ANALYSIS

An index of sustainable economic welfare (ISEW) for Chile

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Received 28 July 1997; received in revised form 20 March 1998; accepted 26 March 1998

Abstract

Chile has experienced a period of strong economic growth. The Gross Domestic Product (GDP) has doubled in the past 12 years, however, income inequality remains relatively the same as in the 1960s. The economic growth is primarily attributed to the exports of natural resources, which accounts for 80% of total exports. However, the GDP fails to account for the loss of natural capital and non-marketed services. The objective of this paper is to more clearly indicate the status of the Chilean economy in terms of welfare using the Index of Sustainable Economic Welfare (ISEW) designed by Daly and Cobb (1989). The ISEW provides corrections to the GDP that includes income inequalities, household labor and damage to natural capital. This index has been applied in several case studies for developed countries. In general, the results show that ISEW runs parallel with GDP until the 1970s when a decline in welfare occurs due to a loss in natural capital. This study is the first attempt to utilize the ISEW for the purpose of analyzing whether or not similar trends exist for Chile, a developing country. The ISEW for Chile grew at a much slower annual rate over the past 30 years, compared with GDP (−0.16% vs. 2.9%). The Chilean ISEW parallels the GDP until the 1980s; a decline in the ISEW then occurs, showing that Chile is not on a sustainable path and that there is a strong link between economic growth and the depletion of natural resources. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Economic welfare; Economic growth; Accounting; Chile

1. Introduction

Chile has experienced a period of strong economic growth, but the health and productivity cost of environmental problems have become apparent, and income inequality has not decreased. The Index of Sustainable Economic Welfare (ISEW; Daly and Cobb, 1989), was developed as a more accurate indicator of welfare which incorporates these and other issues. Therefore, it will...
be very useful to investigate the behavior of this index in a developing country such as Chile. Also, it will be particularly interesting to compare this result with those already obtained for other previously developed countries.

Discussions of the effect of economic growth on social welfare and the environment have been active since the late 1960s, addressing such questions as how economic growth can contribute to further increases in social welfare (Nordhaus and Tobin, 1973), and if economic growth will be limited by the scarcity of natural resources and higher levels of pollution (Boulding, 1966; Georgescu-Roegen, 1971; Daly and Cobb, 1989; Daly and Townsend, 1993). The links between economics and the environment have multiple dimensions and complexities, and their repercussions on social welfare are not always obvious. Moreover, the links between these two systems vary between countries, cultures, regions, levels of poverty, and the type of policies applied. In order to achieve sustainability, it is necessary to have appropriate performance indicators of the economy and natural systems that give us appropriate information about the status of those systems.

In economics, the most commonly used indicator of activity is the Gross Domestic Product (GDP). There is a comprehensive system already in place to estimate the GDP, the System of National Accounts (SNA). The GDP is an aggregate statistical measure of the overall production of the economy within the national territory which is expressed in a common monetary unit. The GDP sums up the different final goods (cars, apples, etc.) and services (medical surgeries, haircuts, etc.) valued at market prices and produced in a certain period (Sachs and Larrain, 1993).

One of the main failures of the GDP is that it does not take into account the depreciation of ‘natural capital’, therefore, making the linkages mentioned above very difficult to track. In developing countries where there is a strong link between poverty and environment, and where economic growth is based largely on natural resources, this omitted value can be a misleading signal of real economic growth (Lutz, 1993). The GDP is certainly an important management tool at the macro level, however, its many shortcomings can turn the attention of authorities away from sustainable development policies (Repetto et al., 1989).

In general, there is a tendency to use GDP as a measure of welfare. Countries with high GDP growth are presumed to have higher welfare, yet the GDP makes no distinction between growth due to “…investment in new schools…” or growth due to “…payments to clean up a toxic waste spill…” (Hawken, 1997). Because of the shortcomings mentioned above, it is obvious that an increase in GDP does not necessarily increase the well-being of a country. A notion of welfare includes not only income, but also individual health, environmental health, quality of life, and services that are outside the economy such as childcare.

