

Development Discussion Papers

Central America Project Series

Economic Growth in Central America: Evolution of Productivity in Manufacturing

Edgar Robles

Development Discussion Paper No. 749
February 2000

© Copyright 2000 Edgar Robles
and President and Fellows of Harvard College

Harvard Institute for
International Development

HARVARD UNIVERSITY



DEVELOPMENT DISCUSSION PAPERS

CENTRAL AMERICA PROJECT SERIES

A PROJECT OF HARVARD UNIVERSITY, INCAE AND
THE CENTRAL AMERICAN BANK FOR ECONOMIC INTEGRATION



Economic Growth in Central America: Evolution of Productivity in Manufacturing

Edgar Robles

Abstract

This paper analyzes sources of economic growth and productivity in Central America. Using growth accounting, it calculates Total Factor Productivity (TFP) for each of the five countries in the region and for industrial branches within each country. It is found that TFP and value added are highly correlated. A coherence analysis of the TFP series found important short- and long-run comovements between some pairs of countries. Industry-level data show that there are three sources of value added growth variability among two-digit SIC industrial branches: first, changes within the country, such as demand shocks and economic reforms; second, changes within the region, such as dynamic comparative advantages; and third, legal reforms. TFP growth is concentrated in a few branches, and there are winners and losers in the process of real cost reduction. Statistically, labor-intensive industries seemed not to have grown faster after the economies became more open in the mid-eighties. Probably this relationship does not exist because there are many distortions remaining in these economies.

Keywords: Central America, economic growth, growth accounting, total factor productivity

JEL codes: O40, O47, O54

Edgar Robles, Ph.D., is at the Department of Economics, Universidad de Costa Rica, erobles@cariari.ucr.ac.cr

I would like to thank comments by Felipe Larraín, Gerardo Esquivel, Andrés Rodríguez and Joseph Stiglitz. Also, I am very grateful to my two research assistants, Rudy Corrales and Ricardo Madrigal.

Table of Contents

1. Introduction	1
2. Sources of Economic Growth in Central America	4
2.1 The Debt Crisis Aftermath and Economic Recovery in Central America.....	16
2.2 Macroeconomic Policy and TFP.....	23
2.3 Spectral Analysis and Coherence of the TFP series	28
3. Growth and Total Factor Productivity in Industries.....	32
3.1 Causes of Value Added Growth in Industries.....	37
3.2 Concentration of TFP among Industries	41
4. Concluding Remarks	46
References	50

List of Charts

Chart 1. Central America 1960-1996, GDP per Capita in Current Dollars.....	5
Chart 2. Central America 1960-1996, Evolution of Real Per Capita GDP	6
Chart 3a-f. Relationship Between GDP & TFP Growth.....	9
Chart 4. Central America 1960-1996, Evolution of Total Factor Productivity in Central America.....	15
Chart 5. Central America: Spectral Analysis and Coherence of TFP Series.....	30
Chart 6. Relationship between TFP and Value Added Growth in Industrial Branches	34
Chart 7. Central America Concentration of TFP among Industrial branches.....	45

List of Tables

Table 1.	Central America 1960-1996, Sources of Economic Growth for Central American Countries:	7
Table 2.	Central America 1960 – 1996, Relation Between Good and Bad Episodes of Real GDP Growth and Total factor Productivity	12
Table 3.	Central America 1960-1996, Relationship between TFP and Openness Inflation and the Real Exchange Rate	25
Table 4.	Central America: Relationship between Good and Bad Episodes of Value Added Growth	35
Table 5.	Central America: Example of firms with Positive and Negative Value Added Growth	39
Table 6.	Costa Rica 1986-1991, Concentration of TFP among SIC Manufacturing Branches	43
Table 7.	Costa Rica 1986-1991, Sources of Economic Growth for 27 Manufacturing Industrial Branches	52
Table 8.	Costa Rica 1991-1996, Sources of Economic Growth for 27 Manufacturing Industrial Branches	53
Table 9.	Nicaragua 1990-1996, Sources of Economic Growth for 20 Manufacturing Industrial Branches	54
Table 10.	Honduras 1985-1990, Sources of Economic Growth for 26 Manufacturing Branches.....	55
Table 11.	Honduras 1990-1995, Sources of Economic Growth for 26 Manufacturing Branches.....	56
Table 12.	El Salvador 1985-1990, Sources of Economic Growth for 20 Manufacturing Branches.....	57
Table 13.	El Salvador 1990-1995, Sources of Economic Growth for 20 Manufacturing Branches.....	58
Table 14.	Guatemala 1985-1990, Sources of Economic Growth for 18 Manufacturing Branches.....	59
Table 15.	Guatemala 1990-1996, Sources of Economic Growth for 18 Manufacturing Branches.....	60
Table 16.	Costa Rica 1991-1996, Concentration of TFP Among SIC Manufacturing Branches.....	61
Table 17.	Nicaragua 1990-1996, Concentration of TFP Among SIC Manufacturing Branches.....	62
Table 18.	Honduras 1985-1990, Concentration of TFP Among SIC Manufacturing Branches.....	63
Table 19.	Honduras 1990-1996, Concentration of TFP Among SIC Manufacturing Branches.....	64
Table 20.	El Salvador 1985-1990, Concentration of TFP Among SIC Manufacturing Branches.....	65
Table 21.	El Salvador 1990-1995, Concentration of TFP Among SIC Manufacturing Branches.....	66
Table 22.	Guatemala 1985-1990, Concentration of TFP Among SIC Manufacturing Branches.....	67
Table 23.	Guatemala 1990-1996, Concentration of TFP Among SIC Manufacturing Branches.....	68

1. Introduction

Research on the determinants of economic growth in the five small Central American countries has been very scarce. With a territory ranging from 49,998 square miles in Nicaragua to 8,124 square miles in El Salvador, and a combined population of almost 40 million people, the countries of Central America developed very differently during the last four decades.

History has marked a very turbulent past in these countries, with the exception of Costa Rica. Today, Nicaragua is reconstructing the economy after eleven years of a dictatorial *Sandinista*-communist regime threatened by revolutionary groups outside the capital city. After more than twenty years, El Salvador ended a civil war in 1992; economic recovery has been remarkable afterwards. Meanwhile, Guatemala has done it properly by signing a peace accord with insurgent groups in 1996, ending a 36-year long civil war. Honduras has been the slowest of this group of countries to adjust the economy to international trends; the old elite has partially retained political control of the country and they have resisted the modernization of social, economic and political structures.

These countries have taken the effort to stabilize their political environment and reestablish democracy. Also, most of these countries made great efforts to liberalize their economies during the last ten years. For instance, in 1990, Nicaragua entered a new age of democracy and openness to foreign trade. On the other side of the border, Costa Rica made an important contribution to her foreign sector with a significant reduction of import tariffs in 1986. Similar endeavors were also made in Guatemala and El Salvador, but less intensively in Honduras.

However, Central America needs yet to resolve many problems such as a high percentage of its population living under extreme poverty, an industrial sector carrying the vices of a long-lived import substitution era, and relatively slow economic growth. Despite these deficiencies, there is no study on the sources of economic growth in Central America and the effects on productivity derived from the recent economic policies.

In Robles (1997), preliminary results for a sample of 14 Latin American countries suggested that productivity is stimulated when a country trades more with other countries. However, Central America was not represented properly in the cited study, because of lack of data. For instance, in Robles (1997) Nicaragua was analyzed until 1978, just before the outbreak of the war. Honduras was included only until 1988 before any considerable economic reform had taken place, and El Salvador was not present at all in this study.

Some conclusions can be drawn from Robles (1997). First, productivity and GDP growth are highly correlated in the sample of Latin American countries and the United States. Second, openness to foreign trade is positively correlated in all Latin American countries and, in most countries, inflation is negatively correlated with productivity growth. Third, in the United States, productivity growth is concentrated among a few industrial branches, as well as within a few firms in the car manufacturers and oil producing industries. One purpose of the present study is to extend these results to each country in Central America.

An interesting aspect is to determine how productivity changed in different industries after the trade liberalization process started in Central America after the mid-eighties. One would expect that export-oriented industries experienced, on average, greater rates of productivity growth than other industries in the economy. According to

the Hecksher-Ohlin model, these export-oriented industries should be relatively labor intensive because this is the abundant input in the Central America.

These results can be replicated with a model of tradable and non-tradable goods, where the relative price in local currency of the labor intensive tradable good increases after trade liberalization, causing an increase in productivity and an expansion of the exporting industry. However, this model might depart from the reality of a production structure filled with persistent protectionism, dissimilar import tariffs, prohibitions to imports and subsidies to specific local industries. All this combined with a weak Central American Common Market and stimuli to different kinds of exports.

With the measure of productivity growth of the exporting industries, one can assess their contribution to aggregate productivity growth in the economy, and therefore to the growth rate of GDP. This paper aims at understanding and explaining the process of growth in the region by looking at the sources of economic growth in the five Central American countries. This effort is taken not only at the economywide level but also at the industry one.

The intention of the paper is to calculate the sources of economic growth and measure productivity (TFP) at the two-digit SIC (Standard Industrial Classification) level. This would answer both, why some countries grow faster than others, and why some industries have contributed more to growth than others in one given country. The analysis will show that the evidence blurs the hypothesis that labor intensive manufacturing is the crucial source of growth in Central America after the liberalization of the economies.

Using growth accounting, the sources of economic growth are calculated for each economy and their industrial sectors. This methodology permits the desegregation of

growth into three contributions: labor input, capital input, and a residual interpreted as productivity growth. Indexes of inputs are constructed so as to include both the quantities and qualities of the inputs. In fact, with sufficient data, the contribution of labor may be divided into a quantity component (number of hours worked) and a quality component (the stock of human capital).

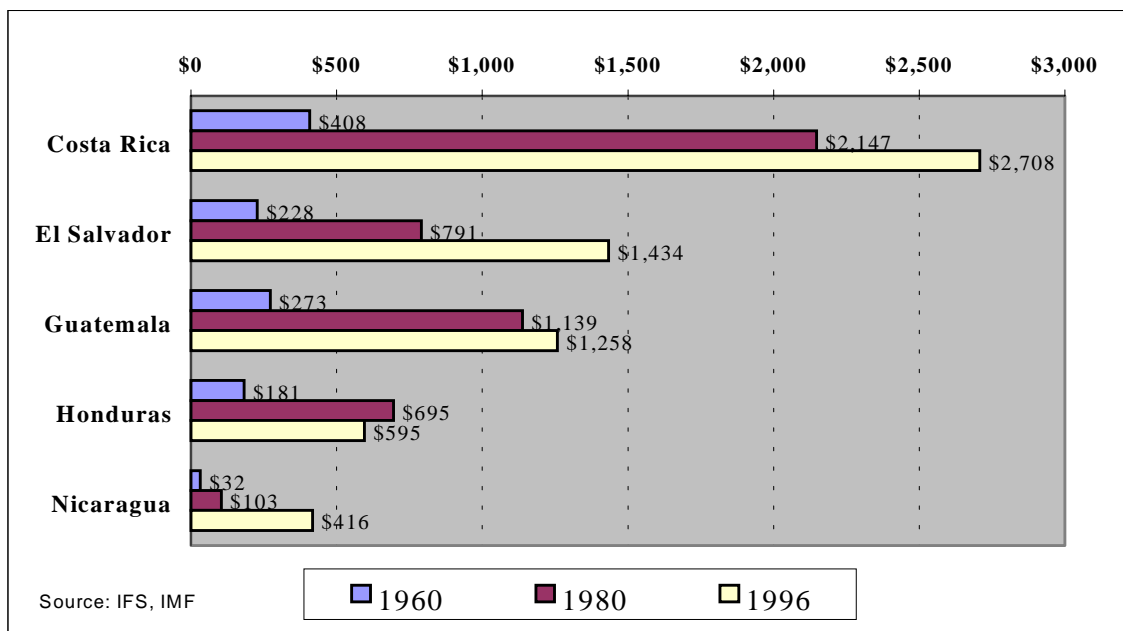
Data to separate growth into its different components come from a great variety of governmental sources. One of the merits of the present paper is to have put together all this data, some of which was buried under a piled of books in a bureaucratic governmental institution of Central America. No government has ever officially published some of the data used in this paper and the very few copies were resting in tabulated sheets in a public library. Both the management of the data and the methodology followed in this paper, are included in the appendix. However, a deeper analysis of the methodology may be found in Robles (1997) and a theoretical analysis may be found in Harberger (1998).

This paper is divided into three more parts. Next, there are calculations of the sources of economic growth and the evolution of TFP in the five Central American countries at the aggregated level. Afterwards, there is an estimation of the sources of economic growth for industrial branches in the manufacturing sector in each country. Finally, the paper ends with a conclusion.

2. Sources of Economic Growth in Central America

In 1960, Costa Rican per capita GDP was 30% greater than Nicaragua's. In 1996, this difference has grown to more than 200%. Chart 1 shows how the real per capita GDP at current international prices has changed since 1960 in Central America.

Chart 1: Central America 1960-1996
Gross Domestic Product per Capita in Current Dollars



This snapshot suggests that there has not been that much of catch-up growth in the last four decades in Central America. Chart 2 shows an index of real GDP per capita of these five countries. With the exception of Honduras, real GDP in Central America grew more or less at the same rate until 1976, despite the differences in initial per capita GDP. Afterwards, real GDP per capita fell as a result of the debt crisis. But later, Costa Rica showed a more dynamic per capital GDP growth, while Honduras, Guatemala and El Salvador stagnated and the Nicaraguan economy collapsed.

But, why have the growth patterns been so distinct in these relatively similar countries? The answer lies in a mix of economic and political factors that may be represented by how productivity changed in the last four decades.

**Chart 2: Central America 1960-1996
Evolution of Real Per Capita GDP**

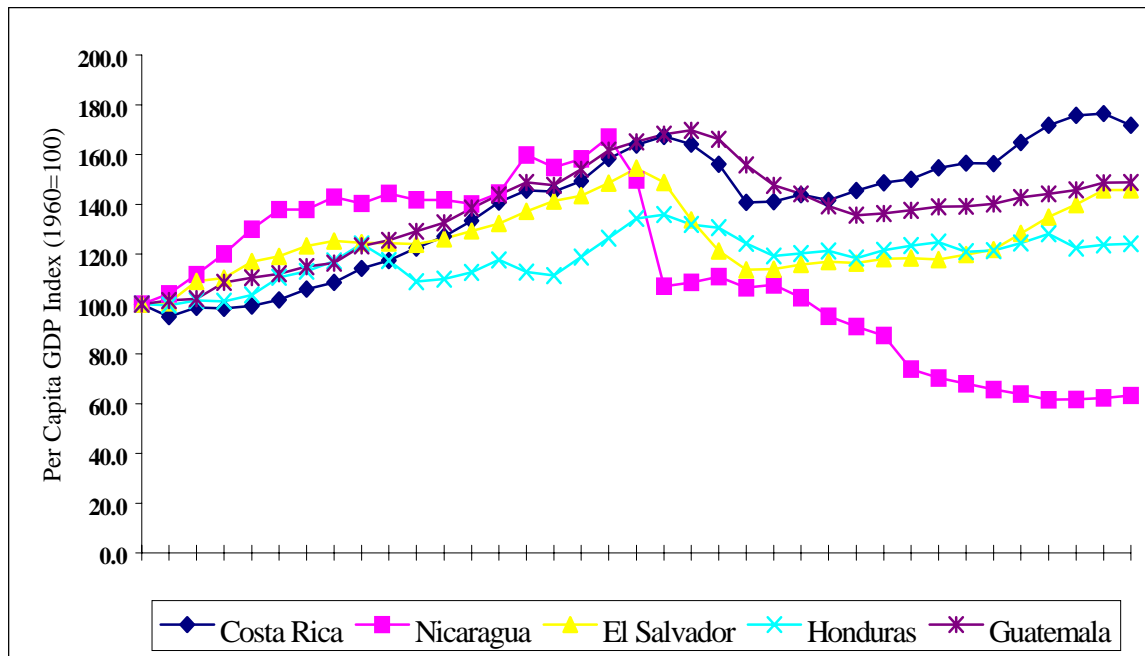


Table 1 presents a summary of the sources of economic growth in Central America. For convenience, data is presented in averages for five-year periods (except for the last period, 1990-96). For the whole 1960-96 period, Costa Rica enjoyed the greatest growth in GDP (at an annual average rate of 4.7%) and TFP (0.9% annual average), while Nicaragua had the worst performance with an average growth rate of 2.2% and an average annual decrease of -0.9% in TFP.

