Assessing the Impact of Higher Oil Prices in Latin America

Joint Report prepared by the
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Economic Policy Sector (LCSPE)

The World Bank
Washington, DC
April 2006

Acknowledgements

Assessing the Impact of Higher Oil Prices in Latin America is the product of a joint effort by several professionals from within the Bank that was coordinated by the Chief Economist Office (LCRCE) and PREM in the Latin America and the Caribbean Region (LCR), with close collaboration with both Development Prospects Group (DECPG) and the International Monetary Fund. The report was prepared by Cesar Calderon (LCRCE) with the inputs from the Economic Policy Sector Group in PREM (LCSPE), including the following country economists and analysts: Ana Lucia Armijos, Clara Ana Coutinho de Sousa, Joost Draaisma, Christian Yves Gonzalez, Rodrigo Jarque, Rocio Lavalle, Carlos Mollinedo-Trujillo, Dante Mossi, Julio Revilla, Elizabeth Ruppert Bulmer, Rodrigo Suescún, Elaine Tinsley and Alvaro Vivanco. The report has benefited from comments by Andrew Burns, Mauricio Carrizosa, Ernesto May, Guillermo Perry and Hans Timmer. We also thank Shane Streifel for sharing data on world oil markets.

Executive Summary

1. Crude oil prices have already surpassed the US$ 70 per barrel threshold, and have increased sharply with respect to the average levels of US$ 29 per barrel in 2003 and US$ 54 per barrel in 2005, and forecasts point towards sustained higher prices due to a combination of increasing demand from fast growing economies (China and India in particular) and, more recently, uncertainties and constraints on the supply and processing of oil.
2. China has made her presence felt in the commodity markets: The Chinese demand for commodities has increased approximately 50 percent between 2000 and 2003. In particular, China represented 28 percent of the world consumption of steel in 2003, 27 percent of the world consumption of iron ore, 21 percent of aluminum, 21 percent of zinc, 19 percent of copper, and 11 percent of nickel. On the other hand, China accounted for 37 percent of the world demand of cement.
3. On the other hand, the low spare capacity in OPEC countries coupled with shortfalls in the provision of oil by non-OPEC countries is recently reinforcing expectations of high international oil prices in the medium term. Indeed, long run futures prices recently have followed the same pattern as spot prices, indicating that the markets expect tight conditions to remain in place.
4. In spite of the rising oil prices, the global economy has been resilient so far: real output in the world and among developing nations in 2005 grew by 3.2 and 5.9 percent, respectively. However, there concern of possible deterioration of the leading indicators (such as inflation) in most industrialized countries in the upward trend in oil prices continues. This will have negative consequences for the region through a slowdown of export demand or increased inflationary pressures. In addition, there will be direct pressures on growth, inflation, external accounts, and the fiscal stance of various magnitudes in each country.
5. For some Latin American countries —especially, the oil importers in the Caribbean— rising energy prices could pose a significant threat to their current account sustainability, particularly if they are accompanied by other negative shocks. In some countries the fiscal costs associated with subsidies to protect domestic consumers have been considerable so far. Hence, a better understanding of the effects of high oil prices and potential responses in the region is needed.
6. The present report evaluates the effects of oil shocks on economic performance for a sample of selected Latin American countries. Obviously, the effects at the country level depend not only on the structural characteristics of the economy, such as the degree of dependence on oil, but also on the policy reactions to rising prices. Among the countries included in our study we have:
    a. Large economies (Argentina, Brazil, Colombia and Mexico),
    b. Net oil exporters (Venezuela and Ecuador), and
    c. Net oil importers (Dominican Republic, El Salvador, Guyana and Honduras).

Recent Evolution of Commodity Prices

7. We argue that the current episode of higher oil prices in the world commodity markets is different from previous oil price hikes from different dimensions:
8. Oil price shocks in the 1970s were characterized by disruptions in the oil production of OPEC countries: world oil production declined by 1.3 mbpd in the year after the oil price shock, and the decline was even more pronounced (2.9 mbpd) in year 2 after the price shock. The production reduction was higher for OPEC countries —2 and 3.7 mbpd in year 1 and 2 after the shock, respectively. In contrast, the current episode of higher oil prices is characterized by a higher provision of oil (especially from OPEC countries): OPEC supply in 2004 was 2.3 million barrels per day, while non-OPEC countries contributed with an increase of 1 mbpd in oil supply.
9. The decline in world demand for oil after the oil shocks in the 1970s was mainly explained by a decreasing demand from OECD countries. In contrast, the current episode of higher oil prices is

characterized by a boom in demand mainly explained by higher demand for oil by non-OECD countries (particularly, China).