The GDP is a snapshot of today’s economy and does not account for sustainability (i.e. depreciation of natural capital is not included). If the policy of a country is to increase the GDP (i.e. increase consumption), even if natural resources were abundant and pollution not a problem, there should be a ceiling for that growth, and therefore, it should be possible to define optimal limits to per capita consumption, with constraints to income inequality (Hannon, 1991). Finally, faster economic growth it is not sufficient to assure an equitable distribution of income.

There have been other attempts, besides the ISEW, to overcome the GDP shortcomings, each of them with their own methodology constraints. The Measure of Economic Welfare (MEW), developed by Nordhaus and Tobin (1973), includes adjustments for non-marketed services but does not include natural capital or degradation of the environment; El Serafy’s methodology that adjusts the Net National Product by the depreciation of non-renewable resources (El Serafy, 1989); and the System of Environmental and Economics Accounts (SEEA) developed by the United Nations that creates a satellite account system for natural resources, allowing the introduction of the environment into decision making through a common framework (Bartelmus, 1994).

In summary, from the environmental point of view, national accounts fail to consider scarcity of natural resources, degradation of the environ-
ment, and their effects on human health and welfare.

The link between economics and the environment is crucial for developing countries. Their main concern, with respect to natural resources, should be in how to treat them as a form of capital, an asset of the economy that can have the potential for long-run contributions to productivity and welfare, and also in how to account for the ‘true social value’ of non-marketed goods and services.

2. Chile, as a case study

There have been two serious recessions in Chile, in 1975 and 1982, followed by significant economic growth. In 1973, a military coup occurred which transformed the Chilean economy from one of the most regulated into one of the most deregulated economies in Latin America (Raczynski and Romaguera, 1995). Reforms included decontrolling the price system, privatizing public enterprises, reducing the role of the state, and liberalizing international trade and financial markets. After these reforms, high unemployment, high interest rates, high (but stable) inflation, and high internal and external debt still persist. In 1982, the GDP fell 14.1%, and Chile faced its worst recession since the 1930s. Fig. 1 illustrates the drastic drop in GDP and personal consumption in the 1973 and 1982 recessions.

Currently, Chile is widely recognized as having the most open, stable and liberalized economy in Latin America. With a market-based economy, fast growth and exports based on natural resources, Chile grew at a annual average rate of 6.7% over the last 6 years (Fig. 1); investment and savings were at 28 and 27% of the GDP, respectively, in 1995; and fixed capital formation grew
faster than the GDP in 1995. Since 1989, both fixed capital formation and national savings have averaged about a quarter of the GDP. In the last 12 years, Chile has had a sustained economic growth that has doubled the GDP.

Since 1960, Chile has also increased its level of Human Development Index (HDI) from a medium level of development to a superior category; however, income distribution currently exists at the same level of inequality as was present in the 1960s (PNUD, 1996). The ratio of the richest 10% to the poorest 40% is 3:1, even though poverty was reduced by 30% in absolute number of persons (MIDEPLAN, 1996).

Chile’s main environmental issues are: (a) urban pollution of air and water; (b) industrial
Table 1
Summary of the ISEW methodology*