Table 1: Central America 1960-1996
Sources of Economic Growth for Central American Countries

	GDP Growth	TFP	Contribution of	
			Capital	Labor
Costa Rica				
1960-1965	5.2%	0.7%	1.7%	2.7%
1965-1970	7.0%	3.1%	2.1%	1.8%
1970-1975	6.1%	2.0%	2.8%	1.3%
1975-1980	5.3%	0.5%	2.6%	2.2%
1980-1985	0.4%	-2.8%	1.9%	1.4%
1985-1990	4.6%	2.3%	1.9%	0.4%
1990-1996	3.8%	0.1%	1.7%	1.9%
1960-1996	4.7%	0.9%	2.1%	1.6%
Nicaragua				
1960-1965	10.1%	6.4%	1.3%	2.4%
1965-1970	3.8%	0.3%	1.7%	1.8%
1970-1975	5.2%	0.9%	1.9%	2.3%
1975-1980	-3.2%	-5.5%	0.5%	1.8%
1980-1985	0.7%	-2.3%	0.9%	2.1%
1985-1990	-3.2%	-5.7%	0.4%	2.1%
1990-1996	2.0%	-0.3%	0.3%	2.0%
1960-1996	2.2%	-0.9%	1.0%	2.1%
Honduras				
1960-1965	5.5%	2.8%	1.4%	1.3%
1965-1970	3.6%	-1.0%	2.4%	2.2%
1970-1975	3.7%	-0.4%	2.0%	2.2%
1975-1980	7.2%	1.8%	2.7%	2.8%
1980-1985	1.8%	-1.5%	0.9%	2.4%
1985-1990	3.2%	-0.1%	1.3%	2.0%
1990-1996	3.6%	1.1%	3.0%	-0.4%
1960-1996	4.1%	0.4%	2.0%	1.7%
El Salvador				
1960-1965	6.9%	2.7%	2.7%	1.5%
1965-1970	4.5%	0.1%	2.6%	1.7%
1970-1975	5.5%	0.3%	3.7%	1.4%
1975-1980	1.2%	0.6%	2.9%	-2.4%
1980-1985	-1.8%	-4.0%	0.3%	1.9%
1985-1990	1.9%	-5.0%	0.6%	6.2%
1990-1996	5.5%	1.6%	1.9%	2.0%
1960-1996	3.4%	-0.4%	2.1%	1.8%
Guatemala				
1960-1965	5.3%	2.3%	1.5%	1.5%
1965-1970	5.8%	2.3%	2.0%	1.5%
1970-1975	5.6%	1.7%	2.6%	1.3%
1975-1980	5.7%	0.4%	3.3%	2.0%
1980-1985	-1.1%	-3.1%	0.9%	1.1%
1985-1990	2.9%	0.8%	0.8%	1.3%
1990-1996	4.1%	0.9%	1.5%	1.7%
1960-1996	4.0%	0.8%	1.8%	1.5%

Here, we can group the countries in three categories: first, Costa Rica and Guatemala with higher growth in both GDP and TFP; second, El Salvador¹ and Nicaragua with low growth in GDP and negative TFP growth; and finally, Honduras in the middle.

This suggests that there is a good correlation between the growth rate of GDP and the change in TFP. That is, one country grew more from period to period than the rest of the countries, when it experienced greater increase in TFP, and vice versa. Panel (a) of Chart 3 shows exactly this pattern in Central America with a plot of GDP growth versus TFP growth for the five-year average data presented in Table 1. A line has been fitted to summarize this relationship between the two variables, which is statistically not different from 1.

The other panels of Chart 3 attempt to identify the relationship between TFP and GDP growth in the short-run (year by year) in a country by country basis, this relationship was found to be weaker, and there are two likely explanations for these findings. First, in the short-run, the figures capture business-cycles effects specific to each country; and second, measurement errors are averaged out in longer periods. Therefore, the safe conclusion is that in the long run, TFP and GDP growth go hand by hand.

¹ For El Salvador, the measure of TFP change in this paper is very close to one obtained by the World Bank (1996). Using a completely different methodology (parametric and not growth accounting), the World Bank estimated a TFP decrease of -1.5% between 1960 and 1990; the results in this paper show a decrease in TFP of -1.3% for the same period.

Chart 3a & 3b Relationship Between GDP & TFP Growth

3a. Central America 3b. Costa Rica

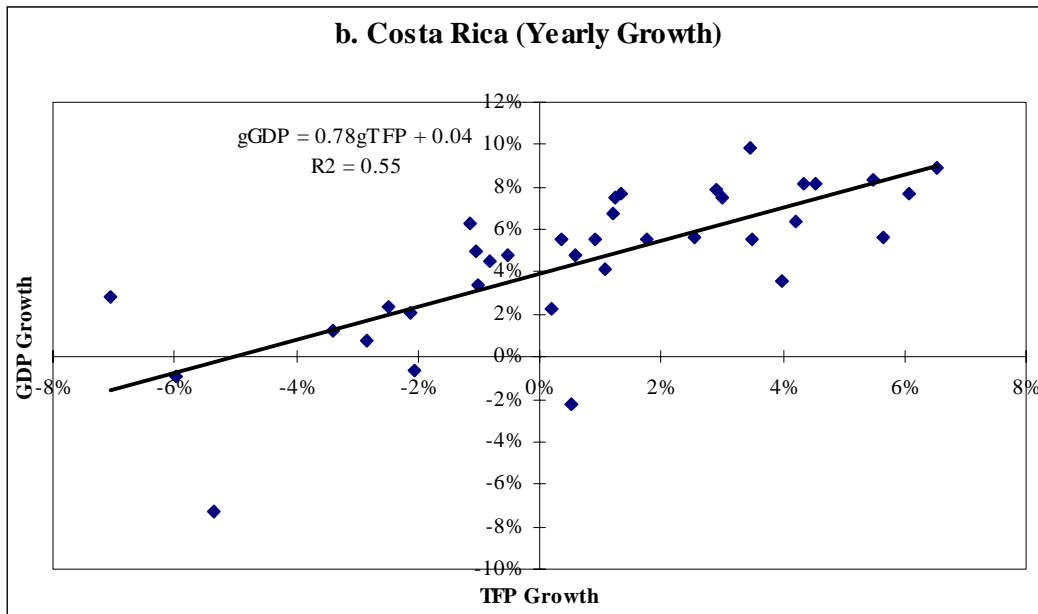
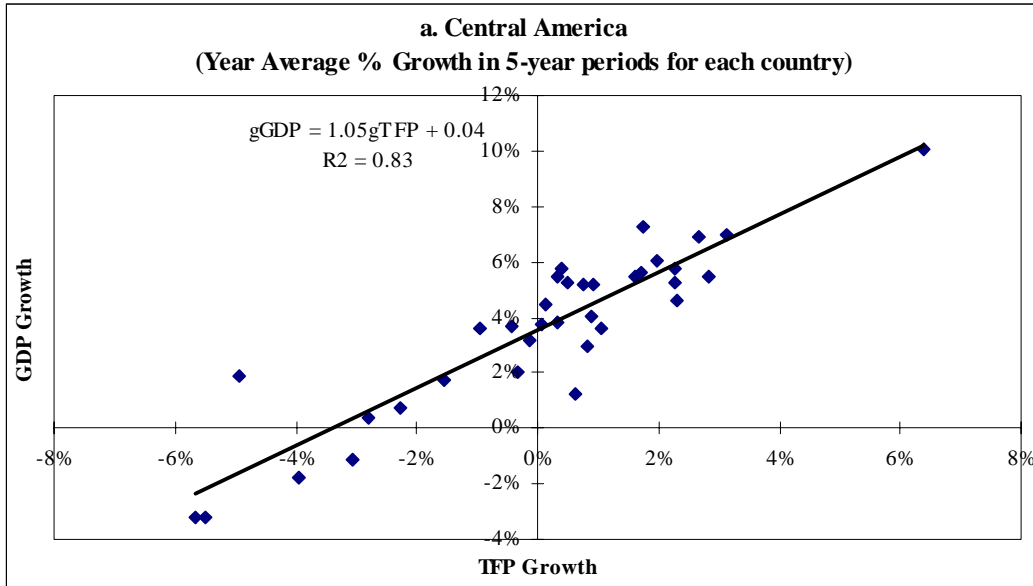
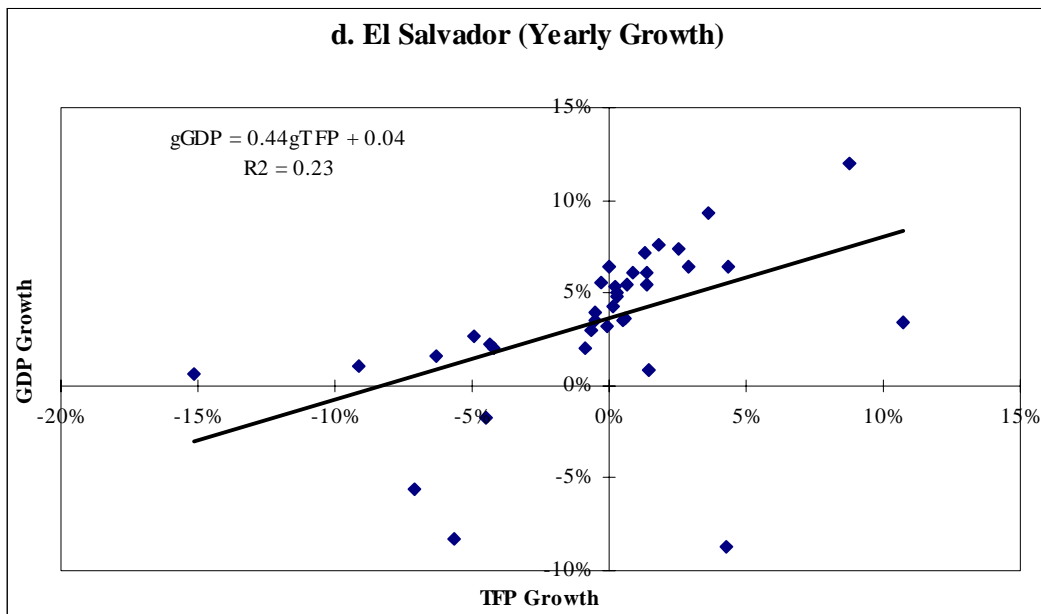
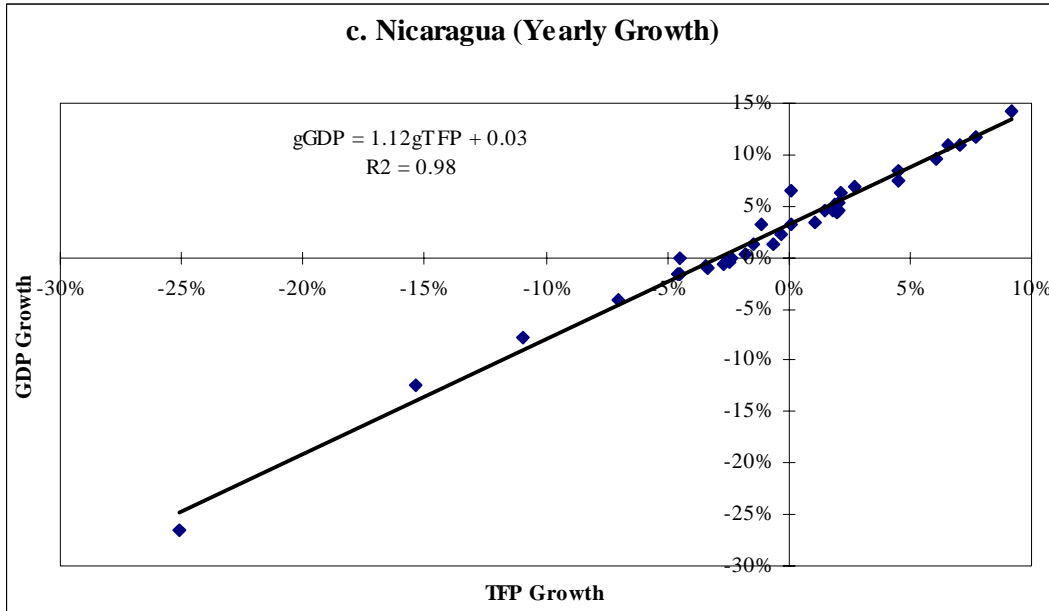


Chart 3c & 3d Relationship Between GDP & TFP Growth

3c. Nicaragua 3d. El Salvador



Furthermore, to show how GDP and TFP growth go hand in hand, Table 2 calculates the means and averages of the five five-year episodes of Table 1 with the greatest and the lowest average rates of GDP growth and compares them with the corresponding growth in TFP. What Table 2 shows is that about 80% of the differences in means and 76% of the differences in medians in GDP between the good episodes and the bad episodes are explained by TFP differences.

**Table 2: Central America 1960 – 1996
Relation Between Good and Bad Episodes of Real GDP Growth
And Total factor Productivity
(averages of 5-year periods from Table 1)**

		Average Rate of GDP Growth	Average Rate of TFP Growth	Ratio of Differences
5 five-year periods with the highest GDP growth rates	Mean	7.46%	3.19%	
	Median	7.00%	2.66%	
5 five-year periods with the lowest GDP growth rates	Mean	-1.78%	-4.20%	
	Median	-1.77%	-3.96%	
Differences in	Means	9.24%	7.39%	0.80
	Medians	8.77%	6.63%	0.76

However, one of the most striking facts about Table 1 is that TFP growth has been relatively low in Central America. For example, El Salvador grew on average 3.4% but, TFP decreased -0.4% a year on average. And Costa Rica, being the best performance in this 36-year span, grew only 0.9% in TFP. This contrasts with the experience of the

Asian countries in other studies like Harberger (1996), Jorgenson (1995) and Young (1996), which rates of growth of TFP in the order of 3 to 4% per year, and a corresponding higher growth of GDP.

The low TFP growth observed in Central America is due to a mixture of political turmoil and vices inherited from a period of import substitution schemes. In the first place, there is no doubt that civil wars have reduced the confidence of foreign and local investors in the region, they have also destructed the infrastructure required for production. And secondly, the early adoption of protectionism and a closed Common Central American Market (MERCOSUR) created an economic structure not compatible with growth based on productivity.

Import Substitution Industrialization (ISI) was based on the observation that the richest countries in the world were all industrialized. Therefore, Raul Presbich and the Economic Commission for Latin America started a movement in the region to produce industrialization, with the belief that this would bring economic development to the region. Governments in Latin America granted protection against foreign competition to the local industry, using prohibited import taxes, quantitative restrictions and production subsidies, among other incentives.

Beginning in the sixties, Central America started to protect the so called “infant industry”. In general, a local industrial class became the most import source of growth in the region. However, although the policy succeeded in partially industrializing these countries, it did it based on input accumulation and not on productivity increases. One problem of growth based on input accumulation is that it eventually falls under diminishing returns. This is not the case with growth based on productivity improvements, because it permits the economy to move its production frontier.

In the beginning, the MERCOSUR grew in productivity because it exploited a “captive” market. However, when this market saturated, growth stagnated and the countries in Central America were left with a productive structure not able to compete in international markets. As products were destined to the local market and faced no foreign competition, firms developed expensive products and of poor quality. The production of these goods was not based on comparative advantages but on protectionism.

In summary, ISI succeeded in developing the industries, but not as the policy had expected. Countries substituted trade based on comparative advantages by imports necessary to produce the industrial goods. Because most of the produced goods were not of exportable quality, any foreign exchange was mainly used to finance imports of inputs for the industry, causing a deterioration of the current account. This created an inflexible production structure that collapsed later when the local demand reached its peak, and the countries entered into a balance of payment crisis. This became evident in the beginning of the eighties when the situation of international loans at low interest rates reversed.

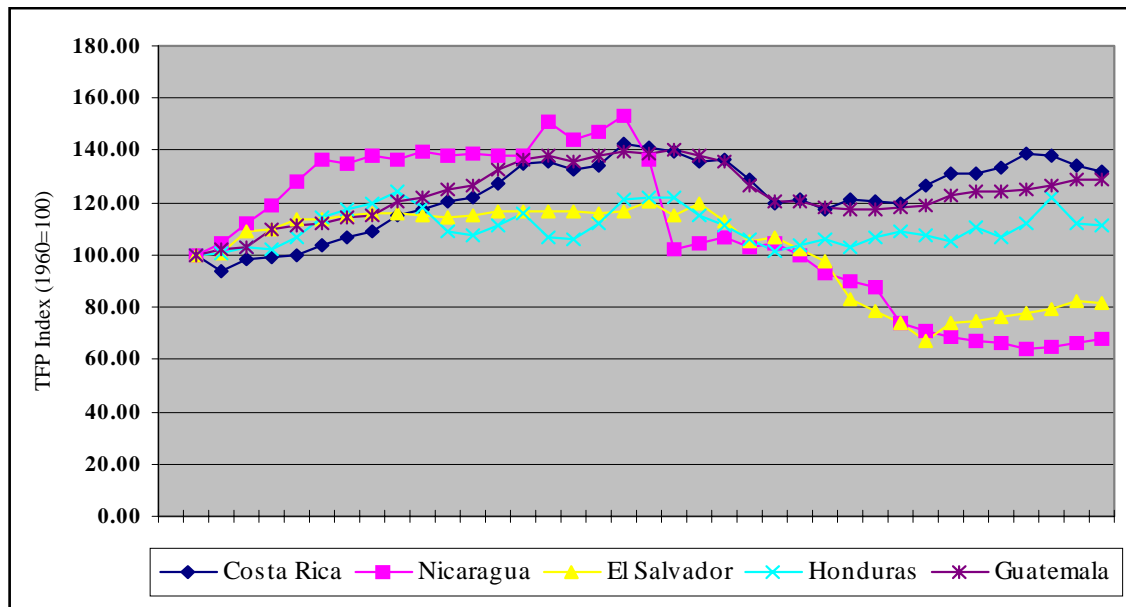
After the decay of ISI, Central America turned their economies toward the external sector. Industrialization was replaced by export promotion. However, this change has been occurring very slowly and today efforts are being made to open the economies further and eliminate protectionism. As the countries opened their economies, TFP started to grow again. In Table 1, all countries show an upward trend in TFP growth in the last years, which coincides with the trade liberalization period.