10. The current episode of higher oil prices is also characterized by an increasing demand for other commodities from fast-growing nations such as China and India. We find evidence that the 2002-3 period seems to be a turning point in the relationship between industrial activity in China and the evolution of commodity prices. Higher growth in China is associated with higher commodity prices (especially for metals and minerals) but also the influence of China on world commodity markets seems to have grown in magnitude.
11. We observe that in the last five years that real prices of oil and natural gas have increased steadily —along with rising industrial production in OECD countries and in China. Metals and minerals (and, especially, copper and nickel) have also increased steadily. On the other hand, agricultural commodities seem to have remained stable or slightly decreased after 2003. In previous episodes of high oil prices (e.g. oil price hikes in the 1970s and after the start of the Persian Gulf War), we observe that the increase in real oil prices is less permanent and other real commodity prices decline steadily over the next 4-5 years.

Co-movement of Commodity Prices

12. Higher oil prices could also affect the economic performance of Latin American countries through their impact on other (non-fuel) commodity prices. Comovement may exist due to common aggregate shocks to the world commodity markets and the complementarity or substitutability in consumption / production of related commodities. Given the heavy export concentration of LAC on few commodities, it is crucial to evaluate the presence of co-movement among oil and non-fuel commodity prices.
13. We use two statistics to measure the pattern of co-movement between oil prices and other non-fuel commodities: (1) the *concordance* measure, and (2) the correlation analysis.
14. he concordance statistic measures the proportion of time that two series of prices coincide in the same boom periods and in the same slump periods. This measure suggests that fluctuations in many LAC export prices and oil prices may be synchronized. Among the commodities with significant concordance we have: coffee, copper, cotton, gold, nickel, soybeans, sugar, tin and zinc. The price of coffee and soybeans seem to decline whenever oil prices rise above trend. On the other hand, the rest of the commodities seem to be rise and fall accordingly with oil price fluctuations.
15. The correlation analysis is calculated around key oil dates identified as possible break points in the co-movement between the series. We find that since the Persian Gulf War, the correlation with oil prices has increased for most commodities, especially for the group of metals and minerals. Within this group, the correlations for copper and nickel prices with oil prices displayed the largest increase. On the other hand, the correlation of most commodities with oil prices collapses after the Second Oil Shock.
16. Consistent with the increasing correlation between metals (and, especially, copper and nickel) with oil prices, we also observe that the correlation between oil prices and industrial production among advanced economies (IPI) as well as the correlation between copper and IPI experienced the largest increase in the last 5 years (2000-2005). This would imply that the demand shock from advanced economies may be driving the higher correlation between oil and metal prices.

Real Effects of Higher Oil Prices

17. We evaluate the impact of higher oil prices on economic performance for a selected sample of countries in the Latin America and the Caribbean region in the short- and long-term for different scenarios of oil and commodity price movements:

a. **Actual Scenario**: We consider the variation of oil and commodity prices in the 2004-5 period relative to the 2000-3 period.
b. **Oil Shock Scenario**: We consider the variation of oil prices in 2006-10 relative to 2001-5 using our own forecasts as well as forecasts perform by DECPG and the IMF.
c. **Commodity Shock Scenario**: We consider the variation of oil and non-fuel commodity prices in 2006-10 relative to 2001-5 using our own forecasts as well as forecasts perform by DECPG.

18. **Terms of Trade Effects**. We first evaluate the impact of higher oil prices on real income through terms of trade effects.
    a. For the *oil shock* scenario, we find that the increase in oil prices renders positive income effects for oil exporting countries, as expected. Venezuela, Trinidad and Tobago and Ecuador registered the largest terms of trade effects.
    b. For the *commodity shock* scenario, on the other hand, countries like Chile, Peru and Bolivia now achieve gains in real income due to terms of trade effects. This is partly attributed to the higher prices in copper and natural gas.
19. **Short-Run Output Responses**. Our VAR analysis suggests that higher oil prices will have a negligible impact on output in the short run in either scenario. However, the composition of output changes. For net oil exporters, domestic demand expands due to higher income effects, imports increase and net exports decline. The converse holds for net oil importers. This response is clearly observed when we compare the impulse response functions of net oil exporter and net oil importer countries —say, Venezuela and Guyana, respectively.
20. **Long-Term Output Responses**. Based on cross-country growth regression analysis, we design a back-of-the envelope approach to calculate the impact of higher oil prices on economic growth for LAC economies. We incorporate some country-specific features of these economies in our calculations: (a) the degree of openness of the country relative to the region's, and (b) the share of fuel exports and imports. In particular, we calculate the impact on economic growth of the average annual increase in the price of crude oil in 2006-10 relative to 2001-5 (say, 16.3 percent for our preferred scenario)
    a. Net oil exporters are expected to obtain the largest growth per capita benefits: Growth per capita in Venezuela is expected to increase by 0.5 percentage points per year, while growth in Trinidad and Tobago and Ecuador raises by 0.45 and 0.25 percentage points per annum.
    b. Net oil importers —especially countries in the Caribbean region— are expected to suffer the largest losses in growth per capita:

