike. But without a measure of the changes in the shares of total regional production across farm sizes, this remains an open question.

Table 5: Evolution of farm numbers and average size in Chile, 1976-1997

Region		*Number of Farms*			*Average Size*		
		1976	*1997*	*Change (%)*	*1976*	*1997*	*Change (%)*
Arid North	I	2736	5690	108	288.1	157.6	-45
	II	1341	2042	52	86.7	56.4	-35
	III	1920	2427	26	738.8	837.1	13
	IV	17585	17291	-2	202.1	225.0	11
Central	V	21115	20242	-4	69.2	68.8	-1
	Metropolitana	20630	15491	-25	60.5	73.5	21
	VI	36880	30967	-16	44.4	39.4	-11
South	VII	41779	40559	-3	58.8	53.0	-10
	VIII	56314	56891	1	56.3	48.2	-14
	IX	50587	61443	21	53.3	39.5	-26
	X	50557	55045	9	72.5	66.1	-9
Extreme South	XI	2996	2570	-14	602.2	601.9	0
	XII	1078	1045	-3	4397.4	3756.3	-15
	Total	305518	311703	2	94.1	87.0	-8

Source: VI Censo Nacional Agropecuario, INE 1997 (Table 3.1).

More recent evidence suggests that the dairy sector has experienced rapid changes not only in terms of production levels but also in terms of the number and size of producers. Anrique (2000) reports that the number of Chilean dairy producers is declining at a rapid annual rate of about 3%. Currently 2500 milk producers (18% of the total) account for 86% of milk received by processing plants; 800 producers (6%) account for 60% of processed milk (Odepa, 2003).

Similarly, for the Chilean pork and poultry sectors the number of producers has shown a marked decline as the scale of production has increased due to the adoption of new technologies and marketing methods. Since 1978, the number of production units in the pork sector has declined by 59%, while the number of pigs processed per grower has risen by over 1,100% from 472 to 6,046 pigs per producer. This average, however, should also be interpreted in the light of the skewed distribution of the sizes of pork producers: most producers are small scale, but the bulk of total production comes from a very few producers with operations of more than 100 thousand pigs. Over the same period, the number of poultry growing units has declined 79%, while the number of broilers produced per unit has grown by over 260%.

With respect to concentration on the buyer side, little information appears available to give an overall picture country by country in Latin America. For Chile, however, there is evidence of a high degree of buyer concentration and of increasing vertical coordination through contracts and integration in agro-processing. This phenomenon is reinforced by the increasing concentration of retail food sales in supermarket chains, which also puts pressure on the competitiveness of very small producers in terms of sales volume and quality control. Foster and Vargas (2001) report that, of the 16 most important agricultural products, only the market for potatoes corresponds to the stylized model of many market participants whose activities are determined by spot prices generated by open markets. All other product markets have high degree of buyer concentration and/or are coordinated through marketing or production contracts or are integrated completely. The evidence suggests that the degree of industrialization of Chilean agriculture is already high and that this process of industrialization has been ongoing and continues to intensify. Interestingly, the export-oriented sectors of fresh fruit and wine have less processor concentration than have import-competing sectors.

3. SOCIAL EFFECTS OF AGRICULTURAL REFORMS: RURAL POVERTY AND IMMIGRATION

The effects of the policy reforms on agriculture derive from five main components of reform: macroeconomic stabilization, trade liberalization, deregulation, privatization, and a more explicit commitment to the targeting of social policies. There has been, of course, heterogeneity in the balance of these reform components. Moreover, some elements of reforms were implemented more rapidly than others, most notably macroeconomic stabilization and trade liberalization. The institutions and information systems for implementation of the other components have required time, which exacerbates the problems of evaluating the impact of reforms for countries that have more recently initiated reform. Even in the case of Chile, where due to the earlier initiation of reforms there is a greater amount of longitudinal and cross-sectional household data (CASEN and FICHA CAS), nevertheless there is very little information prior to

1987 at the micro level on which to base a comparative analysis of the impacts of reform on poverty[10].