Nonetheless, the speed and intensity of trade liberalization has been different in the region. The first countries to open their economies were Costa Rica and Guatemala during the mid-eighties, and TFP regenerated sooner in these countries after the debt

crisis. Nicaragua and El Salvador did properly but waited until the beginning of the nineties with the signing of the peace accords. Honduras has adjusted her economy toward foreign trade very slowly, producing a low increase in TFP during the nineties.

Chart 4 presents the evolution of the TFP index calculated using growth accounting. The methodology and assumptions followed is described in the Appendix and a theoretical explanation may be found in Harberger (1998). Chart 4 shows similar patterns in the TFP series of Costa Rica and Guatemala, and of El Salvador and Nicaragua.

Chart 4. Central America 1960-1996
Evolution of Total Factor Productivity in Central America



One puzzle is to find the answer to why today Costa Rica and Guatemala have not reached the productivity level they had 20 years before, after several years of economic reform. One possible explanation would be that these countries share a common measurement error: a very old base year for real GDP, which for Costa Rica is 1966 and for Guatemala 1958.

A study performed by the Central Bank of Costa Rica estimated a possible GDP undervaluation of up to 20%, which occurred especially after the trade liberalization of the mid-eighties. First, there are new sectors, such as electronics, not accounted for in the base year basket. Second, there are relative price changes after the liberalization. This means that the error is completely borne by the TFP measure since it is a residual, so the measure should be scaled upward by 20% during the eighties. Finally, the contribution of capital may be overvalued, and therefore TFP undervalued, if the relative price of capital has a decreasing trend and the base year is very old.

2.1 The Debt Crisis Aftermath and Economic Recovery in Central America

Chart 4 shows a marked effect of the debt crisis on TFP growth. This crisis signified the end of the ISI scheme. In Table 1, it may be observed that the contribution of TFP to growth was less in every period until it turned negative during the debt crisis of the beginning of the eighties. This shows the exhaustion of the ISI model to produce productivity-based growth.

Central American countries suffered differently during the crisis of the eighties. In fact, during the same period, Nicaragua and El Salvador entered into civil wars and their TFP collapsed during that time.

In Nicaragua the war started with the military coup of 1979 and it was extended until 1990 with the first democratic elections since the thirties. In this way, the Sandinista's regime ended, but not their control on the economy. Economic depression from the debt crisis deepened with the U.S. embargo during the eighties. After the end of economic help from the Soviet Union ended by late eighties, the government financed his budget and military expenses by printing money. This produced a hyperinflation that left the

country with two changes of currency and the highest inflation in the world for the period, reaching an annualized 36,000 percent in 1988.

Today, Nicaragua has not recovered the real GDP level it had twenty-five years earlier and the United Nations (1998) ranks the country as the second poorest in Latin America and the Caribbean, only above Haiti.

During the nineties, the country initiated an effort to reconstruct the economy, increase employment, initiate GDP growth and TFP improvements. Many of the policies started in 1990 were aimed at making the transition from a communist to a democratic regime.

The current government of Nicaragua started a movement to liberalize and stabilize the economy, eliminate restrictions to trade, privatize many public companies and attract foreign investment and international aid. These policies started definitively to yield fruits in 1994 when the country showed signs of production recovery with positive GDP growth rates averaging around 4.5%. This recovery of the economy has come together with some increases in TFP. Nonetheless, TFP growth since 1994 has not been sufficient to pull the economy out of the limbo.

Nicaragua needs to solve great problems, the lack of property rights being among the most serious ones. During the *Sandinista*-communist years, valuable properties were taken away from the owners and given to *Sandinista* officials. Today, the original owners are claiming their properties and the government has not been able to define property rights properly because of the influence of the Sandinistas in the government. On the top of this, the government has to face more than two-thirds of the population living in poverty, an unemployment and underemployment rate over 50%, a rudimentary

predominantly agricultural economy based on subsistence and underground activities, a deterioration of infrastructure and a lack of confidence by international investors.

Political history in El Salvador has been somewhat similar to that of Nicaragua. The military ruled the economy between 1931 and 1979 they coexisted with insurgent groups, which started a furious civil war in 1980 that ended in 1992 with the signing of a peace accord. Civil war resulted from increased repression in the country in 1979, when military officers took control of the government fearing that something similar to Nicaragua could happen in El Salvador. Repression came together with violation of human rights, death squads and abuses by the military elite.

The increase in injustices and income inequalities created the revolutionary group *Frente Farabundo Martí para la Liberalización Nacional* (FMLN). Although they never got control of the government, this group performed offensives aimed at destabilizing the economy, such as terrorism, assassinations, kidnappings and sabotage. Warfare caused thousands of deaths and the flight of hundreds of thousands of Salvadorans out of the country. Today, FMLN is one of the political parties participating in the recent democratic era.

Chart 4 shows that TFP in El Salvador stayed almost unchanged from 1964 to 1981. This is a reflection of the ISI effects on productivity because for more than seventeen years growth in the country was based almost solely on input accumulation. Afterwards, the attenuation of the civil war and violent struggles caused a continuous fall in output, an exodus of international investors, a destruction of the local infrastructure and a considerable increase in unemployment (especially in 1980). All these factors produced a considerable fall in TFP until 1989. Also, growth was affected considerably by the low investment levels during the civil war of the eighties. In 1990, more than 70% of the

Salvadorians were living under poverty. By the end of the eighties and beginning of the nineties, peace accords were signed and the economy started to recover and grow.

Economic recovery and stability have been somewhat outstanding in the nineties, averaging more than 5% a year. However, economic stability has been reached thanks partly to remittances of Salvadorians living abroad. The Central Bank estimated that these remittances account for about one and half times the income brought in from exports. Presently, El Salvador has a stable economy, with its currency anchored to the US dollar, low inflation rates below 5%, and a fiscal policy close to balance. Under these circumstances, TFP has had an important increase since 1990. Nonetheless, today El Salvador suffers from the same social problems that existed before the civil war.

Political turmoil in Guatemala, El Salvador and Nicaragua has driven away investors from their economies, producing a negative impact on growth. According to Table 1, the contribution of investing in capital to growth has been the lowest in Central America during the years of the war. This is the result of both, the destruction of physical infrastructure and low investment rates, caused by economic uncertainty of foreign investors and the disenchanted local entrepreneurs who fled abroad with their money. Nonetheless, the effect of the civil war was not so devastating over the Guatemalan economy because of oil discoveries during the seventies, when the economy grew remarkably.

The debt crisis in Guatemala and Costa Rica produced a fall in TFP until 1984, TFP recuperated later through economic reform and increased democracy in the first country. Diversification of agricultural exports and the investment of assembly plants of apparel and textiles are among the policies oriented at modernizing the economy, with the advancement of the new export promotion model.

Also, after the mid-eighties, the governments of Guatemala and Costa Rica revised the protectionist policies of the past. Import taxes were lowered significantly, and fiscal discipline and monetary control became a national concern, especially in Guatemala. Traditionally, inflation rates in Guatemala have stayed relatively low, usually at one-digit or in the lower tens.

Moreover, the change of economic model from ISI to export promotion has produced a positive effect on TFP. A test of structural change shows that TFP statistically improved in Guatemala and Costa Rica after 1984² when not only did the economy start to open to international markets, but also the government ordered the public finances and maintained consistent macroeconomic policies.

Also, a dummy variable was added to the regressions shown in Table 3 to try to incorporate the effect on TFP of the war in El Salvador and Nicaragua. In these cases, it was not possible to conduct structural change tests because of the lack of degrees of freedom. The dummies representing the end of the war showed a positive effect on TFP in both countries³. Logically, TFP growth can not be solely attributed to the end of war. However, the end of war allowed governments to reconstruct the economy, attract investment and perform structural adjustment reforms.

Despite all efforts, Guatemala has to face great social problems. The literacy rate is hardly above fifty percent and the country is known worldwide as a land of terrible assassinations, kidnappings, death squads and rural massacres. The inhabitants of the

² Chow tests were conducted for these two countries and the sample was divided into two subperiods, 1960-1984 and 1985-1996. The tests produced an $F(6,24)=21.76$ for Guatemala and $F(6,24)=7.27$ for Costa Rica. Both of these values reject the hypotheses that the coefficient vectors are the same in the two periods at significant levels below 1%.

³ In fact, the effect of the end of the war in Nicaragua is so strong that the incorporation of the dummy in the regression produced insignificance in the coefficients of inflation variability, openness and real exchange rate. Similarly, the effect of the dummy in El Salvador reduced the significance of the coefficients, but this effect was not so strong to produce an insignificance of the coefficients.

country believe that the most prominent problem of Guatemala is the existence of a country within the country; that is, the combination of a great majority living under poverty, and a deep division between the rich and the poor.

This division has been the cause of the violence and political turmoil shaping the country's history. Government repression in the sixties led to a civil war that lasted until 1996. Today, about 80% of the Guatemalan population live under the poverty line and malnutrition affects about 60% of children. Also, the military maintained the control of the government until 1985 and indirectly afterwards.

Honduras has been the slowest in Central America to adjust to globalization tendencies of the economies. This is the result of a combination of factors, such as the power maintained by the military over government and the existence of a rich elite of landlords and industrials who had benefited from protectionism, resisting the modernization of economic, social and political structures. This inability to make substantial reforms in the economy generated no productivity growth in the country during the eighties and nineties.

Since the middle of the fifties, the Honduran industry has grown significantly. However, as in the cases of the other Central American countries, the industrial growth was based on input accumulation. Table 1 shows that Honduras has not accumulated any productivity growth since 1965. Investment in physical capital is one of the major sources of economic growth for the country.

Honduras has also faced difficulties with its own infrastructure. Development of Tegucigalpa, the capital city, has been slower than that of other cities like San Pedro Sula, the most industrial city in the country. Also, the major airport of the capital seems to have filled its capacity a long time ago.

Added to this, the inability of public enterprises to satisfy demand is a limitation to growth. Lack of electricity generating capacity is a major concern in the country and it is something that has hampered TFP and economic growth in the past. Despite the country's rainfall richness and natural valleys, Honduras has to rely on burning fuel to cope with the country's electricity demand. Telecommunication density is also very low and the only public firm is very inefficient. The combination of all these factors has created "bottle necks" in an economy where it is difficult to establish productive business and grow.

Despite deficiencies, labor is abundant and very cheap in Honduras and international investors have focussed on the country to establish assembly plants (*maquiladoras*), mainly of textiles and garments. Today, the government is trying to diversify agricultural production because in the past exports depended basically on coffee and bananas. This idea of diversification of exports came to Honduras decades later after the same policies were successfully applied in other countries of the area. Today, more than fifty percent of the Honduran labor force is engaged on agricultural activities.

The evolution of TFP for Honduras according to Chart 2 marks the same tendency as in the rest of Central America during the sixties. This decade was the flourishing one for ISI. However, the end of the sixties interrupted the productivity trend. A likely explanation for the TFP decay was a costly war with El Salvador over immigration from the latter country.

The effect of the debt crisis in Honduras' TFP and GDP growth was not as profound as in the other Central American countries. The strength of Honduras during the debt crisis came mainly from the aid received principally from the US to try to contain the advance of communism in the region. However, the lack of reform has stopped TFP

growth until 1993, when the country succeeded in making some policy changes, such as the opening of the economy, but at a very low pace. Today, various import taxes and benefits to exports abound in the economy, combined with non-tariff barriers, locating the country among the less advanced in terms of commercial policy in the region.

In summary, some reform has been made in Central America and the economies are more stable as compared with the eighties. However, the extension of these reforms has not been very large and that explains why TFP is not growing at a greater pace. A study by Lora (1998) for Latin America shows that those countries with faster and more profound structural reforms grow faster. According to that study, Costa Rica, Guatemala and Honduras are classified as slow reformers, as compared to the Latin American Average. Meanwhile, El Salvador and Nicaragua are among the recent reformers.

This suggests that despite the current TFP upward trend, several reforms need to be made in the future to further increase productivity and grow faster. Some of the reforms have been undertaken like the opening the telecommunication market in Guatemala and El Salvador.

2.2 Macroeconomic Policy and TFP

It would be interesting to understand why TFP behaved in these countries in the way depicted by Chart 4. For this purpose, a simple regression was fitted using TFP as the dependent variable and several other variables on the right side of the equation, such as, a trend, openness of the economy, the real exchange rate, and the inflation rate and its variability. More than order of magnitudes or an actual causality, the intention of the regression is to identify the commovements between TFP and these macroeconomic

variables. Nonetheless, the relationships are merely suggestive and are not meant to represent an exhaustive test, nor a fully specified model.

The measurement of the variables in the regression is subject to criticism. However, much of the arguments are solved by not making inter-country regressions. Openness is measured as the ratio of export plus imports divided by GDP, the inflation rate is the growth of the Consumer Price Index, and the real exchange rate (RER) is calculated using the SDR-WPI method⁴.

⁴ With this method, the $RER = E * P_I/P_L$, where the P_L is the local CPI and P_I is a world price index of tradable goods which is calculated using the inflation rates of the biggest six industrialized countries (USA, France, UK, Germany, Canada and Japan), weighted by the corresponding Special Drawing Rights in the International Monetary Fund. This is the origin of the name of SDR-WPI. For an extension see Harberger (1988)

Table 3. Central America: 1960-1996¹					
Relationship between TFP and Openness, Inflation					
and the Real Exchange Rate					
(t-statistics in parenthesis)					
Variables	Costa Rica	Nicaragua	El Salvador	Honduras	Guatemala
Intercept	43.06	211.36	55.34	90.37	91.79
	4.59	15.69	4.59	9.77	8.14
Openness	116.41	24.10	75.38	56.54	121.92
	6.56	2.17	4.75	4.70	7.12
Inflation variability	-21.24	-0.18	-82.75	-10.24	-12.03
	-1.67	-1.39	-2.09	-0.42	-0.66
Inflation Rate	-6.98	0.20	-7.76	-26.79	8.30
	-0.60	1.14	-0.39	-1.34	0.54
Real Exchange Rate	-0.43	-167.57	1.85	-2.33	-4.78
	-6.85	-1.60	1.83	-0.72	-1.53
Trend	1.35	-4.67	-0.56	-0.28	0.04
	5.70	-11.49	-1.71	-1.99	0.34
R-Square	0.84	0.93	0.88	0.48	0.70
F - stat	31.73	46.03	46.12	5.45	13.93
Degress of freedom	30	17	30	30	30

¹1972-1996 for Nicaragua

It may be asked why only these variables are included. The answer here is to try to measure the effect of macroeconomic policy on TFP, and these variables serve as a proxy. As it will be explained later, TFP improvements come from a variety of sources and it is a mixture of actions taken at the firm level and it is very difficult, if not impossible, to define all the ways in which real cost reduction may take place. So, the intention in this segment is just to get an idea of the relationship of policy and TFP growth.

Some variations of the independent variables were tested, such as the ratio of imports to GDP for openness, or a different price index. However, results were similar. Also, some structural change analysis was used, rather than dummy variables, in trying to capture important changes like the end of a war (El Salvador and Nicaragua), or a relevant policy like a strong tariff reduction (Costa Rica in 1986).

The results of the regressions are reported in Table 3. The effect of openness on TFP is positive and highly significant for all countries. This means that TFP grew faster when the economy in each Central American country was more open to foreign trade. The reason is simple. Foreign competition forces local producers to be more efficient in production to cope with goods of higher quality. Greater efficiency can only be attained by reducing real costs, which in essence is what TFP is all about.

An industry protected from foreign competition may not necessarily experience growth based on TFP, because that firm does not have to compete for a share of the market. Rather, the industry may grow by simply accumulating inputs. This is what happened during ISI.