<table>
<thead>
<tr>
<th>Item</th>
<th>Pos./Neg.</th>
<th>Rationale</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer expenditures (A)</td>
<td></td>
<td>Basis for the index</td>
<td>From Chilean National Accounts</td>
</tr>
<tr>
<td>Income distribution (B)</td>
<td></td>
<td>Accounting for income inequality</td>
<td>Gini coefficient</td>
</tr>
<tr>
<td>Weighted personal consumption</td>
<td>A/B</td>
<td>Adjusted base for the index</td>
<td>Women’s wages times workforce dedicated to domestic labor (Universidad de Chile, 1989a; INE, 1965–1996)</td>
</tr>
<tr>
<td>Services from domestic labor</td>
<td>+</td>
<td>Incorporate non-monetaryized contribution to welfare</td>
<td></td>
</tr>
<tr>
<td>Services from consumer durable</td>
<td>+</td>
<td>Accounting for service value of consumer stock</td>
<td>22.5% of total expenditures on durable (Banco Central de Chile, 1983; Universidad de Chile, 1989b)</td>
</tr>
<tr>
<td>Services from street and highways</td>
<td>+</td>
<td>Accounting for service provided not included in personal consumption</td>
<td>6% of GDP on transportation and communication (10% depreciation, 64% non-commuting, of which 10% is real service to the consumer (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Public expenditures on health and education</td>
<td>+</td>
<td>Adding in non-defensive expenses</td>
<td>Half of the government final consumption on education and health (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Expenditures in consumer durable</td>
<td>–</td>
<td>Accounting for defensive expenditures on stock replacement</td>
<td>Total expenditures on consumer durable (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Private expenditures on health and education</td>
<td>–</td>
<td>Accounting for defensive expenditures</td>
<td>Half of the private expenditures on health and education (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Cost of commuting</td>
<td>–</td>
<td>Subtracting defensive private expenditures</td>
<td>36% of total expenditures on personal travel in 1994 (Zegras, 1997)</td>
</tr>
<tr>
<td>Cost of car accidents</td>
<td>–</td>
<td>Subtracting defensive private expenditures</td>
<td>US average values per accident times number of car accidents in Chile (INE, 1965–1996)</td>
</tr>
<tr>
<td>Cost of crime</td>
<td>–</td>
<td>Subtracting defensive private expenditures</td>
<td>1994 cost extrapolated using number of crimes (Guzman, 1994)</td>
</tr>
<tr>
<td>Cost of water pollution</td>
<td>–</td>
<td>Subtracting cost of environmental damage</td>
<td>1992 cost of imputed cases of Typhus fever, extrapolated using number of imputed cases. (Fereccio et al., 1994)</td>
</tr>
<tr>
<td>Cost of air pollution</td>
<td>–</td>
<td>Subtracting cost of environmental damage</td>
<td>1992 health cost associated with increases in PM10, extrapolated using amount of PM10 (Ostro et al., 1994)</td>
</tr>
<tr>
<td>Cost of noise pollution</td>
<td>–</td>
<td>Subtracting cost of environmental damage</td>
<td>Omitted</td>
</tr>
<tr>
<td>Loss of wetlands</td>
<td>–</td>
<td>Accounting for loss in natural capital</td>
<td>Omitted</td>
</tr>
<tr>
<td>Loss of farmland</td>
<td>–</td>
<td>Accounting for loss in natural capital</td>
<td>Productivity (Ag GDP/total Ag surface) times 1000 ha lost each year due to urbanization minus 1% of total Ag land that is considered eroded (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Depletion of non-renewable resources</td>
<td>–</td>
<td>Accounting for loss in natural capital</td>
<td>Cost of replacing each barrel of oil equivalent (US$75) consumed with a renewable source (INE, 1965–1996)</td>
</tr>
<tr>
<td>Depletion of renewable resources</td>
<td>–</td>
<td></td>
<td>Hotelling rent (Vincent, 1996; Cloude and Pizarro, 1995; FAO, 1994, 1995)</td>
</tr>
<tr>
<td>Long-term environmental damage</td>
<td>–</td>
<td>Subtracting cost of environmental damage</td>
<td>Energy consumption times accumulative damage value (US$0.50; INE, 1965–1996)</td>
</tr>
<tr>
<td>Cost of ozone depletion</td>
<td>–</td>
<td>Subtracting cost of environmental damage</td>
<td>Omitted</td>
</tr>
<tr>
<td>Net capital growth</td>
<td>+</td>
<td>Accounting for formation of manmade capital</td>
<td>Minimum capital per worker required for the next period (Banco Central de Chile, 1983)</td>
</tr>
<tr>
<td>Changes in net international position</td>
<td>+</td>
<td>Accounting for international stability</td>
<td>Omitted</td>
</tr>
</tbody>
</table>

* Modified from Jackson and Stymne, 1996.
pollution by localized industries, mining, etc.; and (c) intensive use of natural resources, including native forests and fisheries.