Even with the best of data, it would be difficult to isolate from real observations the partial effect of any one of these components of the package of reforms from the net effect resulting from the general shift toward market-oriented policies. With the data actually available, analysis is particularly problematic for the rural sector, because the countries which have had household surveys have had a strong urban bias in both the design and coverage of those surveys, and where questions are ill-constructed to dissect the sources of rural income. The weaknesses of the time-series data on rural poverty in the region (including the data on which are based the studies of CEPAL, the World Bank, IDB and others) is acute. This leads not only to wide differences in the estimated levels of poverty at any point in time (as discussed below in reference to Table 6), but also perhaps to suspicion about the estimated trends in rural poverty rates over time. There are some countries for which reliable data on rural household income and poverty is available for specific years at least for representative regions. While these snapshots of individual country situations are extremely useful for cross-sectional analysis, they are only marginally useful for the analysis of the evolution and determinants of poverty rates over time, especially in the context of the question regarding the effects of reforms.

3.1 Poverty measures

As one can observe in Table 6, with the same micro-level data derived from reliable and consistent surveys, there is a wide range of results with respect to poverty measurement. An analysis of household surveys requires many adjustments, such as the decision to use per capita or per household measurements, or instead to use adult equivalents. There is a question of whether there is reliable data to adjust the poverty line to the rural sector, considering differences in prices between sectors. Furthermore there are the questions of whether and how to adjust for regional prices and household production. And there is the standard question of adjusting income levels for consistency with national income accounts data. Nevertheless, the four measures presented in Table 6, show a degree of consistency in basic trends. All sources show a significant decline in poverty levels over time and a slowing of the decline in poverty rates in later years.

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[10] Systematic efforts to compile a nationwide, large, biannual representative household survey for Chile began in 1985 with the first CASEN. Reliable data, however, was not available until the 1987 survey. Comparisons of poverty measures using pre- and post-reform data are difficult given the dubious nationwide representation of pre-1985 data.

Table 6: The evolution of poverty rates in Chile 1987-1998

Percent below poverty line[a]		1987	1990	1992	1994	1996	1998
Urban	WB 2000[b]	35.2	29.1	20.7	19.3	15.6	13.5
	De Janvry and Sadoulet [c]	38.0	33.0	28.0	23.0	19.0	--
	Wodon [d]	45.3	48.3	41.2	27.4	24.1	23.6
	CEPAL[e]	-	38	-	28	22	21
Rural	WB 2000 [b]	63.5	50.6	40.1	42.1	42.5	37.3
	De Janvry-Sadoulet [c]	45.0	34.0	28.0	26.0	26.0	--
	Wodon [d]	57.0	60.8	60.4	44.6	42.5	42.5
	CEPAL[e]	-	40	.	32	31	28
Poverty Deficit [b]							
Total		15.7	12.0	7.8	7.6	6.5	5.7
Urban		13.4	10.2	6.5	6.3	4.8	4.5
Rural		25.3	19.7	13.4	14.2	15.0	12.6

Source: (a) All estimates are based on the same survey data of approximately 40,000 households commissioned biannually by MIDEPLAN, known as CASEN. (b) From World Bank (2000). The poverty line was set at P$37,889 per month in 1998 pesos. (c) From de Janvry and Sadoulet (1999) based on CEPAL calculations. (d) From Wodon et al. (2001). (e) CEPAL as presented in Ocampo (2001). The CASEN household survey, with a sample of approximately 40,000 households, is representative nationwide, and it is taken every two years since 1985. See Valdes and Mistiaen (2001).

Using what we consider the most reliable of the sources, the World Bank 2000 report, there are three notable results. First, the incidence of poverty is considerably higher in rural areas than in urban: in 1987, 63.5% of the rural population was poor compared to 35.2% of the urban population. Second, rural poverty has declined significantly over the period, from 63.5% in 1987 to 37.3% in 1998. Third, the reduction is more pronounced in urban areas than in rural areas. Urban poverty in 1998 was 38.3% of the rate in 1987. In contrast rural poverty in 1998 was 58.7% of the rate in 1987. The implication of this last result is that, although rural households are better off today than when the surveys began, there has been a widening of the rural-urban income differentials. The reasons for this growing income gap have not been well addressed, and it is unknown the degree to which growing income differentials can be attributed to reforms in and of themselves.