Fear to failure is what makes entrepreneur innovate and reduce costs in real terms. If a firm is unable to lower costs in a competitive environment, it would lower its share in the market, and eventually it will go bankrupt. This is the Schumpeterian creative destruction at work.

The effect of the real exchange rate on TFP is moderately significant for all countries except Honduras. In Costa Rica, Guatemala and Nicaragua, the sign of the coefficient is, as expected, negative.

For El Salvador, the appreciation of RER impacted TFP negatively. This relationship suggests the presence of some kind of *Dutch Disease* in El Salvador. That is,

exports have lost competitiveness and therefore productivity as a result of the remittances from Salvadorians living abroad. A study by the World Bank (1996) concluded that remittances in El Salvador are more permanent than an export boom, and therefore, producers have had to compete by switching to non-tradables and by exporting cheap-labor-intensive commodities.

The inflation rate does not seem to have a great impact on TFP in Central America, since it is not significant in any of the countries. This may seem surprising and it contrasts with the results found in Robles (1997) for 14 Latin American countries. Nonetheless, with the exception of Nicaragua, inflation has been contained at low levels in the region, under Latin American standards.

For instance, in Guatemala and El Salvador the rate is usually below the two-digit mark, in Honduras the inflation rate has barely passed 25% in two times, and in Costa Rica the inflation rate has been above 30% only three times in the last 36 years.

The analysis for Nicaragua is for a shorter period since data for inflation starts in 1972. The coefficient is not significant for inflation and this may show that the economy is closed to be indexed, due to the loss of confidence in the local currency after the crisis and the hyperinflation the country experienced during the end of the eighties and beginning of the nineties.

An interesting variable is the variability of inflation (absolute value of change in the rate from year to year). The problem with inflation comes up when it is unexpected, because it blurs the information transmitted by the price system, and people can not hedge against it. The chance of having these problems increases when inflation is variable.

According to Table 3, inflation variability had a significant negative impact on TFP in Costa Rica, and less significantly ($\alpha=10\%$) in El Salvador. That is, for these countries, volatility of inflation rather than its level has been more damaging.

2.3 Spectral Analysis and Coherence of the TFP series

In this section, a spectral analysis is presented to test the coherence of TFP series between pairs of countries. This analysis permits us distinguish high frequencies (short-run effects) from low frequencies (long-run) in the series. According to Hamilton (1994), "the spectrum identifies the contributions to the variance of the observed data of periodic components with different cycles"⁵. This is an alternative approach to filtering data to find business cycles in series. The most known filter is the Hodrick-Prescott.

This analysis is important because it permits us to know how TFP series are related between Central American countries. In other words, it is interesting to understand if TFP series of two countries are affected by common trends, by short-run effects, such as terms of trade shocks, or not related at all.

The frequency concept relates to the time required by the data to complete a cycle. Therefore, high frequency means that data completes a cycle very fast, so it corresponds to the short run or business cycles variations. On the other hand, low frequency represents data with very wide loops, that is, a cycle which is completed in a long time, so it pertains to long run variations.

⁵ Hamilton (1994), pp. 152.

The coherence of two series is a measure of the degree to which these series are jointly influenced by cycles of frequency ω ⁶. A large coherence indicates that the two series have important cycles of frequency ω in common.

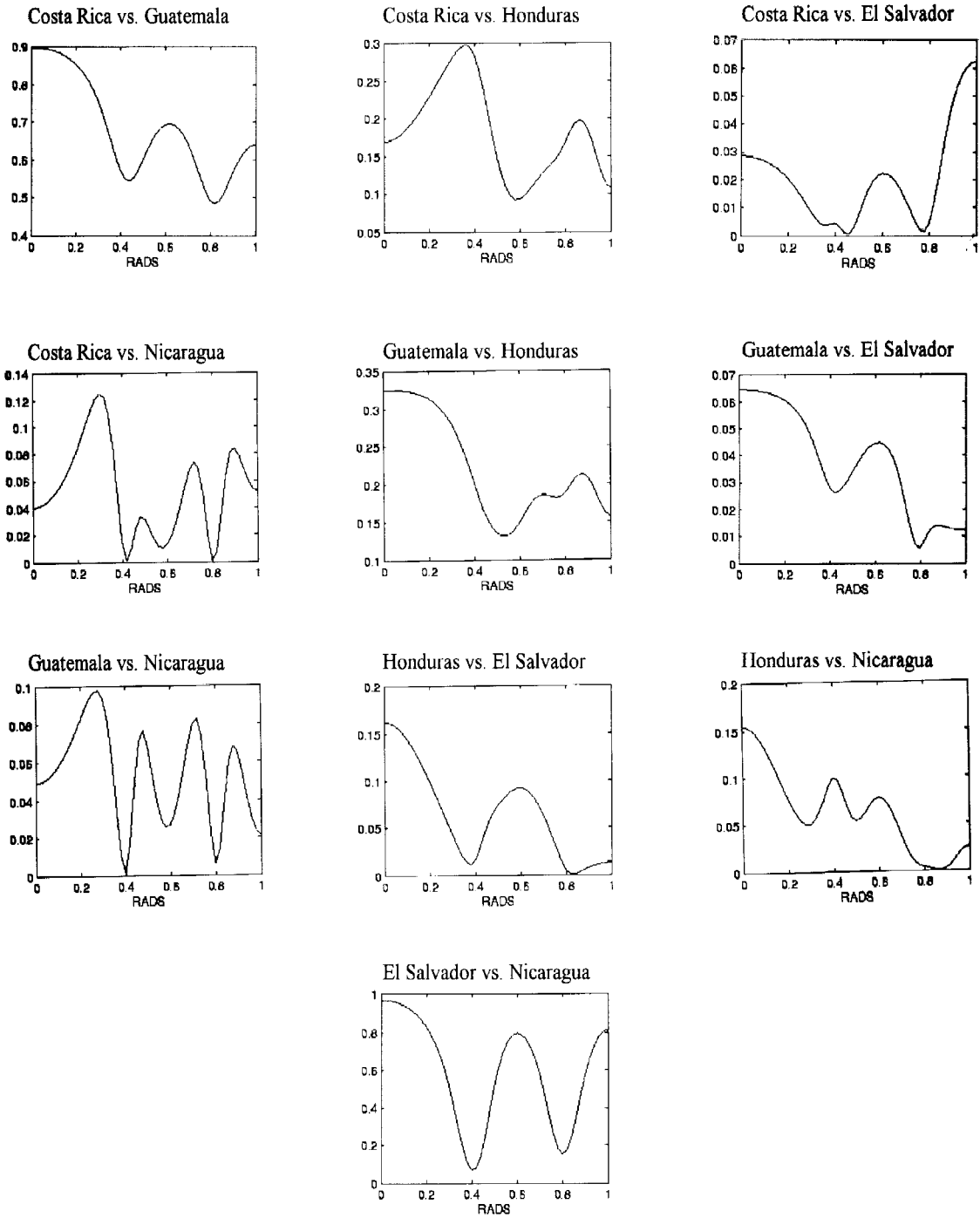
For example, the coherence of TFP between Costa Rica and Guatemala in Chart 5 shows a very strong commovement at low frequencies. That is, these two countries share permanent shocks that persist in the long run and affect the trend of TFP. A similar production structure and similar policy reforms undertaken in these countries may explain this relationship. However, some commovements of TFP persist in the short run, possibly due to common exporting and importing goods, affected by international price changes.

A different story is the coherence of TFP series between Costa Rica and El Salvador. Here, the commovement, although weak, is mostly in the short-run, like features specific to each economy. In fact, structural reform is relatively recent in El Salvador, and these countries have not coordinated macroeconomic policy in the past.

The coherence of TFP series between Costa Rica and Nicaragua and Guatemala and Nicaragua is very similar. The series show a stronger commovement in the long run than in the short run. Nonetheless, there are many short run shocks affecting the commovement of the series, probably pertaining to the Nicaraguan economy. The explanation for negative commovements in the trend may be due to the Nicaraguan civil war, whose long run effects were not present in the other two countries. Also, short run

⁶ Formally, the coherence is defined as $h_{XY} = \sqrt{\frac{[c_{XY}(w)]^2 + [q_{XY}(w)]^2}{s_{YY}(w)s_{XX}(w)}}$, where ω is the frequency c_{XY} is the cospectrum, q_{XY} is the quadrature spectrum and s_{YY} and s_{XX} are the univariate spectra. For more details see Halmiton (1994) pp. 275.

Chart 5. Central America: Spectral Analysis and Coherence of TFP Series



effects, such as immigration and intra-regional trade, are transmitted from Nicaragua to the other countries.

The strongest coherence in TFP series is presented between Nicaragua and El Salvador. This is a combination of both strong long run effects, like the common civil war which affected productivity trends alike, and strong short run commovements, for example, the population exodus to neighboring countries and the United States.

The coherence between Honduras and Nicaragua, Honduras and El Salvador, and Guatemala and El Salvador shows an almost exclusive commovement in the long run. That is, while the TFP trend in El Salvador and Nicaragua was negative, the one in Honduras and Guatemala stayed more stable. The war and the evolution of the debt crisis in the first two countries contrasted with the foreign aid received by Honduras during the eighties and the discovery of oil in Guatemala. Afterwards, structural reforms have been slower in the last two countries.

TFP series in Guatemala and Honduras show more commovement in the long run than in the short run. The same observation applies to Costa Rica and Honduras, although in these two pairs of countries there is some commovement in the short run. High frequency effects are aspects corresponding the internal policies overtaken in Costa Rica and Guatemala and not followed by Honduras, like a more open economy and the tariff reduction timetable. Also, small commovements in the short run suggest changes in the volumes of trade, and common international price shocks (bananas, coffee and oil).

3. Growth and Total Factor Productivity in Industries

As mentioned before, there is a relationship in Central America between growth rates of GDP and TFP. This same relationship holds if one analyzes growth at the industrial level and at the firm level. Evidence on this relationship can be found in Beyer (1997), Harberger (1998), Robles (1997) and Torre (1997).

Data at the industry or sectoral level in Central America is very scarce. Several manufacturing surveys are produced very discontinuously and there has not been any recent industrial census to corroborate data from the surveys. However, existing data permit us to make a few reliable calculations on the sources of economic growth for industrial branches. It should be kept in mind that the extension of these calculations could not be the same for all Central American countries because the desegregation level of the data differs from country to country.

In Tables 7-15 in the appendix, the sources of economic growth are presented for the highest quantity of industrial branches as possible and for the greatest period permitted by the available data. For all the countries except Nicaragua, the ten-year period is divided into two sub-periods. For Nicaragua it was only possible to obtain data from 1990 to 1996. The number of manufacturing branches varies from 27 in Costa Rica to 18 in Guatemala. All industrial branches are covered, however, in the case of Costa Rica data is available for a larger number of branches.

In Nicaragua, data is very scarce and unreliable for the communist years; figures are dubious because units of production could not be valued using a consistent price system. The calculations present here are based on industrial surveys performed after 1990, when democracy returned to the country. Nicaragua has made a remarkable effort to improve its national accounts and today it may be the country with the best statistics in Central

America, not in quantity but in quality. However, the recollection of statistics starts only in 1990.

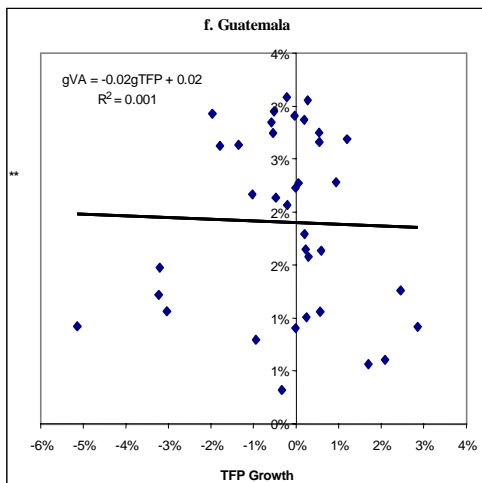
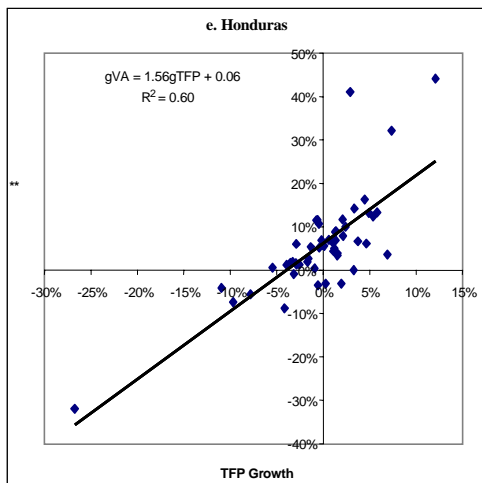
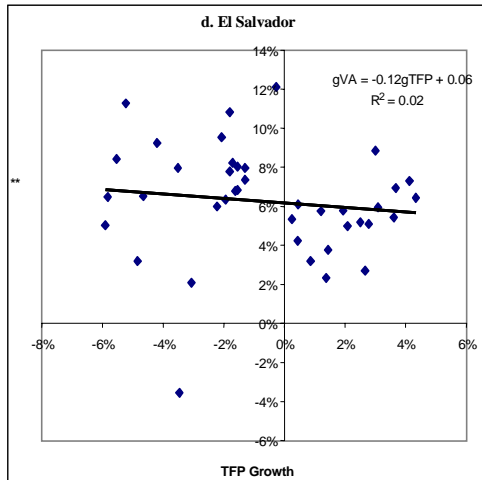
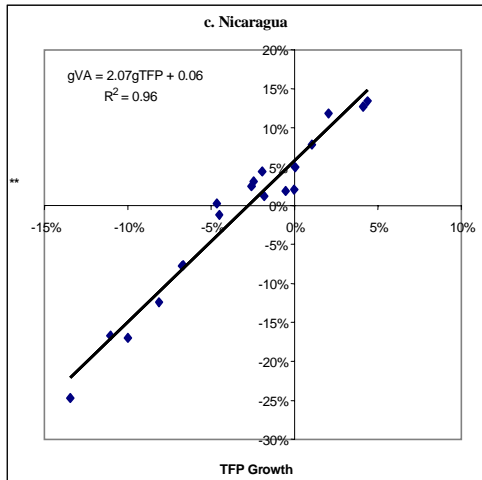
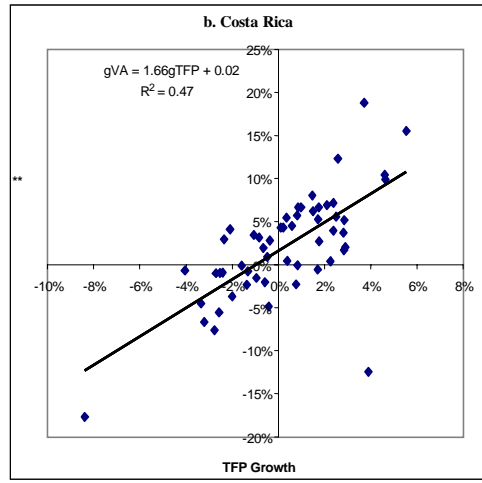
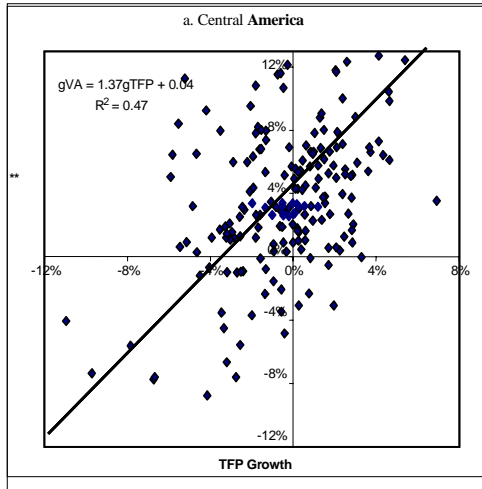
The mentioned relationship between the growth rates of value added and TFP is also present in the case of industrial branches in Central America. From Tables 7-15, a plot of TFP and value added growth is performed with the pool of all industrial branches for every five-year period. The results are shown in panel a of Chart 6 below. Also, individual plots for each country are included in the other panels of this chart. Every point in these panels represents the annual average growth of value added and TFP of an industrial branch over a five-year period.

Data to calculate TFP by industry comes from a variety of sources. In general, value added comes from Central Banks. Data for labor is scarcer and for investment is almost non-existing. In Honduras, Costa Rica and Nicaragua, labor information was provided by the respective Central Bank, and it is based on periodic industrial surveys. In El Salvador data comes from annual industrial surveys of the Ministry of Economy. And in Guatemala, data comes from a sporadic industrial survey performed by the National Institute of Statistics and Census. All sources are explained in detail in Appendix 1.

In panel (a) of Chart 6 for Central America, all branches on average show a very strong relationship between value added and TFP growth. In fact, on average value growth is more than fully explained by the increase in TFP of the Central American industrial branches, with a fit of almost 50%.