These problems are mainly related to the export sector. In 1994, 50% of total exports were from natural resources (forestry, mining and fisheries), with 34% from mineral exports; together they contribute 16% to the total value added. The necessity for expansion of the export sector is such that any effort to approach the problem seems meaningless. Such was the case with the forestry sector.

The Central Bank of Chile decided to implement SEEA for the forestry, mining and fisheries sectors (Cloude and Pizarro, 1995). One of the main results of this study are the stocks balance sheets of native forest, thereby creating links between different uses of the forest and its consumption. This measure allows one to estimate the changes in the surface of native forest by using future consumption estimates. These estimates indicate that Chile has lost between 400 and 900 thousand hectares of native forest between 1985 and 1994 because of the substitution of native forest with monospecific plantations of pine and eucalyptus, clearing for agricultural use, and fires. A complete loss of the native forest was predicted to occur within 20–25 years, assuming a 5% increase in consumption. This projection created a national debate in Chile, with the forestry sector arguing about the effect the export of their products to developed countries

<table>
<thead>
<tr>
<th></th>
<th>ISEW/CAP</th>
<th>GDP/CAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965–1970</td>
<td>1.87</td>
<td>2.20</td>
</tr>
<tr>
<td>1970–1975</td>
<td>−5.20</td>
<td>−2.14</td>
</tr>
<tr>
<td>1975–1980</td>
<td>5.77</td>
<td>4.40</td>
</tr>
<tr>
<td>1980–1985</td>
<td>−4.02</td>
<td>−1.53</td>
</tr>
<tr>
<td>1985–1990</td>
<td>−0.35</td>
<td>4.30</td>
</tr>
<tr>
<td>1990–1995</td>
<td>4.10</td>
<td>5.30</td>
</tr>
<tr>
<td>Total growth: 1965–1995</td>
<td>−4.90</td>
<td>88.60</td>
</tr>
</tbody>
</table>

Fig. 3. ISEW ‘per capita’ and GDP ‘per capita’ in Chile 1965–1995 (1990 pesos).
Fig. 4. ‘Positives’ contribution to ISEW. ‘Household labor’ is first added to ‘Weighted personal consumption’, and then all the other positive adjustment (Table 1), arriving to ‘Total positives contributions’.

(The Economist, 1996). As a consequence, the Central Bank project was canceled and no extra information was released.

This clearly shows the conflict between economic growth and preservation of natural capital, and also how strong the pressures from the private sectors are.

3. Index of sustainable economic welfare (ISEW)

The ISEW was developed by Daly and Cobb (1989) for the United States. The ISEW includes adjustments for income distribution, environmental damage, the value of housework and resource depletion among hosts of other modifications (Daly and Cobb, 1989; Cobb and Cobb, 1994).

In general, the philosophy of the ISEW is to adjust personal consumption for those expenses that do not necessarily increase welfare (defensive expenditures), and for those contributions that may increase it (non-defensive expenditures). These adjustments are either not considered at all in the traditional accounts or they are misrepresented.

So far, there have been six attempts to implement the ISEW (i.e. USA (Daly and Cobb, 1989), UK (Jackson and Marks, 1994), Germany (Diefenbacher, 1994), The Netherlands (Rosenberg and Oegema, 1995), Austria (Stockhammer et al., 1995), British Columbia (Gustavson and Lonergan, 1994) and Sweden (Jackson and Stymne, 1996)). The results of these analyses are shown in Fig. 2. In general, the ISEW runs parallel to the GDP at a lower rate of change until the 1970s, where a faster decline in the ISEW is observed for all countries shown except The Netherlands.