The progress in reducing both urban and rural poverty is mainly due to the sustained and rapid overall economic growth of the country, which enjoyed an annual GDP growth rate of about 6.5% from the mid 1980s to mid 1990s. The Chilean case supports the observed regularity that, in those countries where agriculture's share in income and employment are relatively low – which is typical of middle income countries – and in the presence of integrated labor markets, rapid overall growth can go a long way in reducing rural poverty, even if agriculture does not grow very fast. Migration appears to have been a notable factor translating overall growth into poverty reduction. De Janvry and Sadoulet

(1999) find that rural-urban migration has been primary factor explaining the observed reduction in rural poverty during the 1990s *in most of Latin America*. Although not strictly comparable, the de Janvry and Sadoulet findings are consistent with the very detailed analysis of Mundlak, Cavallo and Domenech for Argentina and Coeymans and Mundlak for Chile using migration functions (see Mundlak, 2000). These authors report high elasticities of migration levels with respect to income differentials (5.6 for Argentina and 7 for Chile)[11]. The implication from these results using agricultural income data is that wage differentials should have also declined, which is interesting in the light of the widening gap of poverty levels using more general income measures of rural and urban households. The determinants of rural income in the World Bank 2000 report are from all sources in an increasingly diversified rural sector that depends less and less on agricultural production *per se*.

From a policy point of view, a measure of the depth of poverty is a more relevant indicator than the incidence. As can be seen in Table 6, the poverty deficit overall has fallen 64%, from 15.7% in 1987 to 5.7% in 1998. For rural households the poverty deficit fell less, by 50% from 25.3% to 12.6%. For urban households the poverty deficit fell by 66%, from 13.4% to 4.5%. One can conclude that for Chile not merely has the incidence of poverty declined with rapid economic growth, but also has the depth of poverty, although poor rural households have a much greater relative chance than urban household of experiencing severe poverty. Further analysis is required to examine to what extent these rural-urban differences in the decline of the poverty deficit are related to different levels of social support, the mix of income sources, demographic changes (especially important in light of the self-selection implicit in migration decisions), and other variables. In the case of Chile, with a well-established social support system, it would be highly relevant in terms of policy analysis to investigate whether the coverage is biased (explicitly or implicitly) toward urban areas.

3.2 Did the expansion of agriculture after the reforms contribute to the alleviation of national poverty?

The national poverty rate in Chile showed a marked reduction especially after the full impact of policy reforms were becoming obvious with respect to productivity and the composition of agricultural output and trade. The national headcount fell from approximately 45% in 1987 to 20% in 2000, and the rural headcount fell from over 50% in 1987 to 23% in 2000. The question is: what has

[11] The data for the Mundlak, Cavallo and Domenech study were for the period 1913-1984, and those for the Coeymans and Mundlak study were for 1962-1982. Income differentials are measured as the ratio of sectoral average labor productivity for Argentina. For Chile income differential is measured as the ratio of wages in non-agriculture to the average labor productivity in agriculture, adjusted for differences in the cost of living and unemployment in the non-agricultural sector.

been agriculture's role in this decline in poverty? There are three avenues through with agricultural growth can affect poverty: labor income of unskilled workers (used relatively more intensively by the agricultural sector), poor farmers' income, and real food prices (mainly of non-tradables). A study by Lopez and Anríquez (2004) presents an econometric analysis of Chilean agriculture's influence on poverty alleviation via the impact of agricultural growth on these three factors. The effects of agricultural growth on the wages of the unskilled and labor income were derived by estimating demands for skilled and unskilled labor controlling for relative prices (of capital, and skilled and unskilled labor) and the outputs of two sectors: (1) agriculture and agro-processing, (2) everything else in the economy. (Factors are assumed to be mobile between these two sectors.) Thirteen regional skilled and unskilled labor quantities, agricultural and non-agricultural output, and wage data[12] were derived from household surveys and other sources for four years (1990, 1992, 1994 and 1996) and served as the bases of the regression estimates from which were derived labor demand own-price and cross-price elasticities. Own price elasticity estimates of labor are -0.53 for unskilled and -0.61 for skilled, similar to other estimates in the literature. The results also indicate that unskilled and skilled labor are substitutes, and both types of labor are substitutes for capital.