Policy Responses to Higher Oil Prices

21. **Pass-through to Domestic Prices**. The degree to which higher oil prices translate into higher consumer prices is a key policy decision for governments. Oil exporters may spend, for instance, windfall revenues in providing domestic subsidies to protect consumers from higher oil prices. We find that although the pass-through from world oil prices to domestic gasoline prices has been high for most countries in the region, the pass-through to domestic consumer prices (as proxied by the CPI) has been limited. This is also consistent that in countries where information was available, oil prices do not appear to have affected core inflation.
22. Indeed, we find that only for two countries (Dominican Republic and Honduras) the pass-through from oil prices to inflation levels is significant, while for three countries (Brazil, El Salvador and Guyana) is limited. Interestingly, countries like Argentina, Mexico and Venezuela show no significant pass-through from oil prices to domestic gasoline prices and no pass-through from oil to CPI prices.
23. **Effects on the Fiscal Stance**. Political pressures to contain domestic gasoline prices may create fiscal pressures through the provision of either explicit or implicit subsidies. On the other hand,

higher oil prices may increase government revenues in oil exporting countries which may be directed to higher spending.

24. We observe that the higher fuel bill has led to the modification of taxes and the imposition of price caps on fuel. Although the impact of the fiscal balances has been limited in large countries (that were already running strong primary surpluses), the fiscal position in Caribbean countries are already showing some signs of strain.
25. **Effects on monetary policy**. Monetary authorities will try to contain inflationary pressures stemming from higher oil prices. For instance, countries with formal inflation targeting frameworks would raise their interest rates in order to contain inflation.
26. We find that higher oil prices have a significant impact on the short-term interest rates only in the Dominican Republic (where the pass-through from oil prices to CPI is significant). For the rest of the sample, the impact is either modest or statistically negligible. This is consistent with the finding that oil prices have not affected yet core inflation.
27. **Effects on the External Sector**. As expected, higher oil prices has deteriorated the fuel trade balance of Central American and the Caribbean countries. However, the current account position of these countries remains healthy due to: (a) favorable prices in other commodities exported by these countries (especially, metals and minerals, sugar and coffee), and (b) the increasing inflow of workers' remittances.
28. After assessing the impact of higher oil prices on economic performance and the subsequent policy responses, we can infer the following policy recommendations:
    a. In countries where the government (or state-owned enterprises) sets the wholesale and/or retail price, there is a need for more transparent rules. This would avoid potential fiscal costs of price management. For oil exporting countries, it will give clear price signals in the market and provide the correct incentives for investors.
    b. Governments in oil-exporting countries should reduce the vulnerability of their fiscal accounts in the event of a decline in oil prices. For instance, Ecuador and Venezuela should be running higher primary surpluses. Actions should be taken in terms of widening the tax base, lower fuel subsidies, and reduce the wage bill.
    c. Oil-exporting countries should eliminate legal uncertainties in order to promote higher private investment in the oil sector. For instance, lack of investment in Venezuela is reflected in the problems of production sustainability faced by Petroleos de Venezuela (PDVSA), where the country is producing already below the quota assigned by the OPEC.

I. Motivation

Crude oil prices have already surpassed the US$ 70 per barrel threshold, and have increased sharply since 2003, with the price of crude oil increasing from an average of US$ 29 per barrel in 2003 to an average of US$ 54 per barrel in 2005.[1] Forecasts point towards sustained high prices as the result of two forces: a strong global demand —especially stemming from fast-growing nations such as China— and, more recently, uncertainties about the future supply of crude oil.

First, **there is an increasing demand for oil from fast-growing economies** —China and India, in particular. China has transformed itself into a major engine for global growth and the emergence of China in the global economy have generated major shifts in production, trade and investment patters across the world (Prasad and Rumbaugh, 2004). In 2004, China produced 6.7 percent of world exports and consumed 6.2 percent of world imports, becoming the third largest exporter and third largest exporter in the World. In addition, China has become a prime destination for foreign direct investment (FDI) and equity flows. Specifically, China was the world's second largest recipient of total FDI, attracting almost US$ 62 billion in 2004 (Fiess, 2005). China has also made her presence felt in the commodity markets: the Chinese demand for commodities has increased approximately 50 percent between 2000 and 2003 (Deutsche Bank, 2004). In particular, China represented 28 percent of the world consumption of steel in 2003, 27 percent of the world consumption of iron ore, 21 percent of aluminum, 21 percent of zinc, 19 percent of copper, and 11 percent of nickel. On the other hand, China accounted for 37 percent of the world demand of cement.