However, this observation does not hold as data is decomposed by country, probably because of the different political and economic situations affecting each country of the region during the last decade. For example, Costa Rica and Honduras, in panels (b) and (e), are very similar to the average. Nicaragua is well above the average, meaning that

Chart 6. Relationship between TFP and Value Added Growth in Industrial Branches
 (Annual Average Growth for 5-year periods from Tables 7-15 in the Appendix)



** Value-Added Growth

TFP growth is fundamentally necessary for industrial value added growth with almost a perfect fit (96%). In Guatemala and El Salvador, panels (f) and (d), there is no statistical relationship between TFP and value added growth in the industrial sector. This means that in these two countries, those industries growing at higher rates did it by investing more in labor and capital inputs rather than by being more productive.

Table 4 reinforces the results of Chart 6. With the same data of Tables 7-15, the average and means are calculated for 25% of the industries in the region showing the highest value added growth and 25% of the industries with the lowest value added growth. Then, the difference between good episodes of growth and bad episodes is calculated and compared to the corresponding differences in TFP growth. What the table shows is that 34% of the differences in the average value added growth and 36% of the differences in the medians are accounted for by differences in TFP growth.

		Average Rate of VA Growth	Average Rate of TFP Growth	Ratio of Differences
25% of Industries with the highest average VA growth	Mean	15.64%	2.85%	
	Median	12.33%	3.35%	
25% of Industries with the lowest average VA growth	Mean	-9.00%	-5.47%	
	Median	-6.65%	-3.47%	
Differences in	Means	24.63%	8.32%	0.34
	Medians	18.98%	6.81%	0.36

Situations taking place in Central America during the ten-year period studied (1985-1995 or 1986-1996) are very diverse. For example, in Guatemala and Costa Rica, this decade was one of tariff reductions. In Costa Rica growth rates of value added and

TFP were very dissimilar in both periods. In the second period (1991-1996), most of the industrial branches showed negative TFP growth.

On the other hand, Guatemalan industrial branches had all small and positive value added growth rates, a little higher during the second period (1990-1995). But, on average, the industry showed a fall in TFP growth. All of the growth in value added in Guatemala came almost exclusively from investing in capital.

In El Salvador, the industry grew remarkably during both periods, a cumulative 77% in ten years compared to a 40% at the whole economy. In the first period (1985-90), the industry grew an average of 7.4% per year, and every industrial branch had an average positive value added growth, most of them above 5%. However, TFP growth is negative in all branches.

The expansion of the industries came mainly from extremely high contributions of labor to value added growth. Data shows an industrial sector fearful of investing in a country living under a civil war; therefore, there were low investment rates and low contributions of capital to growth.

Data for Nicaragua are for an era in which distortions in the economy were reduced. During this period, some industries grew very fast and others fell considerably. However, most growth in value added came in many cases as a result of input accumulation, so on average the industry showed negative TFP growth.

The desegregation of TFP is interesting because it may be viewed as a process that starts at the firm level. TFP is a synonym for real cost reduction (RCR). A firm increases its productivity when it produces more with the same quantity of inputs, or the same output with less input. As inputs become more productive, they will receive higher compensations, that is, when a firm increases its productivity, the rate of return to capital

will raise and the firm will pay higher wages to their employees. The only way a firm may increase its productivity and pay its labor and capital better is by reducing the costs of production in real terms. RCR is what an owner of a firm continuously has in mind and when successful, TFP grows. The evolution of TFP in the economy may be viewed as the result of the effort of thousands of firm owners to reduce costs in real terms.

Finally, during the period 1985-1990, Honduras presents high value added growth in all industries and TFP growth in most of them. However, many big industries such as foods and drinks show negative TFP change and this dropped the industrial average to negative values. The situation for the second period did not change dramatically, with the exception that there are some industries with negative value added growth.

3.1 Causes of Value Added Growth in Industries

Table 5 is a summary, from Tables 7-15, of the industries with the highest positive and negative value added growth for every country. Here, one encounters three major changes in the region:

- a. Reallocation of inputs due to changes within the country, such as changes in local demand.
- b. Reallocation of inputs due to changes within the region, such as changes in comparative advantages.
- c. Reallocation of inputs due to legal reforms.

Changes in local demand results in reallocation of inputs toward those areas, which are now more profitable. These are the cases of the growth observed with clay, crockery and porcelain objects (Costa Rica, Honduras), fabricated metal products and non-ferrous industries (Costa Rica, El Salvador), non-metallic mineral products (Nicaragua,

Honduras) and basic metal industries (Honduras, El Salvador). Some industries shared this boom like paper products, especially cardboard boxes in El Salvador and Costa Rica. These sectors are related to construction sector, which experienced a boom after Central American countries recovered from the crisis at the beginning of the eighties. One of the sectors to respond faster to shocks is construction. Therefore, during the recession, the sector decreases substantially, but it recovers equally fast when the economy geared up. During the boom, the sectors overreacts to the demand shock in the economy and therefore, one may observe that some of the industries described before, contract in the following period, as demand stabilizes.

The second source of change is changes in comparative advantages. In this case, there is a clear tendency of the textile industry to leave Costa Rica and Nicaragua, to be relocated in El Salvador and principally in Honduras. These are mainly foreign assembly plants looking for cheap low-skilled labor. Also, the shoes and leather products received great protection in Costa Rica before 1986; as the market opened these industries decreased its participation in this country and moved to Honduras and El Salvador.

Another case is electric and electronic equipment, in which Costa Rica gains comparative advantage to attract foreign investment, especially in computing and communication systems components. Currently, with the installation of Intel in Costa Rica, this industry has the highest growth prospects for the future. Costa Rica is changing her assembly plants from textiles and apparel to electronics and high technology products.

**Table 5. Central America:
Example of firms with Positive and Negative Value Added Growth**

Costa Rica		
1986-1991	<ul style="list-style-type: none"> ↑ Clay, crockery and porcelain objects ↑ Paper products ↑ Fabricated metal products and non-ferrous industries 	<ul style="list-style-type: none"> ↓ Petroleum refineries and derivatives ↓ Shoes and leather
1991-1996	<ul style="list-style-type: none"> ↑ Chemical substances ↑ Electric and electronic equipment ↑ Petroleum refineries and derivatives ↑ Rubber products 	<ul style="list-style-type: none"> ↓ Textile mill products ↓ Lumber, cork and wood products ↓ Shoes and leather
Nicaragua		
1990-1996	<ul style="list-style-type: none"> ↑ Drinks ↑ Transportation equipment ↑ Non-metallic mineral products 	<ul style="list-style-type: none"> ↓ Textile mill products, apparel and other textiles ↓ Fabricated metal products, including machinery and electrical ↓ Rubber products ↓ Chemical substances
Honduras		
1985-1990	<ul style="list-style-type: none"> ↑ Clay, crockery and porcelain objects ↑ Basic metal industries ↑ Chemical substances ↑ Textile mill products and apparel ↑ Shoes and leather 	
1990-1995	<ul style="list-style-type: none"> ↑ Apparel and other textiles ↑ Transportation equipment ↑ Non-metallic mineral products 	<ul style="list-style-type: none"> ↓ Petroleum refineries ↓ Basic iron and steel industries ↓ Electric and electronic equipment ↓ Clay, crockery and porcelain objects ↓ Rubber products
El Salvador		
1985-1990	<ul style="list-style-type: none"> ↑ Printing and publishing ↑ Basic metal industries and fabricated metal products ↑ Textile mill products ↑ Furniture and fixtures 	
1990-1995	<ul style="list-style-type: none"> ↑ Lumber, wood products, furniture and fixtures ↑ Paper and allied products ↑ Apparel, other textile products ↑ Leather and shoes ↑ Electric and electronic equipment 	<ul style="list-style-type: none"> ↓ Petroleum refineries and derivatives
Guatemala		
1985-1990	<ul style="list-style-type: none"> ↑ Food and kindred products ↑ Drinks 	
1990-1996	<ul style="list-style-type: none"> ↑ Food and kindred products ↑ Drinks 	

In addition, Costa Rica gained comparative advantage in the rubber products, an industry that fell considerably in Nicaragua and Honduras. This rather small industry has been growing almost solely at the hands of one firm in Costa Rica, which is one the leading producer in the world of water rubber gaskets.

Finally, the third source of reallocation of inputs came from legal reforms. For example, Costa Rica gained comparative advantage in chemical substance, which was mainly the result of increasing sales of fertilizers, locally and abroad, as the only public fertilizers company was successfully privatized and competition was brought to the market. After the liberalization, fertilizers represent one of the industries with the highest productivity growth in Costa Rica. Meanwhile, Nicaragua had a fall in this industry. Lumber and wood products in Costa Rica lost comparative advantage after an increase in conservationist efforts and regulations to extract woods. This industry seems to have moved to El Salvador.

It is worth mentioning that the food products and drinks are the two biggest industries in Guatemala. Also, these industries are the leading exporters of manufactured goods in Central America. In other words, food products are the most important industry in Guatemala and the biggest in Central America. During the trade liberalization process the Guatemalan food producers were able to set a slower timetable for tariff reduction. Also the Central American Common Market has tended to protect food and drink industries more heavily. Therefore, the lack of competition in this field has created an industrial structure in food products whose growth is based mainly on investment in physical capital (with the exception of El Salvador). This has caused negative TFP changes in these industries in the region, especially in food products.

At last, one final comment on the petroleum refineries and derivatives. This industry depends mainly on local demand and international prices. However, some public policies may affect the growth of this sector, like in the case of Costa Rica where imports and refinement are controlled by the State.

Nonetheless, the distribution of derivatives of petroleum and imports of oil products (except refined oil) are held in the hands of the private sector. The increase in value added and productivity in these activities at the beginning of the nineties, reflects the opening of the market to foreign distribution companies such as Texaco, Shell and Chevron, which may import their own products but are only permitted to sell the governmental refined product.

3.2 Concentration of TFP among Industries

This section presents more evidence on the concentration of TFP growth among few industries, contrary to assertions by some economic theories⁷. Here, as in other studies (Robles 1997, Harberger 1998) for the United States, it is showed that average TFP change in the industrial sector can be explained by the productivity increase of only four or five industrial branches during the period.

Table 6 contains the data for Costa Rica and it presents the concentration of productivity among industrial branches and the contribution of each branch to the total productivity growth of the industrial sector. In the first column we have the cumulative TFP growth during the five-year period for each industry. Branches have been sorted from the highest increase in TFP to the lowest increase (or highest decrease). Column 4 is the real value added of each branch in the first year of the period. Therefore, the

multiplication of columns 1 by 4 yields column 2, which is the contribution of each branch's TFP to output growth. The cumulative sum of 2 (column 3) and 4 (column 5) is what we are after. These two columns show TFP concentration across industries as relative to the size (measured in value added) of that industry. This exercise was repeated for all the Central American industrial branches and the corresponding tables are presented in the Appendix 2.

Following Table 6, the first five branches contribute 22.8 million of real *Colones* to the total productivity growth of the industry of 77.2 million *Colones*. This means that branches representing only 6% of the total value added ($= 127.2 \div 2104.4$), explain almost 30% of all productivity growth during the period. Continuing in this direction, the top nine TFP-increasing industrial branches explain more than fully the TFP growth of the industry between 1986 and 1991, but they only represent less than 30% of the industry's value added.

These results are summarized in Chart 7 for all Central America. The concavity of the curve reflects the concentration of TFP among industrial branches. The ray from the origin is the average cumulative TFP percentage change of all industries considered during the period depicted in each panel. The vertical axis is the average cumulative sum of TFP growth and the horizontal axis is the cumulative contribution of the branches to the total value added of the industry.

⁷ The most common family of models are those with a production function expressed as: $Q_t = A^{\lambda t} F(K,L)$, where λ is the common generalized TFP growth in all sectors of the economy. There is no evidence that TFP growth takes this functional form.

Table 6: Costa Rica 1986-1991						
Concentration of TFP Among SIC Manufacturing Branches						
[Columns (2) - (5) are in millions of real <i>colones</i> of 1966]						
Industrial	Cumulative	Absolute Contrib.	Cum. Sum	Value Added	Cum Sum	L/K
Branch	TFP Growth	of TFP to Growth	of (2)	by Industrial	of (4)	Index
	1986-1991	(1)*(4)		1986		1986a
	(1)	(2)	(3)	(4)	(5)	(6)
361.Clay, crockery and porcelain objects	0.3004	1.23	1.2	4.1	4.1	0.51
381.Fabric, metal products, except mach. & transp. equip.	0.2529	7.46	8.7	29.5	33.6	0.46
354.Petroleum derivatives	0.2052	0.05	8.7	0.3	33.8	0.18
321.Textile Mill Products	0.1511	9.41	18.1	62.3	96.1	0.50
384.Transportation Equipment	0.1485	4.62	22.8	31.1	127.2	0.44
352.Other chemical products	0.1474	15.43	38.2	104.7	231.9	0.95
322.Apparel and other textile products excluding shoes	0.1455	9.94	48.1	68.3	300.2	1.23
341.Paper and allied products	0.1314	7.76	55.9	59.1	359.3	0.73
313.Drinks	0.1256	32.42	88.3	258.1	617.4	1.59
351.Industrial Chemical Substances	0.1185	7.91	96.2	66.8	684.2	1.64
332.Furniture and Fixtures, except those mainly metallic	0.1151	4.81	101.1	41.8	726.0	1.50
362.Glass and glass products	0.0953	1.79	102.8	18.8	744.8	1.21
372.Basic non-ferrous metal industries ¹	0.0942	0.23	103.1	2.5	747.3	0.49
390.Miscellaneous Manufacturing	0.0879	0.62	103.7	7.1	754.3	0.12
342.Printing and Publishing	0.0849	5.31	109.0	62.5	816.8	1.21
331.Lumber, cork and wood products except furniture	0.0792	4.12	113.1	52.0	868.8	0.72
383.Electric and electronic equipment	0.0766	5.06	118.2	66.1	934.9	1.00
356.Plastic products	0.0744	5.01	123.2	67.4	1002.2	1.07
369.Other non metallic mineral products	0.0455	2.50	125.7	55.1	1057.3	1.00
324.Shoes except those made of rubber or plastic	0.0353	0.69	126.4	19.6	1076.9	0.56
382.Machinery except electrical	0.0320	1.00	127.4	31.3	1108.3	0.81
314.Tobacco Products	0.0278	1.80	129.2	64.8	1173.1	0.88
311-312.Food and kindred products, except drinks	0.0154	10.90	140.1	706.7	1879.7	1.51
230-290.	-0.0226	-0.22	139.9	9.9	1889.7	0.13

The different panels of Chart 7 are the so called sunset-sunrise diagrams, Harberger, 1998. A sunrise reflects an overall industry with a positive cumulative TFP growth in the period, while the contrary holds for a sunset. The bigger the sunset or the sunrise, the greater the concentration of TFP in a few industrial branches.

A deviation from the ray represents concentration of TFP growth among a few industries. Usually the curve is comprised of two parts, one ascendant showing the

branches with positive TFP increases and the other descendant of those with negative TFP changes.