The most important finding in Lopez and Anriquez (2004) is the asymmetric response of the two types of labor to expansion of the two sectors, agriculture and non-agriculture. The demand for unskilled workers is more sensitive to an expansion of agriculture than skilled workers (respective elasticities of 0.58 and 0.44). Additionally, and critically for the results of the study, expansion in agriculture leads to a relatively higher increase in unskilled labor demand compared to an expansion in non-agricultural output. In contrast, skilled labor exhibits a greater sensitivity to non-agricultural output growth. Moreover these results can be extended to the case of increasing only the share of agricultural output (keeping total output constant). Increasing agriculture's GDP by 1% (with a corresponding reduction of 0.17% in non-agricultural output – a zero-growth scenario) would lead to a 0.51% expansion of the employment of unskilled workers. In Chile, agricultural based growth is more favorable for unskilled (usually poor) workers than is total economic growth with a stagnant agricultural sector.

The reduction of non-tradable food prices affects poverty in two ways: household real incomes increase and the food basket defining poverty becomes

[12] Wage data vary by regions, but capital costs data by regions is not available and were assumed constant and equal to a national average. To the extent that true capital costs are negatively (positively) correlated across regions with wage rates, the elasticity of labor demand would tend to be over-estimated (under-estimated).

cheaper. Recent household surveys show the food budget share of total expenditures is 27%, and the non-tradables share is 20%[13]. The analysis simulated the impact on poverty via reduced food prices due to an expansion of agriculture by 4.5% (an historically reasonable rate, approximately the rate experienced during the last two years), and finds a reduction of poverty by about 0.73% (less than 1%)[14]. Thus the food price effects resulting from agricultural growth appears marginal for both the poor and the vulnerable. The third channel examined by Lopez and Anríquez (2004) is the relation between agricultural growth and poor farmers' income. Results suggest that this relation is negligible. Furthermore the estimates also suggest that as aggregate agricultural output increases, so does the share of off-farm income in poor farmers' total incomes. The results are consistent with the increasing importance of non-farm income in rural Chile (Berdegue, et al., 2001), and the low rates of subsistence farming. The implication is that increases in agricultural growth would have negligible effects on poverty via poor farmer income.

The results for the effects of agricultural growth on poverty are consolidated in Table 7. Taking the uncompensated simulations as the most relevant, because it allows for overall growth in the economy, the estimates indicate that an expansion of 4.5% in agriculture GDP would lead to poverty rates falling 7.4%. (From a headcount of 20.58% in year 2000 to an estimated 19.20% due to wage and employment effect, plus an additional decline in the poverty rate of 0.15 due to the output price effect of agricultural growth.) Labor market effects explain more than 90% of the total poverty reduction while the food price effects explain the remaining 10%. Agriculture's share in the composition of national output is also important. What is driving these results is that for Chile, the agricultural sector as a whole tends to demand more unskilled labor than the rest of the economy, and thus the strongest poverty effect works through the labor market[15].

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[13] The non-tradable share of the total food budget (0.20/0.27 = 0.74) might appear too high in the case of Chile, but this share would include marketing margins, determined in large part by non-tradable services.

[14] Lopez and Anríquez (2003) estimated the long-run elasticity of non-tradable food prices with respect to agricultural output to be approximately –0.6 . Thus a 4.5% expansion in output would result in a decline of 2.7% in the price of non-tradable food, which in turn leads to a 0.5% decline in the food budget. One would not expect that such a small decline would lead to an outward shift in the supply of unskilled labor that might offset the effect of labor demand increase on wages.