There have been several critiques of this index which are summarized in Cobb and Cobb’s revised ISEW (Cobb and Cobb, 1994) and in each of the country cases. In summary, they are first divided into specific methodological inquiries such as adjustment to personal consumption by income inequality, the ‘imputations of cost imposed upon future generations by depletion of natural resources’ (Cobb and Cobb, 1994, p. 47), and the estimates for environmental degradation, which are very uncertain (e.g. effect of global warming). Secondly, there are broad criticisms, such as ISEW’s inability to be used for international comparisons, at least quantitatively, given the differences in methodology. Some of the defensive expenditures calculated have a very local effect;
therefore, it is not obvious how to extrapolate for the rest of the country. The index assumed welfare is to be proportional to consumption; thus the index omits human capital and ignores a measure of ‘happiness’ that is correlated with relative rather than absolute levels of income.

In general, the methodology and the rationale to calculate the ISEW is as follows. The ISEW was intended to be a more accurate measure of welfare. In doing so, the index uses personal consumption (PC) as a starting point. PC includes only the total final expenditures by consumers; it excludes government expenditures and trade. The PC then is adjusted for income inequality. Next, expenditures that are considered defensive (i.e. increased personal consumption, but not necessarily welfare) are subtracted. These expenditures are the costs associated with air and water pollution, over population and congestion, and a portion of healthcare and education. Non-marketed services such as household labor and a proportion of government expenditures for healthcare and education (considered non-defensive, therefore increasing welfare) are included. The PC is then adjusted for depletion of natural capital and added net capital formation (which takes into account stocks of capital that should be preserved over time in order to maintain consumption). Table 1 details the objectives and methodologies of each portion of the index utilized for this work (detailed explanation in Castañeda, 1997).

This study, in particular, incorporates two new columns and omits three with respect to Cobb and Cobb’s revised version of the ISEW (Cobb and Cobb, 1994). The new columns are ‘Depletion of renewable resources’ and ‘Criminal cost’. These categories should have an important impact on welfare and the economy of the country. The omitted columns are ‘Loss of wetlands’, ‘Cost of ozone depletion’, and ‘International position’. These categories were omitted due to a lack of data.

All data are computed in 1990 Chilean pesos which have been converted using the GDP implicit price deflator unless otherwise specified.
4. Results and discussion

Fig. 3 and Table 2 show the general results for the ISEW (for details, Castañeda, 1997, Table A1). During the last 30 years, the GDP increased 88% at an annual rate of 2.95%. The ISEW decreased by 4.9% at an annual rate of \(-0.16\%\). Table 2 shows the average growth for every 5-year period. The sharp decline after 1973 is primarily due to a decrease in personal consumption produced by a recession, as previously explained in the Introduction of this report.

On the non-defensive side, using ‘Weighted personal consumption’ (PC adjusted by income inequality) as a starting point, the contribution of household labor to the economy is quite significant (Fig. 4). As shown in the previous studies, household labor services contribute to approximately 80% of the total ‘positive’ contributions to the index over the period of study. These services increased in absolute terms mainly due to an increase in women’s wages and population. Also, Chile is a young country, the size of families is large, and 50% of the population are women (approx. 20% work at home).

Fig. 5 also shows the importance of the depletion of natural resources in relation to the overall result. One important factor to bear in mind is that depletion of non-renewable resources account for nearly all of the impact, where renewable resources are smaller by three orders of magnitude (See Castañeda, 1997, Table A1). The way that depletion of renewable resources (forest) was calculated underestimates the loss, because it does not include erosion, loss of biodiversity, industrial
Table 3
Annual per capita growth for different sensitivity adjustments to ISEW