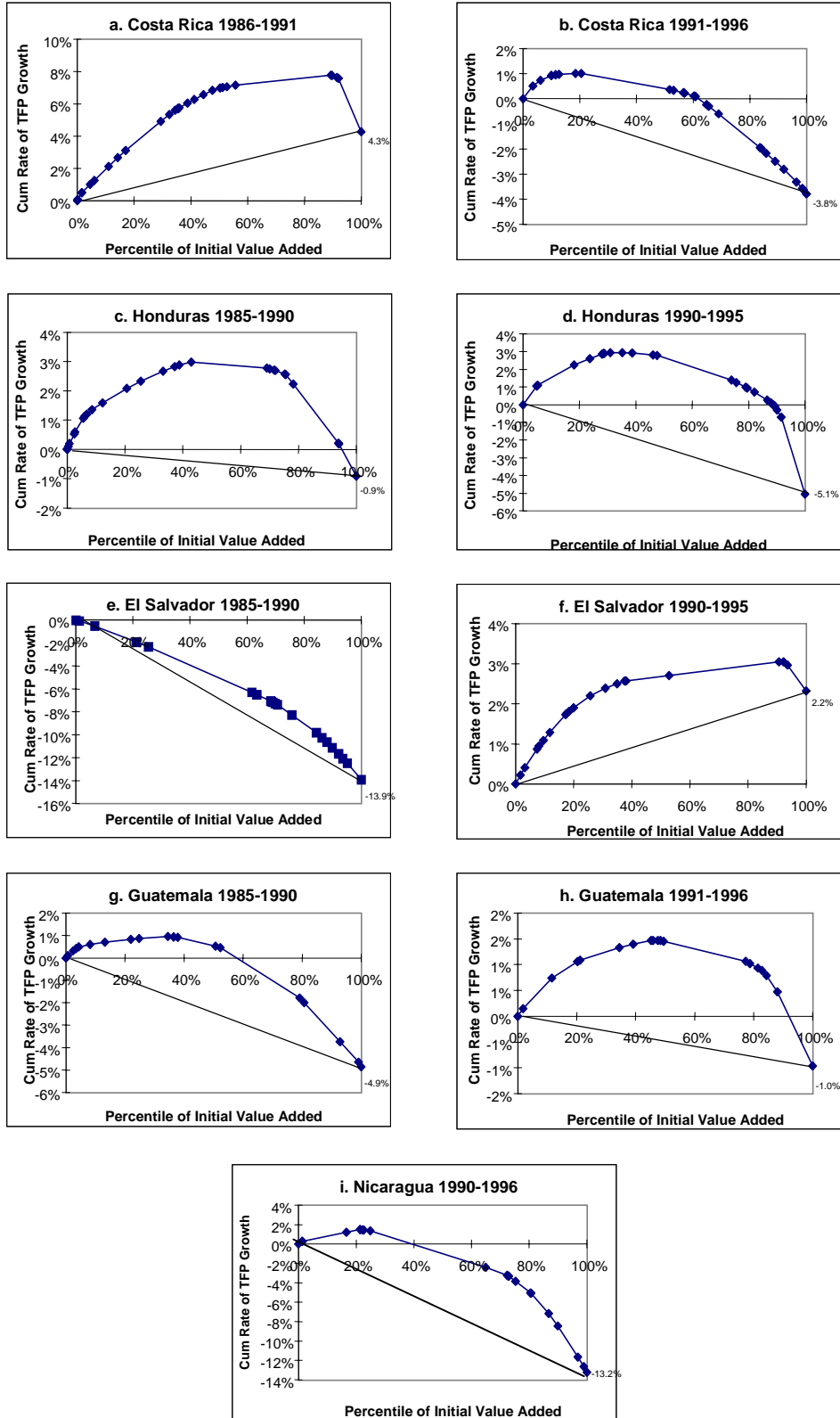
With the exception of El Salvador (1985-90), every single panel shows gainers and losers in the process of cost reduction. This is the Schumpeterian creative destruction in action.

Also, all panels show concentration of TFP in a few industries. For instance, in the periods of positive cumulative average TFP growth, the overall increase in the industry's TFP is explained by industries producing less than 25% of the value added. However, El Salvador 1985-90 shows a strong decay in TFP and despite some concentration, the fall in TFP was distributed very evenly in all industrial branches.

Finally, the rightmost column of Table 6 is a labor-capital index at the starting year of the period. In this index, a value of one represents the industry's average. That is, a value of 1.77 means that this industry is 77% more labor intensive than the average labor-capital ratio of the industry.

In general, there does not seem to be a statistical relationship between labor intensity and TFP success of an industrial branch. This simple exercise does not provide evidence in favor of the hypothesis that labor-intensive industries had important TFP improvements after the 1986 liberalization. It is very difficult to obtain this kind of relationship in an economy, that presents a lot of distortions, such as tariff disparities, duty-free export schemes, public subsidies, assembly plant programs, activities monopolized by the public sector and tax exemptions to promote specific sectors.

Chart 7. Central America
Concentration of TFP among Industrial Branches



4. Concluding Remarks

There is strong evidence of the existing relationship between economic growth and TFP. A country that pretends to grow faster will have to find ways to improve the TFP of the economy. This relationship holds between countries and within a country for industrial branches.

The coherence of the TFP series of countries shows important short-run and long-run common events between some pairs of countries. Guatemala and Costa Rica seemed to be more related in the long run, while Costa Rica and El Salvador in the short-run. El Salvador and Nicaragua show a combination of effects in both the short-run and long-run.

Government may influence TFP in different ways. However, boosting TFP in the economy can not be achieved by giving special treatments to specific sectors in the economy. In fact, Import Substitution Industrialization failed to base economic growth on TFP and the industry in Central America grew between 1960 and 1980 as a result of accumulation of labor and physical capital. Eventually, ISI drove Central America to stagnation because the region was caught by diminishing returns to investment.

Some vices of ISI years are still predominant in Central America, and the persistence of these structures will threaten TFP growth in the future. Some of these vices constitute public enterprises monopolizing sectors in the economy, high tariff and non-tariff barriers to trade, disparity of import tariffs, differential treatment for products produced locally, inefficient and costly tax systems, benefits to specific sectors of the economy, indiscriminated subsidies, rustic financial sectors, lack of local competition, high fiscal deficits, lax monetary policy, governmental inability to stand before pressure groups and corruption, just to mention a few.

A good policy change in Central America was the restoration of peace and the adoption of democracy. This change created a better environment for investors; especially foreign. The effect of war on economic growth and TFP has been devastating and social consequences of civil wars left countries in the region in a worse situation than many decades before.

Another good policy change that may have improved TFP was the opening markets to international trade. Statistically, there is a strong positive relationship between openness and TFP growth in all countries. Opening to foreign trade provides several advantages. First, importing good quality products restores competition, so local producers have an incentive to reduce costs to cope with imports and TFP in the economy grows. Second, the availability of better and new technologies increases with an open market policy and local firms are able to make joint ventures with leader producers in the world. And third, a more open market permits the attraction of foreign investors. Investment attraction has improved the economic situation in Central America, but especially in Costa Rica, Honduras and El Salvador.

However, openness does not come free of pain. Tariff reduction and elimination usually causes redistribution of inputs and the decay of industries in which the countries have not had comparative advantages. This becomes a political factor because many times the affected industries are able to influence governmental policy decisions in their favor.

The analysis of industrial branches showed three characteristics of the process of economic growth. First, there are important demand changes affecting some industries. Second, there is a reallocation of inputs due to dynamic movements in comparative advantages, as some business moved from one country to another within the region, or as

some sectors fell as the market opened. For instance assembly plants of apparel, shoes and leather moved out from Costa Rica to other countries like Honduras and El Salvador. Third, inputs were reallocated after some legal reforms.

Generally speaking, there is no statistical relation between the fall and rise of TFP in industrial branches and the labor-capital ratio. That is, it can not be said that the most labor oriented industries expanded after trade liberalization. However, this kind of relationship is impossible to find in a region filled with price distortions and preferential policies to specific sectors of the economy. Also, trade liberalization has not been completed and there is a lot to be done on these grounds.

In another study (Robles 1997) it was proved that TFP is negatively related to high and variable inflation rates for a group of thirteen Latin American countries (the sample excluded El Salvador and Nicaragua in Central America). In the case of Central America, the effect of the inflation rate on TFP is not statistically significant. Since inflation rates have usually been low for Latin American standards (Nicaragua excluded), this may explain the results. However, in Costa Rica and El Salvador the volatility of inflation rates seems to have a perverse effect on TFP growth.

Finally, the relationship between TFP and the evolution of the Real Exchange Rate (RER) is statistically significant for all countries, but Honduras. In the rest of Central America, except in El Salvador, there is a presumed negative association between TFP and the RER. The interpretation of this may be that when exports lose productivity, the amount exported falls and TFP depreciates, and vice versa. In the case of El Salvador, the relationship is the opposite possibly reflecting the existence of a “Dutch Disease” caused by the capital income from the foreign remittances, or payments received by Salvadorians from their families living abroad.

Central America has performed great reforms since 1985, however there is a lot to be done. In a recent study (Lora, 1998), it is shown that countries making more reforms have grown faster. More reforms mean greater TFP increases. In this context, during the last ten years the two countries reforming the most have been Nicaragua and El Salvador, followed by Costa Rica, Guatemala and Honduras. This coincides with the growth rates observed in these countries during the last years.

REFERENCES

- Barro, Robert J. (1989). *Economic Growth in a Cross Section of Countries*, Working Paper No. 3120. NBER (September). Cambridge, MA.
- Beyer, Harald (1996). *Sources of Economic Growth: Cross-Country Comparisons*, Discussion paper, University of California, Los Angeles.
- Hamilton, James D. (1994). *Time Series Analysis*, Princeton University Press. Princeton, New Jersey.
- Harberger, Arnold (1989). "Applications of Real Exchange Rate Analysis", *Contemporary Policy Issues*. Vol. VII, pp. 1-26. April.
- . (1993). *The Process of Economic Growth: A Vision for the 1990s*, Paper presented at the Conference of the Argentine Bankers' Association (ADEBA). University of California, Los Angeles.
- . (1996). *Reflections on Economic Growth in Asia and the Pacific*, University of California, Los Angeles.
- . (1998). "A Vision of the Growth Process", *American Economic Review*, Vol. 88, No.1, pp. 1-32. March.
- Jorgenson, Dale W. (1995a). *Productivity Volume 1: Postwar U.S. Economic Growth*, The MIT Press. Cambridge, MA.
- . (1995b). *Productivity Volume 2: International Comparisons of Economic Growth*. The MIT Press. Cambridge, MA.
- Kendrick, John W. (1956). "Productivity Trends: Capital and Labor", *Review of Economics and Statistics* 38, no. 3 (August): 248-257.
- Lal, Deepak and Sarath Rajapatirana (1987). *Foreign Trade Regimes and Economic Growth in Developing Countries*. Vol. II, No. 2 (July): 189-217.
- Lora, Eduardo (1998). "Una Década de Reformas Estructurales en América Latina: Qué se ha Reformado y Cómo Medirlo". *Pensamiento Iberoamericano*. Volumen Extraordinario. Banco Interamericano de Desarrollo.
- Lucas, Robert E., Jr. (1988). "On the Mechanics of Economic Development", *Journal of Monetary Economics* 22 (July), 3-42.
- Robles, Edgar A. (1997). *An Exploration into the Sources and Causes of Economic Growth in the United States and Fourteen Latin American Countries*. Ph.D. dissertation, University of California, Los Angeles.
- Solow, Robert M. (1957). "Technical Change and the Aggregate Production Function" *Review of Economics and Statistics* 39, no. 3 (August): 312-320.

- Solow, Robert M. (1987). *Growth Theory: An Exposition* Oxford University Press. New York, NY.
- Torre, Leonardo (1997). *Concentration Patterns of the Contribution of TFP to Output Growth: Evidence from the Mexican Manufacturing Sector*. Paper presented at the meeting of the Western Economic Association. Seattle.
- World Bank (1996). *El Salvador: Meeting the Challenge of Globalization* A World Bank Country Study. Washington D.C.
- Young, Alwyn (1995). "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience". *The Quarterly Journal of Economics* (August), 641-680.

Table 7: Costa Rica 1986-1991
Sources of Economic Growth for 27 Manufacturing Industrial Branches
(Annual Average Rates)

Industrial Branch	Value Added Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	0.45%	-2.13%	2.19%	0.38%
313.Drinks	5.55%	0.31%	2.73%	2.50%
314.Tobacco Products	4.50%	-0.25%	4.16%	0.59%
321.Textile Mill Products	2.04%	-1.93%	1.07%	2.90%
322.Apparel and other textile products excluding shoes	3.72%	-0.89%	1.79%	2.82%
323.Leaner and leather products excluding shoes	-2.36%	-3.50%	2.50%	-1.36%
324.Shoes except those made of rubber or plastic	-2.33%	-4.18%	1.07%	0.77%
331.Lumber, cork and wood products except furniture	-0.53%	-3.36%	1.13%	1.70%
332.Furniture and Fixtures, except those mainly metallic	0.40%	-3.09%	1.23%	2.26%
341.Paper and allied products	12.33%	3.60%	6.14%	2.59%
342.Printing and Publishing	5.27%	0.15%	3.41%	1.71%
351.Industrial Chemical Substances	3.95%	-0.67%	2.24%	2.37%
352.Other chemical products	5.18%	-0.09%	2.42%	2.85%
353.Petroleum refineries	-17.67%	-9.77%	0.49%	-8.39%
354.Petroleum derivatives	-12.42%	-16.08%	-0.23%	3.89%
355.Rubber products	-0.77%	-2.14%	2.68%	-1.32%
356.Plastic products	6.19%	0.55%	4.14%	1.50%
361.Clay, crockery and porcelain objects	15.55%	5.70%	4.32%	5.54%
362.Glass and glass products	6.93%	0.91%	3.92%	2.10%
369.Other non metallic mineral products	6.65%	0.95%	4.72%	0.98%
372.Basic non-ferreous metal industries ¹	10.44%	-0.64%	6.48%	4.61%
381.Fabric. metal products, except mach. & transp. equip.	9.85%	2.11%	3.11%	4.64%
382.Machinery except electrical	-0.06%	-3.00%	2.11%	0.83%
383.Electric and electronic equipment	6.67%	0.68%	4.23%	1.76%
384.Transportation Equipment	1.68%	-2.07%	0.92%	2.83%
390.Miscellaneous Manufacturing	2.68%	-1.26%	2.17%	1.77%
230-290.	-4.86%	-5.81%	1.37%	-0.42%
Total	1.86%	-1.54%	2.51%	0.89%

¹ 1989-1991 only

Table 8: Costa Rica 1991-1996
Sources of Economic Growth for 27 Manufacturing Industrial Branches
(Annual Average Rates)

Industrial Branch	Value Added Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	2.79%	1.57%	1.60%	-0.37%
313.Drinks	2.96%	1.40%	3.91%	-2.35%
314.Tobacco Products	-0.10%	-0.14%	1.62%	-1.58%
321.Textile Mill Products	-7.62%	-4.99%	0.13%	-2.77%
322.Apparel and other textile products excluding shoes	1.93%	1.13%	1.44%	-0.64%
323.Leaner and leather products excluding shoes	-1.57%	-1.43%	0.82%	-0.96%
324.Shoes except those made of rubber or plastic	-3.71%	-2.31%	0.59%	-2.00%
331.Lumber, cork and wood products except furniture	-6.65%	-4.17%	0.72%	-3.21%
332.Furniture and Fixtures, except those mainly metallic	-5.57%	-4.00%	0.99%	-2.56%
341.Paper and allied products	-1.00%	-0.62%	2.34%	-2.71%
342.Printing and Publishing	3.13%	1.70%	2.26%	-0.82%
351.Industrial Chemical Substances	18.80%	9.98%	5.11%	3.71%
352.Other chemical products	4.29%	2.09%	1.99%	0.22%
353.Petroleum refineries	7.14%	3.09%	1.67%	2.38%
354.Petroleum derivatives	6.66%	5.94%	-0.13%	0.85%
355.Rubber products	5.72%	2.04%	2.86%	0.82%
356.Plastic products	4.12%	1.86%	4.34%	-2.09%
361.Clay, crockery and porcelain objects	-0.90%	-0.66%	2.18%	-2.41%
362.Glass and glass products	-0.66%	-0.53%	3.91%	-4.04%
369.Other non metallic mineral products	-0.94%	-1.19%	2.78%	-2.53%
372.Basic non-ferreous metal industries	3.47%	1.70%	2.84%	-1.06%
381.Fabric. metal products, except mach. & transp. equip.	4.28%	2.04%	2.14%	0.11%
382.Machinery except electrical	5.46%	2.97%	2.13%	0.35%
383.Electric and electronic equipment	8.02%	3.64%	2.91%	1.47%
384.Transportation Equipment	0.89%	0.89%	0.48%	-0.47%
390.Miscellaneous Manufacturing	-4.53%	-2.93%	1.76%	-3.35%
230-290.	-2.07%	-1.54%	0.05%	-0.58%
Total	2.39%	1.09%	2.03%	-0.74%

Table 9: Nicaragua 1990-1996
Sources of Economic Growth for 20 Manufacturing Industrial Branches
(Average Annual Rates)

Industrial Branch	Value Added Growth	Contribution of		
		Labor	Capital	TFP
Foods	1.2%	1.06%	1.95%	-1.8%
Drinks	11.8%	3.90%	5.84%	2.0%
Tobacco Products	4.4%	1.03%	5.27%	-1.9%
Textile Mill Products	-16.7%	-4.31%	-1.33%	-11.1%
Apparel and other textile products excluding shoes	-24.7%	-4.96%	-6.26%	-13.4%
Leather and leather products excluding shoes	3.1%	1.57%	4.02%	-2.5%
Shoes except those made of rubber or plastic	4.9%	2.17%	2.69%	0.0%
Lumber, cork and wood products except furniture	1.9%	1.13%	1.30%	-0.5%
Furniture and Fixtures, except those mainly metallic	2.1%	-0.21%	2.29%	0.0%
Paper and allied products	2.5%	1.43%	3.65%	-2.6%
Printing and Publishing	-1.2%	1.04%	2.29%	-4.5%
Chemical Substances	-7.8%	-1.45%	0.44%	-6.7%
Petroleum and derivatives	0.3%	0.30%	4.65%	-4.6%
Rubber products	-7.6%	-2.19%	1.26%	-6.7%
Non metallic mineral products	7.8%	3.16%	3.62%	1.0%
Fabric. metal products, except mach. & transp. equip.	-12.4%	-2.85%	-1.43%	-8.1%
Machinery including electrical	-17.0%	-4.92%	-2.07%	-10.0%
Transportation Equipment	12.7%	5.39%	3.19%	4.1%
Miscellaneous Manufacturing	13.4%	4.17%	4.83%	4.4%
TOTAL	1.2%	-0.80%	4.32%	-2.3%