[15] Of course, the skill intensity varies across various crops and activities, and likely across regions. The estimates reported by Lopez and Anríquez are a net effect accounting for the historical correlation of all activities with labor use in all of agriculture. Demand elasticities specifically with respect to exportables, say, would probably be higher, due to the greater labor intensity (including unskilled) of exportables compared to import-competing crops.

Table 7: Consolidated effects of agricultural growth on poverty headcount declines

Effect of 4.5% increase in agricultural GDP	Price and wage effects only	Price and employment effects only	Price, wage and employment effects	Elasticity of poverty reduction w.r.t. ag. growth*
Holding non-agricultural GDP constant	-7.29	-7.29	-7.43	1.5
Holding national GDP constant thus changing composition of output	-6.46	-6.41	-6.17	1.1

**Elasticity estimates based on price, wage and employment effects taken together. Other elasticities extimates for the effect of aggregate growth on poverty in Chile are in the range of 0.8 to 1.2. Source: Lopez and Anriquez (2004).*

3.3. What have been the effects of the export-orientation of agriculture on rural-urban migration and the sustainability of local economies?

Agriculture's role in the sustainability of local economics is directly through its generation of on-farm employment and indirectly through its impact on off-farm employment. Migration rates at the municipal level is a good proxy for measuring the relative profitability of local activities, including those related to agriculture. The determinants of migration are an area's economic opportunities, community amenities and quality basic services (e.g., education, health, communications, etc.), characteristic of the base population (e.g., age and gender distribution) compared to other areas. People vote with their feet. Migration captures the response of individuals and families to their perception of a community's income opportunities and quality of life.

In an innovative study, Anríquez (2003) constructed implicit migration rates by municipality using Chilean census data and birth and death rates, and observed population changes between census years of 1992 and 2002. At the municipal level data were collected of agricultural and forestry related variables using the agricultural census of 1997. Analysis focused on the correlation of migration rates and measures of agricultural activities at the municipal level. It is likely that neighboring municipalities are similar in migration patterns, and that there will be lesser correlation with greater distance. The analysis therefore made use of a spatial autoregressive model and a generalized spatial model that incorporates the spatial correlation of errors.

The model was used to test the importance of various explanatory variables in the determination of migration rates. Results show that, controlling for all other variables, out-migration from a municipality is affected positively by rurality (less than 50 inhabitants/km^2) and unemployment rates at the local level, and negatively correlated with income per capita, level of education, the share of women in the population, whether the locality is tourism-oriented or not, the share of employment in the primary sector (including agriculture), and the share of employment in industry.

The analysis captured the impact of agricultural output orientation towards exports on migration. One specification used the share of fruits in total farmland area in crops, and a second used the share of fruit area in formation (planted but not in full production) in total cropland. Interestingly, the share of cropland in fruits does not contribute significantly to explaining out-migration rates, but the share of cropland in fruits in formation is both significant statistically and has a relatively high impact on emigration rates. Overall, more agricultural employment reduces future out-migration, but more secondary sector employment reduces it even more. And part of this secondary sector is agro-processing, in most cases oriented to exports (e.g., fruit, vegetables and wine), which is usually (though not always) dependent on local agricultural production. Thus it appears that the *expansion* of export oriented agriculture is correlated with low out-migration rates.

The Anríquez study gives support to the thesis that Chilean agriculture has played an important role in the viability of rural communities. It plays an important role in geographically diversified development and, as a consequence, in countering over-concentration in large cities. The composition of primary output, however, is relevant to determine the effects of the expansion of this sector on migration patterns. While export oriented agriculture expansion is associated with reductions in the incentives to emigrate, the expansion of the forestry was found to be associated with exactly the opposite, out-migration, or displacement of population. This could be related to the fact that forestry develops in areas with relatively low productivity in intensive cultivation, and thus areas associated with forestry are predisposed to higher levels of out-migration. It also generates less permanent local employment than agriculture. With respect to the traditional import-competing agricultural products, the analysis is inconclusive, partly because it is more difficult to identify the spatial distribution of such crops. One might infer that impact of fruits is the opposite of import-competing crop, because the two activities are in direct competition for land.