<table>
<thead>
<tr>
<th></th>
<th>ISEW-IP/cap&lt;sup&gt;a&lt;/sup&gt;</th>
<th>ISEW-LT/cap&lt;sup&gt;b&lt;/sup&gt;</th>
<th>ISEW-NR/cap&lt;sup&gt;c&lt;/sup&gt;</th>
<th>ISEW-FW/cap&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965–1970</td>
<td>2.2</td>
<td>2.0</td>
<td>2.8</td>
<td>2.1</td>
</tr>
<tr>
<td>1970–1975</td>
<td>−5.0</td>
<td>−5.0</td>
<td>−4.3</td>
<td>−5.8</td>
</tr>
<tr>
<td>1975–1980</td>
<td>−5.7</td>
<td>5.7</td>
<td>5.5</td>
<td>5.7</td>
</tr>
<tr>
<td>1980–1985</td>
<td>−13.0</td>
<td>−3.7</td>
<td>−2.9</td>
<td>−5.4</td>
</tr>
<tr>
<td>1985–1990</td>
<td>36.6</td>
<td>0.1</td>
<td>2.5</td>
<td>−1.9</td>
</tr>
<tr>
<td>1990–1995</td>
<td>5.5</td>
<td>4.0</td>
<td>5.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Total growth: 1965–1995</td>
<td>−1.5</td>
<td>1.3</td>
<td>41.2</td>
<td>−27.6</td>
</tr>
</tbody>
</table>

<sup>a</sup> ISEW with international position.
<sup>b</sup> ISEW without long-term environmental costs.
<sup>c</sup> ISEW calculated using Hotelling rent for depletion of non-renewable resources.
<sup>d</sup> ISEW calculated using replacement cost to estimate depletion of renewable resources.

pollution, and other long-term losses. Interestingly, the exhaustion time for native forest is approximately 50 years. Fig. 5 also shows that ‘Defensive costs’ have an important impact on the last 5 years, reflecting increasing costs of agglomeration of people in cities and urbanization, commuting, and crime costs.

Surprisingly, adjustments for degradation of natural resources show no significant impact on the overall result. The methodology used to calculate costs for air and water pollution involves some possible double calculation for costs already deducted in private expenditures for healthcare. Nevertheless, this method still underestimates true costs (e.g. the damage to crops due to acid rain and corrosion are not included in the calculation).

In summary, ISEW runs parallel to GDP until 1985. After the recession of 1982, Chile almost doubled GDP per capita while ISEW decreased (Fig. 3).

In the previous ISEW country studies, ISEW was compared with GDP. However, it is also interesting to compare the index with the starting point, personal consumption. If we look at the relative importance of private consumption with respect to ISEW (ISEW/PC), values below one would indicate an increasing gap between the two, in which private consumption increases but ISEW does not, reflecting a decline in welfare. Fig. 6 shows this type of relationship for Chile. It indicates that in the past 30 years, the gap between how much was spent by the consumer in defensive costs has increased with respect to non-defensive expenditures over the period of study, by decreasing its welfare, especially after the 1980s. (ISEW decreased even though private consumption increased over the period of study.)

5. Sensitivity analysis

Following Daly and Cobb’s sensitivity analysis (Daly and Cobb, 1989), this study includes adjustments for long-term environmental costs and alternative measures for depletion of natural capital (native forest and copper). Also, this study explores the effect of ‘international position’, that was omitted in the final calculation of ISEW.

International position was originally excluded from this calculation for two reasons: (1) lack of data for years prior to 1980; and (2) the inclusion of this adjustment intended to show the borrowing-lending status of a country. The rationale is that an increase in foreign debt worsens welfare because it is money that eventually has to be repaid with interests. A decrease in the international debt is certainly a benefit, but an increase in foreign debt (e.g. investments) could increase productivity in a certain period and should not be considered entirely as a cost.

For purposes of comparison, ISEW was calculated using this adjustment (ISEW-IP). In order to tabulate this new column, data on total national foreign debt for 1980–1995 was taken from
World Debt Tables (The World Bank, 1996). The difference in the debt for every year was calculated and then added to personal consumption, where positive numbers indicate a decrease in the debt. For years before 1980, it was assumed that there was no change in international position. Table 3 summarizes the results. The rate of growth for ISEW-IP increased and shows a more irregular shape; consequently, over the last 10 years ISEW-IP grew more rapidly than GDP (Fig. 7).