Table 10: Honduras 1985-1990
Sources of Economic Growth for 26 Manufacturing Branches
(Annual Average Rates)

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	5.70%	3.62%	2.15%	-0.07%
313.Drinks	1.23%	2.37%	1.72%	-2.86%
314.Tobacco Products	3.38%	-0.66%	2.51%	1.53%
321.Textile Mill Products	13.19%	7.03%	1.24%	4.92%
322.Apparel and other textile products excluding shoes	11.51%	10.53%	1.73%	-0.74%
323.Leather and leather products excluding shoes	12.46%	5.37%	1.70%	5.39%
324.Shoes except those made of rubber or plastic	14.19%	10.12%	0.72%	3.35%
331.Lumber, cork and wood products except furniture	1.71%	4.96%	0.29%	-3.53%
332.Furniture and Fixtures, except those mainly metallic	6.12%	0.60%	0.88%	4.64%
341.Paper and allied products	11.70%	5.47%	4.14%	2.09%
342.Printing and Publishing	1.55%	3.53%	0.97%	-2.96%
351.Industrial Chemical Substances	16.34%	6.83%	5.03%	4.48%
352.Other chemical products	6.53%	3.65%	1.93%	0.95%
353.Petroleum refineries	8.80%	3.89%	3.61%	1.30%
355.Rubber products	5.16%	4.52%	1.06%	-0.42%
356.Plastic products	3.82%	0.10%	2.18%	1.54%
361.Clay, crockery and porcelain objects	44.16%	20.67%	11.40%	12.08%
369.Other non metallic mineral products	9.05%	5.07%	2.62%	1.36%
371.Basic iron and steel industries	32.20%	12.70%	12.14%	7.36%
372.Basic non-ferrous metal industries	0.34%	0.11%	1.15%	-0.93%
381.Fabric. metal products, except mach. & transp. equip.	7.04%	3.06%	3.36%	0.62%
382.Machinery except electrical	7.88%	1.30%	4.45%	2.14%
383.Electric and electronic equipment	4.36%	-0.69%	3.96%	1.09%
384.Transportation Equipment	11.61%	8.62%	3.60%	-0.61%
385.Professional and scientific equipment	1.21%	4.04%	1.10%	-3.92%
390.Miscellaneous Manufacturing	10.68%	8.07%	3.09%	-0.47%
Total	5.31%	3.33%	2.13%	-0.15%

Table 11: Honduras 1990-95
Sources of Economic Growth for 26 Manufacturing Branches
(Annual Average Rates)

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	5.34%	2.72%	3.97%	-1.35%
313.Drinks	6.64%	-1.39%	4.31%	3.73%
314.Tobacco Products	6.93%	2.40%	4.73%	-0.19%
321.Textile Mill Products	-3.08%	-4.38%	1.04%	0.26%
322.Apparel and other textile products excluding shoes	41.04%	32.24%	5.93%	2.88%
323.Leaner and leather products excluding shoes	1.29%	0.60%	3.25%	-2.56%
324.Shoes except those made of rubber or plastic	-0.01%	-4.01%	0.71%	3.29%
331.Lumber, cork and wood products except furniture	3.53%	-4.53%	1.14%	6.92%
332.Furniture and Fixtures, except those mainly metallic	1.85%	2.07%	1.46%	-1.69%
341.Paper and allied products	6.00%	3.79%	5.11%	-2.90%
342.Printing and Publishing	4.92%	2.05%	1.64%	1.22%
351.Industrial Chemical Substances	0.62%	-0.43%	6.53%	-5.47%
352.Other chemical products	5.56%	2.23%	3.22%	0.11%
353.Petroleum refineries	-31.99%	-5.79%	0.55%	-26.75%
355.Rubber products	-3.48%	-4.00%	1.09%	-0.57%
356.Plastic products	2.63%	1.58%	2.65%	-1.59%
361.Clay, crockery and porcelain objects	-5.62%	-2.50%	4.72%	-7.84%
369.Other non metallic mineral products	10.00%	1.78%	5.82%	2.39%
371.Basic iron and steel industries	-7.36%	-3.42%	5.77%	-9.70%
372.Basic non-ferrous metal industries	6.90%	3.27%	2.30%	1.33%
381.Fabric. metal products, except mach. & transp. equip.	-0.96%	-1.07%	3.29%	-3.18%
382.Machinery except electrical	1.90%	0.94%	4.24%	-3.28%
383.Electric and electronic equipment	-4.06%	2.60%	4.30%	-10.96%
384.Transportation Equipment	13.27%	4.88%	2.59%	5.80%
385.Professional and scientific equipment	-3.10%	-6.51%	1.46%	1.95%
390.Miscellaneous Manufacturing	-8.77%	-6.83%	2.20%	-4.14%
	4.98%	2.08%	3.71%	-0.82%

**Table 12: El Salvador 1985-1990
Sources of Growth for 20 Manufacturing Branches
(Annual Average Rates)**

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	8.23%	7.73%	2.21%	-1.71%
313.Drinks	7.97%	7.23%	2.04%	-1.30%
314.Tobacco Products	6.80%	6.07%	2.35%	-1.62%
321.Textile Mill Products	10.81%	12.26%	0.35%	-1.80%
322-324.Apparel, other textile products and shoes	5.03%	10.94%	0.00%	-5.91%
331.Lumber, cork and wood products except furniture	6.48%	7.37%	4.93%	-5.82%
332.Furniture and Fixtures	9.25%	12.18%	1.27%	-4.19%
341.Paper and allied products	6.52%	10.73%	0.45%	-4.65%
342.Printing and Publishing	12.13%	11.83%	0.57%	-0.27%
323.Leather and leather products excluding shoes	8.42%	10.94%	3.01%	-5.54%
355-356.Rubber and plastic products	8.02%	9.05%	0.52%	-1.55%
351.Industrial Chemical Substances and other chemical products	7.37%	7.98%	0.69%	-1.30%
353-354.Petroleum refineries and derivatives	2.10%	4.99%	0.18%	-3.07%
36.Non-metallic mineral products	7.96%	9.26%	2.21%	-3.51%
37.Basic metal industries ¹	11.28%	11.06%	5.45%	-5.23%
381.Fabric. metal products, except mach. & transp. equip.	9.54%	10.62%	0.99%	-2.07%
382.Machinery except electrical	6.00%	8.43%	-0.21%	-2.22%
383.Electric and electronic equipment	6.83%	7.91%	0.46%	-1.54%
384.Transportation Equipment	6.35%	7.91%	0.37%	-1.94%
385-390.Miscellaneous Manufacturing	3.20%	7.77%	0.28%	-4.84%
Total	7.39%	8.09%	1.65%	-2.35%

**Table 13: El Salvador 1990-1995
Sources of Growth for 20 Manufacturing Branches
(Annual Average Rates)**

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
311-312.Food and kindred products, except drinks	6.10%	2.94%	2.71%	0.46%
313.Drinks	4.23%	0.24%	3.55%	0.45%
314.Tobacco Products	2.34%	-0.59%	1.56%	1.38%
321.Textile Mill Products	4.99%	1.83%	1.08%	2.08%
322-324.Apparel, other textile products and shoes	6.95%	2.88%	0.39%	3.67%
331.Lumber, cork and wood products except furniture	7.80%	7.73%	1.87%	-1.80%
332.Furniture and Fixtures	8.85%	2.83%	3.01%	3.01%
341.Paper and allied products	7.31%	1.20%	1.99%	4.13%
342.Printing and Publishing	5.97%	0.17%	2.71%	3.09%
323.Leaner and leather products excluding shoes	5.33%	1.90%	3.18%	0.25%
355-356.Rubber and plastic products	3.19%	0.62%	1.71%	0.86%
351.Industrial Chemical Substances and other chemical products	5.08%	1.54%	0.76%	2.78%
353-354.Petroleum refineries and derivatives	-3.55%	-3.21%	3.13%	-3.47%
36.Non-metallic mineral products	3.77%	-1.15%	3.48%	1.44%
37.Basic metal industries ¹	5.77%	0.85%	3.71%	1.21%
381.Fabric. metal products, except mach. & transp. equip.	5.19%	1.40%	1.28%	2.51%
382.Machinery except electrical	5.41%	0.00%	1.80%	3.62%
383.Electric and electronic equipment	6.44%	1.86%	0.24%	4.34%
384.Transportation Equipment	2.72%	-0.42%	0.47%	2.67%
385-390.Miscellaneous Manufacturing	5.78%	2.49%	1.35%	1.94%
Total	5.38%	2.20%	2.68%	0.50%

Table 14: Guatemala 1985-1990
Sources of Economic Growth for 18 Manufacturing Branches
(Annual Average Rates)

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
Food and kindred products, except drinks	2.62%	1.01%	3.41%	-1.79%
Drinks	2.85%	1.11%	2.31%	-0.58%
Tobacco Products	1.06%	-0.24%	0.73%	0.57%
Textile Mill Products	1.58%	-0.53%	1.82%	0.29%
Apparel and other textile products including shoes	1.79%	-0.14%	1.73%	0.20%
Lumber, cork and wood products except furniture	1.26%	-1.95%	0.75%	2.46%
Furniture and Fixtures	0.90%	0.20%	0.72%	-0.01%
Paper and allied products	0.79%	0.48%	1.26%	-0.94%
Printing and Publishing	1.06%	1.70%	2.39%	-3.03%
Leather and leather products	0.92%	-3.40%	1.46%	2.86%
Rubber and miscellaneous plastic products	0.32%	-1.14%	1.79%	-0.34%
Chemical and allied products	1.01%	-1.76%	2.52%	0.24%
Non metallic mineral products, except coal and petroleum products	1.64%	-1.90%	2.94%	0.59%
Fabricated metal products, except machinery and transportation equip.	1.22%	2.38%	2.06%	-3.22%
Machinery except electrical	0.56%	-3.97%	2.84%	1.70%
Electric and electronic equipment	0.60%	-2.49%	1.00%	2.09%
Transportation Equipment	0.92%	4.21%	1.86%	-5.14%
Miscellaneous Manufacturing	1.48%	0.74%	3.93%	-3.20%
Total	1.88%	0.40%	2.47%	-0.99%

Table 15: Guatemala 1990-96
Sources of Economic Growth for 18 Manufacturing Branches
(Annual Average Rates)

Industrial Branch	V.A. Growth	Contribution of		
		Labor	Capital	TFP
Food and kindred products, except drinks	3.08%	1.25%	2.05%	-0.22%
Drinks	3.06%	0.86%	1.92%	0.28%
Tobacco Products	1.64%	0.29%	1.13%	0.22%
Textile Mill Products	2.66%	0.44%	1.67%	0.55%
Apparel and other textile products including shoes	2.28%	-0.28%	1.62%	0.94%
Lumber, cork and wood products except furniture	2.23%	0.87%	1.37%	-0.01%
Furniture and Fixtures	2.69%	1.03%	0.46%	1.20%
Paper and allied products	2.17%	1.71%	1.48%	-1.02%
Printing and Publishing	2.13%	0.59%	2.01%	-0.48%
Leather and leather products	2.27%	0.31%	1.90%	0.06%
Rubber and miscellaneous plastic products	2.74%	0.91%	2.38%	-0.54%
Chemical and allied products	2.95%	0.66%	2.80%	-0.52%
Non metallic mineral products, except coal and petroleum products	2.63%	0.78%	3.20%	-1.35%
Fabricated metal products, except machinery and transportation equip.	2.87%	0.76%	1.93%	0.19%
Machinery except electrical	2.75%	0.52%	1.69%	0.54%
Electric and electronic equipment	2.06%	0.31%	1.96%	-0.21%
Transportation Equipment	2.91%	1.63%	1.31%	-0.03%
Miscellaneous Manufacturing	2.93%	0.55%	4.35%	-1.97%
Total	2.77%	0.75%	2.18%	-0.16%

Table 16: Costa Rica 1991-1996
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real colones of 1966]

Industrial Branch	Cumulative TFP Growth 1991-1996 (1)	Absolute Contrib. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industrial 1991 (4)	Cum Sum of (4) (5)	L/K Index 1991a (6)
351.Industrial Chemical Substances	0.1837	14.58	14.6	79.34	79.3	1.77
353.Petroleum refineries	0.0993	6.04	20.6	60.81	140.2	0.39
383.Electric and electronic equipment	0.0626	5.56	26.2	88.73	228.9	1.06
354.Petroleum derivatives	0.0386	0.00	26.2	0.12	229.0	0.12
355.Rubber products	0.0334	1.14	27.3	34.17	263.2	0.45
382.Machinery except electrical	0.0115	0.34	27.7	29.63	292.8	0.70
352.Other chemical products	0.0052	0.69	28.3	133.25	426.0	1.04
381.Fabric. metal products, except mach. & transp. equip.	0.0011	0.05	28.4	46.86	472.9	0.62
311-312.Food and kindred products, except drinks	-0.0253	-18.19	10.2	717.64	1190.5	1.47
384.Transportation Equipment	-0.0263	-0.86	9.3	32.79	1223.3	0.45
322.Apparel and other textile products excluding shoes	-0.0333	-2.67	6.7	80.08	1303.4	1.28
230-290.	-0.0384	-0.29	6.4	7.59	1311.0	0.10
342.Printing and Publishing	-0.0435	-3.38	3.0	77.83	1388.8	1.13
323.Leaner and leather products excluding shoes	-0.0479	-0.47	2.5	9.85	1398.7	0.49
372.Basic non-ferreous metal industries ¹	-0.0648	-0.19	2.3	2.98	1401.7	0.67
356.Plastic products	-0.1010	-9.06	-6.7	89.73	1491.4	1.09
324.Shoes except those made of rubber or plastic	-0.1047	-1.77	-8.5	16.91	1508.3	0.49
314.Tobacco Products	-0.1065	-8.57	-17.1	80.44	1588.7	0.91
313.Drinks	-0.1147	-38.58	-55.6	336.33	1925.1	1.89
361.Clay, crockery and porcelain objects	-0.1160	-0.97	-56.6	8.35	1933.4	0.72
332.Furniture and Fixtures, except those mainly metallic	-0.1235	-5.14	-61.8	41.65	1975.1	1.44
369.Other non metallic mineral products	-0.1255	-9.32	-71.1	74.27	2049.4	0.97
321.Textile Mill Products	-0.1321	-9.02	-80.1	68.30	2117.6	0.56
341.Paper and allied products	-0.1357	-14.09	-94.2	103.79	2221.4	0.82
331.Lumber, cork and wood products except furniture	-0.1556	-7.64	-101.8	49.10	2270.5	0.69
390.Miscellaneous Manufacturing	-0.1837	-1.42	-103.2	7.76	2278.3	0.12
362.Glass and glass products	-0.1924	-4.71	-108.0	24.48	2302.8	1.20

Table 17: Nicaragua 1990-1996
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real *cordobas* of 1980]

Industrial Branch	Cum TFP Growth 1990-1996 (1)	Absolute Cont. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industry 1990 (4)	Cum Sum of (4) (5)	L/K Index 1990a (6)
Miscellaneous Manufacturing	21.6%	8.3	8.3	38.3	38.3	0.92
Transportation Equipment	15.5%	0.5	8.8	3.5	41.7	1.74
Drinks	7.0%	32.8	41.5	465.0	506.7	0.82
Non metallic mineral products	6.1%	8.8	50.3	143.8	650.5	1.23
Shoes except those made of rubber or plastic	-0.9%	-0.2	50.1	26.7	677.1	1.16
Furniture and Fixtures, except those mainly metallic	-2.8%	-0.4	49.7	13.9	691.1	1.48
Lumber, cork and wood products except furniture	-3.8%	-2.6	47.1	68.4	759.5	1.00
Foods	-10.5%	-129.3	-82.2	1225.6	1985.0	1.11
Tobacco Products	-12.6%	-28.7	-110.8	227.3	2212.3	0.54
Paper and allied products	-14.9%	-1.9	-112.7	12.8	2225.0	0.89
Leather and leather products excluding shoes	-16.7%	-0.8	-113.5	4.6	2229.7	1.04
Printing and Publishing	-25.2%	-17.5	-131.0	69.6	2299.3	1.27
Petroleum and derivatives	-25.3%	-40.7	-171.7	161.2	2460.4	0.47
Rubber products	-35.6%	-2.1	-173.8	5.8	2466.2	2.16
Chemical Substances	-37.8%	-70.5	-244.3	186.7	2652.9	0.78
Fabric. metal products, except mach. & transp. equip.	-45.6%	-44.4	-288.7	97.4	2750.3	1.69
Textile Mill Products	-52.2%	-108.9	-397.6	208.7	2959.0	1.52
Machinery including electrical	-52.6%	-34.1	-431.8	64.9	3023.9	1.94
Apparel and other textile products excluding shoes	-60.4%	-19.6	-451.4	32.5	3056.4	0.98