An important finding of the Anríquez study that requires further investigation is that the Santiago metropolis does not act as an overwhelming force in concentrating population as it apparently had done before (Aroca and Hewings, 2002). Furthermore, there is evidence of an incipient migratory *turnaround* like in more developed nations.

The Anríquez results suggest there is ample room for public policy aimed at indirectly affecting migratory patterns. Housing policy, including subsidies, can direct population movement as suggested by the significant effect of average household size in migration. Traditionally, an urban bias in the provision of housing subsidies might have increased the rate of rural-urban migration. Investment in education can be also used to promote geographically sound population patterns.

Access to public services like electricity, drinking water and sewage were expected to have an effect on migration decisions. This does not appear, however to be the case, likely due to lack of variation of these variables across municipalities. Electricity and access to drinking water were widely available in 1992, when (at the national level) 90% of the homes had electric connections and 85% of the homes had drinking water connections. In the case of sewage, the availability is less widespread, with 69% of the houses having sewage connections in 1992. That this service/amenity does not appear to be significant in migration decisions could reflect a geographically balanced provision of these services. Future econometric analyses could be complemented with other infrastructure data disaggregated at the municipal level, which were not available at the time, although the raw data is being gathered. These variables would include indicators of the supply and performance of municipal services, such as primary and secondary education and test scores, health and sanitary infrastructure, indicators of labor-intensive activities such as construction permits, social safety net indicators, indicators of municipal revenues, and road density variable by municipality.

4. CONCLUDING REMARKS

To repeat the two broad questions raised in the introduction: To what extent has the expansion of the export agricultural sector been the unintended result of economic reforms?

Have price policies aimed specifically at the agricultural sector been less influential than economy-wide policies such as macroeconomic policies, deregulation and privatization? Regarding the first, economists involved in the reforms certainly anticipated that the trade liberalization program would reduce significantly the anti-export bias implicit in previous policies of high industrial protection, import-substitution, exchange rate management, export licenses and other measures that inhibited the production of exportables. Was this perceived by the farm lobbies and government officials dealing directly with the agricultural sector? Probably not, given their micro and sectoral focus, rather than an economy-wide perspective.

As to the specific path that the agricultural sector would take toward a greater export orientation – the impacts on poverty of this change was not well understood, beyond the general perception that the production of exportables tend to be relatively more labor intensive than import-competing products. Although some agronomist might have anticipated the potential of some fruit products, one of the interesting features of the Chilean story is that there has been substantial development of non-traditional products, some of which never before produced in the country (kiwis, berries, seeds for exports, aquaculture, large-scale forest plantations, and others).

With regard to the second question, the effect of the indirect interventions (exchange rates, and industrial protection, as discussed by Schiff and Valde (1992) overwhelmed the direct (sectoral) policies. Other non-sectoral factors were also very influential for agriculture, particularly deregulation and privatization in the larger economy as it affected infrastructure, ports, telecommunications, energy, banking, etc.

Perhaps the strongest conclusion that can be derived from this review of the impacts of the growth of Chilean agriculture following economic reforms of the last three decades is that the growth in the sector made a significant contribution to poverty reduction. A second conclusion is that the output mix of agriculture – specifically its tendency toward greater export orientation – had a particularly important effect in increasing employment and household income, lowering rural-urban migration, and reducing the intensity of agro-chemical use in terms of the sector's contribution to national income. The present overall policy strategy has been conducive to the growth of export oriented sectors and the modernization of import-competing sectors, but poverty alleviation, reduced agro-chemical use per unit of output, and reduced rates of rural-urban migration are most notably linked to export agriculture rather than to agriculture as a whole. The change in output mix oriented toward exports, and its consequences, has been largely induced by the economic policy reforms (principally trade liberalization, deregulation and privatization) experienced in the country since the mid-1970s[16].