The second sensitivity analysis is relative to natural resources and the environment. If long-term environmental costs are omitted, ISEW-LT shifts upwards, yet keeps the same basic shape (Fig. 8 and Table 3).

If depletion of non-renewables is calculated using Hotelling rent instead of replacement cost, the ISEW-NR shows a similar overall trend, whereas ISEW-NR grows slower than GDP but does not have the decline in growth during the last 10 years (Fig. 8 and Table 3).

In southern Chile, where all the forest is located, there are several small human settlements that open the forest for agricultural and firewood purposes. These settlements produce a patchy landscape, apparently without importance, but it is a growing population in a subsistence economy (Fuentes, 1994). Wilcox (1993) estimates that around 7 million m$^3$ of forest are extracted for domestic and industrial firewood. In order to account for this issue, which is not reflected in Hotelling rent, the depletion of renewable resources was calculated using the same methodology as for non-renewable resources. Thus, from the values of energy consumption coming from firewood only, replacement cost was calculated (barrel-equivalent of oil times US$75). This
method has a much larger impact on the overall index where ISEW-FW decreased over the last 30 years by 27.6% (Fig. 8 and Table 3). The only purpose for this exercise is to show the importance of the environment within the economy of the country, taking into account all the restrictions in the methodology.

6. Conclusion

In summary, ISEW grows slower than GDP; household labor and depletion of natural capital are the important adjustments, and degradation of the environment ranks among the less important adjustments considered. This result is not surprising considering that Chile is a developing country and natural resource export based. Especially since the 1980s, Chile has been on a non-sustainable path, and welfare has not increased over the last 30 years, as observed in this work.

Even though GDP almost doubled in the last 12 years, this increase has not translated into an increase in welfare. On the contrary, a more intensive economy has produced a change in the consumer’s basket; whereas 30 years ago, it was probably more oriented to basic needs, and now those expenses are oriented to defensive expenditures.

This result argues in favor of the threshold hypothesis stated by Max-Neef (1995) that “... for every society there seems to be a period in which economic growth (as conventionally measured) brings about an improvement in the quality of life, but only up to a point, the threshold point, beyond which, if there is more economic growth, quality of life may begin to deteriorate.”
The ISEW developed for Chile in this work highlights the shortcomings of traditional economic measures, in particular GDP. It also shows the direct link between GDP growth and the depletion of natural capital. It also highlights the lack of crucial data, such as the stocks of renewable resources, non-renewable reserves, and the social costs of pollution.

Certainly ISEW can be improved. The index still depends on market prices and some questionable measures, such as the value of replacement costs for non-renewable resources. Given that the index uses market prices, the result underestimates the real cost of depleting natural resources and degradation of the environment. Loss in biodiversity, depletion of marine resources and other non-renewables, and a measure of decreasing leisure time are omitted from the calculation of the ISEW. Therefore, if these values are incorporated, the ISEW would be expected to decrease even further.

Some of the recommendations that can be made as a result of this study are the importance of alternative measures or indicators of real economic growth and welfare. It is important to stop counting depletion of natural capital as income. If the policy of Chile is to continue to grow at the expense of depleting natural resources, this depletion should be counted and acknowledged. Omitting this value will imply that Chile’s future will have a lower level of welfare and will be a poorer country. In order to enter a sustainable path, Chile should design and use policies that create incentives for qualitative development rather than conventionally measured economic growth.

Acknowledgements

I would like to thank my advisor, Robert Costanza, and the master’s thesis committee members, Herman Daly and Ramón Lopez, for all their suggestions and support; Osvaldo Sunkel for letting me work with his group at the Universidad de Chile in Santiago; Tim Jackson, whose work has helped me to understand the ISEW and to write this paper; and the reviewers for their valuable comments and suggestions. Finally, I want to express my deepest appreciation to friends and colleagues, for their support, encouragement and the enjoyable times I had during my graduate studies.

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