Table 18: Honduras 1985-1990
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real *lempiras* of 1978]

Industrial Branch	Cum TFP Growth 1985-1990 (1)	Absolute Cont. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industrial 1985 (4)	Cum Sum of (4) (5)	L/K Index 1985a (6)
361.Clay, crockery and porcelain objects	0.6319	136.5	136.5	216.0	216.0	1.57
371.Basic iron and steal industries	0.2912	543.8	680.2	1,867.6	2,083.5	0.91
323.Leaner and leather products excluding shoes	0.2395	666.8	1,347.1	2,784.3	4,867.8	0.71
332.Furniture and Fixtures, except those mainly metallic	0.2314	2,290.9	3,637.9	9,901.1	14,768.9	1.18
351.Industrial Chemical Substances	0.2222	417.2	4,055.1	1,877.3	16,646.2	0.66
321.Textile Mill Products	0.1834	3,168.9	7,224.0	17,275.8	33,922.0	1.34
324.Shoes except those made of rubber or plastic	0.1423	405.5	7,629.5	2,848.8	36,770.8	1.13
382.Machinery except electrical	0.1054	446.2	8,075.6	4,232.7	41,003.6	1.37
341.Paper and allied products	0.1041	1,178.5	9,254.2	11,323.4	52,326.9	1.31
356.Plastic products	0.0700	1,563.7	10,817.8	22,328.6	74,655.5	1.16
314.Tobacco Products	0.0655	3,312.2	14,130.0	50,540.9	125,196.4	0.93
369.Other non metallic mineral products	0.0552	1,615.9	15,745.9	29,299.4	154,495.8	0.66
353.Petroleum refineries	0.0503	2,334.1	18,080.0	46,364.1	200,859.9	0.99
352.Other chemical products	0.0450	1,104.9	19,184.9	24,542.9	225,402.8	0.94
383.Electric and electronic equipment	0.0431	404.6	19,589.6	9,382.8	234,785.6	0.95
381.Fabric. metal products, except mach. & transp. equip.	0.0251	644.6	20,234.2	25,691.4	260,477.0	0.89
311-312.Food and kindred products, except drinks	-0.0092	(1,457.0)	18,777.2	158,061.8	418,538.8	0.81
390.Miscellaneous Manufacturing	-0.0263	(173.0)	18,604.3	6,576.6	425,115.4	1.44
355.Rubber products	-0.0267	(255.5)	18,348.8	9,551.9	434,667.3	0.87
384.Transportation Equipment	-0.0320	(65.1)	18,283.7	2,031.8	436,699.1	1.33
322.Apparel and other textile products excluding shoes	-0.0415	(843.3)	17,440.4	20,301.0	457,000.1	1.98
372.Basic non-ferreous metal industries	-0.0588	(73.8)	17,366.6	1,255.0	458,255.1	1.04
342.Printing and Publishing	-0.1409	(2,268.0)	15,098.7	16,099.9	474,355.1	1.69
313.Drinks	-0.1437	(13,632.8)	1,465.9	94,898.7	569,253.8	0.99
385.Professional and scientific equipment	-0.1897	(204.2)	1,261.6	1,076.7	570,330.5	0.81
331.Lumber, cork and wood products except furniture	-0.2051	(7,411.6)	(6,150.0)	36,128.4	606,459.0	1.88

Table 19: Honduras 1990-1995
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real *lempiras* of 1978]

Industrial Branch	Cum TFP Growth 1990-1995 (1)	Absolute Cont. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industrial 1990 (4)	Cum Sum of (4) (5)	L/K Index 1990a (6)
331.Lumber, cork and wood products except furniture	0.3544	13,439.3	13,439.3	37,917.8	37,917.8	2.14
384.Transportation Equipment	0.2150	727.1	14,166.4	3,382.2	41,300.0	1.31
313.Drinks	0.1460	14,598.1	28,764.4	99,969.9	141,269.9	0.94
369.Other non metallic mineral products	0.1022	4,501.9	33,266.3	44,032.8	185,302.7	0.73
322.Apparel and other textile products excluding shoes	0.1019	3,404.5	36,670.8	33,407.0	218,709.7	2.31
324.Shoes except those made of rubber or plastic	0.0997	411.2	37,082.0	4,126.8	222,836.4	1.48
385.Professional and scientific equipment	0.0643	73.0	37,155.1	1,135.6	223,972.1	0.90
372.Basic non-ferreous metal industries	0.0308	38.2	37,193.3	1,237.8	225,209.9	0.85
342.Printing and Publishing	0.0294	508.2	37,701.5	17,287.2	242,497.1	1.70
352.Other chemical products	0.0038	125.7	37,827.2	33,225.2	275,722.3	0.96
321.Textile Mill Products	-0.0193	(521.3)	37,305.9	27,081.8	302,804.2	1.66
314.Tobacco Products	-0.0213	(1,232.0)	36,073.9	57,723.1	360,527.2	0.69
355.Rubber products	-0.0394	(465.1)	35,608.8	11,810.9	372,338.1	1.00
311-312.Food and kindred products, except drinks	-0.0864	(17,874.0)	17,734.8	206,830.8	579,168.9	0.87
332.Furniture and Fixtures, except those mainly metallic	-0.1262	(1,635.1)	16,099.8	12,960.1	592,129.0	1.05
356.Plastic products	-0.1274	(3,376.6)	12,723.2	26,497.1	618,626.1	0.84
323.Leaner and leather products excluding shoes	-0.1459	(663.6)	12,059.6	4,548.7	623,174.9	0.84
341.Paper and allied products	-0.1502	(2,931.4)	9,128.2	19,516.4	642,691.3	1.15
381.Fabric. metal products, except mach. & transp. equip.	-0.1613	(5,721.1)	3,407.1	35,478.8	678,170.1	0.77
390.Miscellaneous Manufacturing	-0.2048	(2,184.5)	1,222.6	10,668.2	688,838.3	1.60
382.Machinery except electrical	-0.2089	(1,258.6)	(36.0)	6,025.6	694,863.9	0.89
351.Industrial Chemical Substances	-0.2571	(999.5)	(1,035.5)	3,887.4	698,751.3	0.67
361.Clay, crockery and porcelain objects	-0.3405	(305.0)	(1,340.5)	895.8	699,647.1	1.33
371.Basic iron and steel industries	-0.4082	(2,488.8)	(3,829.3)	6,097.7	705,744.7	0.85
383.Electric and electronic equipment	-0.4722	(5,384.4)	(9,213.8)	11,403.8	717,148.5	0.59
353.Petroleum refineries	-0.8446	(55,716.6)	(64,930.4)	65,970.0	783,118.5	1.03

Table 20: El Salvador 1985-1990
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real *colones* of 1990]

Industrial Branch	Cumulative TFP Growth 1985-1990	Absolute Contrib. of TFP to Growth (1)*(4)	Cum. Sum of (2)	Value Added by Industrial 1985	Cum Sum of (4)	L/K Index 1985a
	(1)	(2)	(3)	(4)	(5)	(6)
342.Printing and Publishing	-0.0551	(3.7)	(3.7)	67.9	67.9	1.1415
351.Industrial Chemical Substances and other chemical products	-0.0883	(25.9)	(29.6)	292.8	360.7	0.4928
313.Drinks	-0.0948	(75.3)	(104.9)	794.5	1,155.2	1.0961
314.Tobacco Products	-0.1083	(24.4)	(129.3)	225.1	1,380.3	0.9533
311-312.Food and kindred products, except drinks	-0.1111	(219.1)	(348.4)	1,972.5	3,352.8	0.9341
383.Electric and electronic equipment	-0.1132	(10.7)	(359.1)	94.9	3,447.7	1.0460
321.Textile Mill Products	-0.1151	(30.4)	(389.5)	264.0	3,711.7	1.1297
384.Transportation Equipment	-0.1170	(2.1)	(391.6)	18.1	3,729.8	0.6563
355-356.Rubber and plastic products	-0.1327	(3.8)	(395.5)	29.0	3,758.8	1.0618
381.Fabric. metal products, except mach. & transp. equip.	-0.1395	(6.3)	(401.8)	45.1	3,803.9	1.2257
382.Machinery except electrical	-0.1399	(5.9)	(407.7)	42.1	3,846.1	0.8304
36.Non-metallic mineral products	-0.1805	(49.2)	(456.9)	272.7	4,118.8	0.9743
353-354.Petroleum refineries and derivatives	-0.1836	(85.3)	(542.2)	464.8	4,583.6	0.7619
332.Furniture and Fixtures	-0.2144	(24.0)	(566.2)	112.0	4,695.6	1.2822
341.Paper and allied products	-0.2478	(21.9)	(588.1)	88.2	4,783.9	1.5815
385-390.Miscellaneous Manufacturing	-0.2521	(26.6)	(614.7)	105.4	4,889.2	1.5036
37.Basic metal industries ¹	-0.2522	(30.0)	(644.6)	118.7	5,007.9	1.1376
323.Leaner and leather products excluding shoes	-0.2676	(21.9)	(666.5)	81.8	5,089.8	1.5922
331.Lumber, cork and wood products except furniture	-0.2732	(23.0)	(689.5)	84.0	5,173.8	1.2696
322-324.Apparel, other textile products and shoes	-0.2918	(78.4)	(767.9)	268.7	5,442.5	2.9087

Table 21: El Salvador 1990-1995
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real colones of 1990]

Industrial Branch	Cumulative TFP Growth 1990-1995	Absolute Contrib. of TFP to Growth (1)*(4)	Cum. Sum of (2)	Value Added by Industrial 1990	Cum Sum of (4)	L/K Index 1990a
	(1)	(2)	(3)	(4)	(5)	(6)
383.Electric and electronic equipment	0.2353	30.2	30.2	128.1	128.1	1.0955
341.Paper and allied products	0.2218	26.0	56.1	117.0	245.1	1.6536
322-324.Apparel, other textile products and shoes	0.1964	62.1	118.2	316.1	561.2	3.0028
382.Machinery except electrical	0.1923	10.5	128.7	54.7	615.9	0.9229
342.Printing and Publishing	0.1623	19.0	147.7	117.2	733.0	1.5402
332.Furniture and Fixtures	0.1574	27.1	174.8	172.0	905.0	1.4942
351.Industrial Chemical Substances and other chemical products	0.1469	60.5	235.3	411.9	1,317.0	0.5391
384.Transportation Equipment	0.1371	3.3	238.6	24.2	1,341.2	0.6983
381.Fabric. metal products, except mach. & transp. equip.	0.1269	8.6	247.2	67.9	1,409.1	1.3218
385-390.Miscellaneous Manufacturing	0.1001	12.0	259.2	120.0	1,529.0	1.3762
321.Textile Mill Products	0.0938	41.0	300.2	436.7	1,965.8	1.3986
36.Non-metallic mineral products	0.0625	24.7	324.9	394.8	2,360.6	1.0314
314.Tobacco Products	0.0492	15.1	340.0	307.3	2,667.8	0.8817
37.Basic metal industries ¹	0.0466	9.2	349.2	197.4	2,865.3	0.9685
355-356.Rubber and plastic products	0.0238	1.0	350.2	41.4	2,906.7	1.1379
313.Drinks	0.0169	19.1	369.3	1,133.8	4,040.5	1.0676
311-312.Food and kindred products, except drinks	0.0157	45.3	414.6	2,890.2	6,930.6	0.9055
323.Leaner and leather products excluding shoes	0.0067	0.8	415.4	120.7	7,051.3	1.4128
331.Lumber, cork and wood products except furniture	-0.1007	(11.5)	404.0	113.9	7,165.2	0.9503
353-354.Petroleum refineries and derivatives	-0.1835	(88.5)	315.5	482.1	7,647.2	0.6838

Table 22: Guatemala 1985-1990
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real quetzales of 1958]

Industrial Branch	Cumulative TFP Growth 1985-1996 (1)	Absolute Contrib. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industrial 1985 (4)	Cum Sum of (4) (5)	Labor/Capital Ratio Index 1985a (6)
Leather and leather products	0.1495	478.8	478.8	3,202.1	3,202.1	0.3754
Lumber, cork and wood products except furniture	0.1285	1,036.4	1,515.2	8,064.6	11,266.7	1.2760
Electric and electronic equipment	0.1074	515.4	2,030.6	4,798.6	16,065.3	1.0787
Machinery except electrical	0.0838	344.1	2,374.6	4,106.1	20,171.4	1.3530
Non metallic mineral products, except coal and petroleum products	0.0271	480.8	2,855.4	17,727.4	37,898.8	0.9470
Tobacco Products	0.0245	567.3	3,422.7	23,145.0	61,043.8	1.1262
Textile Mill Products	0.0141	580.6	4,003.3	41,301.2	102,345.0	1.0993
Chemical and allied products	0.0112	145.7	4,149.0	13,022.8	115,367.8	1.2880
Apparel and other textile products including shoes	0.0095	427.6	4,576.6	45,233.3	160,601.1	0.9025
Furniture and Fixtures	-0.0032	(28.5)	4,548.1	8,828.0	169,429.1	0.8571
Rubber and miscellaneous plastic products	-0.0168	(109.4)	4,438.7	6,523.0	175,952.1	1.3954
Drinks	-0.0318	(1,887.1)	2,551.6	59,258.0	235,210.1	1.3589
Paper and allied products	-0.0464	(358.9)	2,192.6	7,740.8	242,950.9	1.0069
Food and kindred products, except drinks	-0.0867	(10,833.9)	(8,641.3)	125,023.8	367,974.7	1.0683
Printing and Publishing	-0.1426	(1,045.8)	(9,687.1)	7,333.4	375,308.1	1.1097
Miscellaneous Manufacturing	-0.1506	(8,480.9)	(18,168.0)	56,310.9	431,619.0	0.7221
Fabricated metal products, except machinery and transportation equip.	-0.1524	(4,401.0)	(22,569.0)	28,871.5	460,490.5	0.9406
Transportation Equipment	-0.2325	(994.3)	(23,563.2)	4,275.5	464,766.0	0.3739

Table 23: Guatemala 1990-1996
Concentration of TFP Among SIC Manufacturing Branches
[Columns (2) - (5) are in millions of real *quetzales* of 1958]

Industrial Branch	Cumulative TFP Growth 1990-1996 (1)	Absolute Contrib. of TFP to Growth (1)*(4) (2)	Cum. Sum of (2) (3)	Value Added by Industrial 1990 (4)	Cum Sum of (4) (5)	Labor/Capital Ratio Index 1990a (6)
Furniture and Fixtures	0.0740	682.8	682.8	9,231.3	9,231.3	0.9289
Apparel and other textile products including shoes	0.0577	2,853.9	3,536.7	49,420.1	58,651.4	0.8746
Textile Mill Products	0.0334	1,491.6	5,028.3	44,656.1	103,307.5	1.0420
Machinery except electrical	0.0328	138.6	5,166.9	4,219.4	107,526.9	0.7551
Drinks	0.0167	1,138.5	6,305.5	68,166.8	175,693.7	1.4752
Tobacco Products	0.0133	323.8	6,629.3	24,271.0	199,964.7	1.2052
Fabricated metal products, except machinery and transportation equip.	0.0112	344.1	6,973.4	30,670.9	230,635.6	1.1840
Leather and leather products	0.0035	11.6	6,985.0	3,351.1	233,986.7	0.2546
Lumber, cork and wood products except furniture	-0.0006	(4.7)	6,980.3	8,585.4	242,572.1	1.1463
Transportation Equipment	-0.0018	(8.2)	6,972.1	4,475.2	247,047.3	0.5665
Electric and electronic equipment	-0.0125	(61.8)	6,910.2	4,943.2	251,990.5	0.8391
Food and kindred products, except drinks	-0.0129	(1,840.0)	5,070.2	142,291.4	394,281.9	1.0864
Printing and Publishing	-0.0283	(218.7)	4,851.5	7,731.5	402,013.4	1.2206
Chemical and allied products	-0.0307	(420.5)	4,431.0	13,683.6	415,697.0	0.9900
Rubber and miscellaneous plastic products	-0.0325	(215.3)	4,215.7	6,625.7	422,322.7	1.2357
Paper and allied products	-0.0600	(482.7)	3,733.0	8,052.2	430,374.9	1.1238
Non metallic mineral products, except coal and petroleum products	-0.0782	(1,503.6)	2,229.3	19,222.8	449,597.7	0.6711
Miscellaneous Manufacturing	-0.1125	(6,811.5)	(4,582.1)	60,570.7	510,168.4	0.7111