The overall export orientation of agriculture connects the conclusions that can be drawn with respect to the environment, rural-urban migration, rural employment and poverty reduction, and the dynamic growth of the processing sector. Because the evidence points so strongly to the importance of the product mix, rather than to the farm sector per se, paradoxically the protection of the importing competing sector could reduce these positive externalities. Most of the current protection of agriculture in Chile is the result of border, trade-related measures. Such protection can only benefit the import-competing sector. It also represents an implicit tax on the production of exportables, which appears from the analysis in the Chilean case study to be the sector generating most of the positive externalities. The caveat to this output-mix message is that certain sub-

[16] Some observers consider that agrarian reforms between 1965 and 1973, which occurred in the context of import substitution and planned economy policies, could have established pre-conditions of the modernization of Chilean agriculture since the mid-1970s by removing an unresponsive land owner class. According to this thesis is that the sector's modernization following 1973 would have been derived in part from the sales of land by the beneficiaries of land expropriations to a new entrepreneurial class that sought to take advantage of policy reforms since the mid-1970s. This thesis may be plausible but it has not really been tested, and it is hard to establish the counterfactual.

sectors have had difficulties in adapting to the open-market policy regime, especially small-scale farming.

With respect to generalizing the results of this Chilean case study, the analysis found that exportables are an important driving force behind poverty reduction and environmental impacts. But one question remains: Is it the export nature of agricultural activity that matters, or is it the relative labor intensity of the primary and related activities such as processing? Is it the lower agro-chemical use? The answer is: It is the nature of the activity that matters. For Chile, the export sector coincides with higher labor intensity and lower chemical use, but this coincidence is highly unlikely to occur everywhere. An example might be Argentina, where the exports sector is likely overall less labor intensive (such as in the case of grains and beef). Similarly, a sector oriented to the production of import-competing crops could also be associated with strong forward linkages in agro-processing (and so be a source of significant employment effects), and with lower agro-chemical use. Again, for the Chilean import-competing sector, this appears not to be the case.

Another important aspect of the Chilean case that would argue against generalizing the findings of the study is the counter-seasonality and low-storability of a significant proportion of the country's agricultural exports. Chilean export agriculture has been able to take advantage of both characteristics that tend to be associated with lower trade barriers in northern export markets. A contrasting example of a country that could potentially expand the production of horticultural products is Morocco. Exports of Moroccan horticultural exports to Europe coincide with the harvest of EU competing products. And although Morocco has a trade agreement with the EU, it faces relatively greater restrictions on exports than Chile, hampering the expansion of the sector.

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AGRICULTURE ET RÉFORMES ÉCONOMIQUES AU CHILI : CROISSANCE, COMMERCE INTERNATIONAL, PAUVRETÉ, ENVIRONNEMENT

Résumé *- Cet article analyse l'expérience chilienne des réformes économiques – ouverture au commerce extérieur, dérégulation et privatisation – mises en place à partir de la fin des années 70 et l'effet de ces réformes dans le secteur agricole depuis les années 80 jusqu'à aujourd'hui. Il met particulièrement l'accent sur les incidences sur la structure de la production, la diminution de la pauvreté et l'exode rural. L'orientation vers les cultures d'exportation, induite par les réformes économiques, a eu pour effet l'augmentation de l'emploi rural et l'élévation des revenus, et s'est accompagnée d'une diminution de l'usage des produits agrochimiques.*

REFORMAS ECONÓMICAS Y LA AGRICULTURA CHILENA: IMPACTO EN CRECIMIENTO, COMERCIO EXTERIOR, POBREZA Y EN MEDIO AMBIENTE

Resumen *- Este estudio examina la experiencia Chilena respecto a las reformas económicas – apertura al comercio exterior, desregulación, y privatización – que se iniciaron a fines de los 1970s y el efecto de dichas reformas en el sector agrícola en los 1980's hasta la fecha. De especial interés es la interacción entre reformas sectoriales, macroeconómicas e institucionales que afectaron la estructura de incentivos y el mercado de factores. El estudio presenta una interpretación de los principales impactos de las reformas y como incidieron en el nivel y composición de la producción, una significativa reducción de la pobreza rural y de la migración rural-urbana. La mayor orientación hacia la producción de exportables – inducida por las reformas económicas - tuvo un enorme impacto en aumentar el empleo rural y elevar los ingresos, y también estuvo asociado con una reducción en el uso de agroquímicos.*