The emergence of China in the global economy has led several researchers and market specialists to claim that the current episode of high oil prices may be attributed in part to a much larger role for unmet demand conditions. This is a crucial difference from episodes of high oil prices in the 1970s where supply shocks were the dominant force behind the price hike. The larger role of demand shocks in explaining the current higher oil prices has important effects for some developing countries since the higher oil prices have been accompanied by rising prices in other commodities, which in turn, have helped offset (and in some cases, more than compensate for) the higher oil import bill.[2]

Figure 1 shows that the increase in oil prices has not been an isolated phenomena. On the contrary, metals and minerals have experienced similar price hikes during the last two years and a half. In particular, oil price in December 2005 almost doubled the levels observed in January 2003 (index of **181.4**), while the price index of metals and minerals more than doubled its January 2003 level (index of **210.8**). Within the groups of metals and minerals, the largest increases have been registered by copper whose price by the end of 2005 was 2.7 times higher than the one registered at the beginning of 2003. On the other hand, the price of crude oil has increased at a faster pace than the prices indices of agricultural raw materials, food and beverages. However, we should mention that the prices of coffee and sugar have increased significantly —almost doubling the levels of January 2003 (with indices by December 2005 of **196.5** and **176.6**, respectively).

In particular, the increase in the demand for metals and energy in 2004 could be attributed to a large extent to China's appetite for raw materials. Figure 2 shows the decomposition of the world demand for commodities: the share of China in the world oil demand increased from less than 10 percent in 2003 to slightly more than 30 percent in 2004, whereas the share of China in the demand for metals and minerals increased from almost 20 percent in 2003 to approximately 40 percent of the world demand in 2004.

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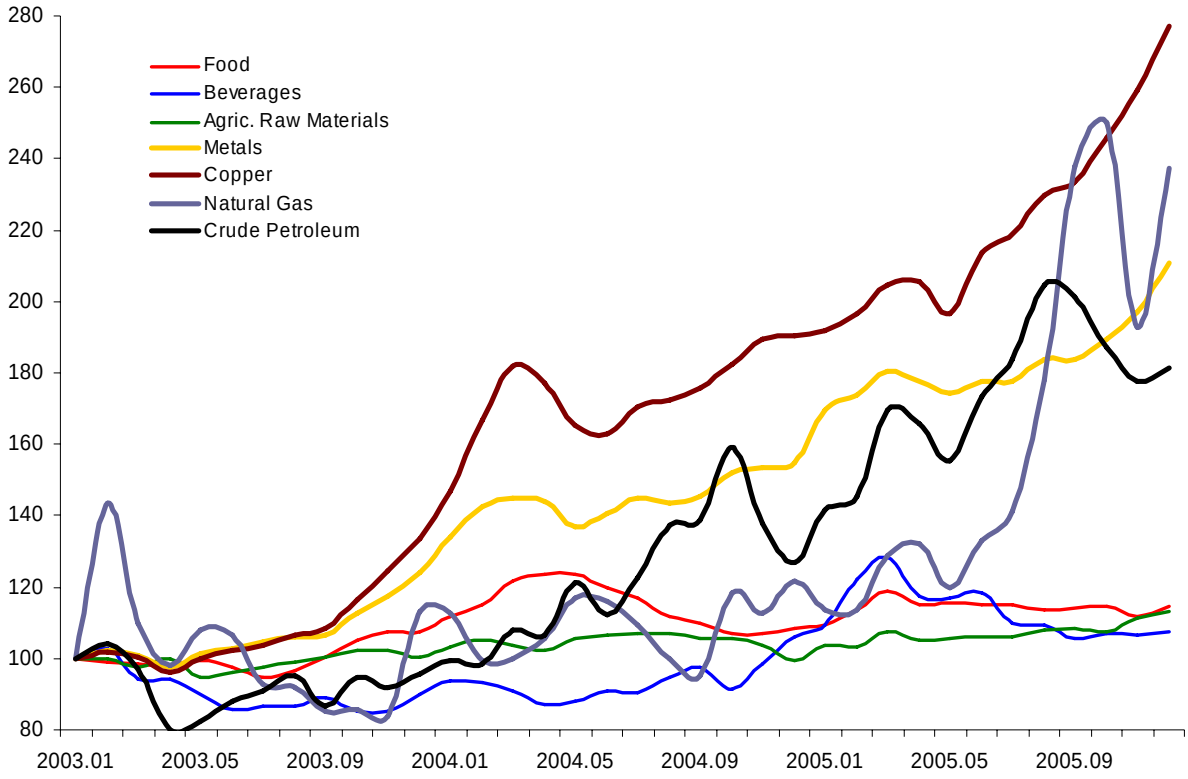
[1] So far, the average for the year 2006 is approximately US$ 62 per barrel.

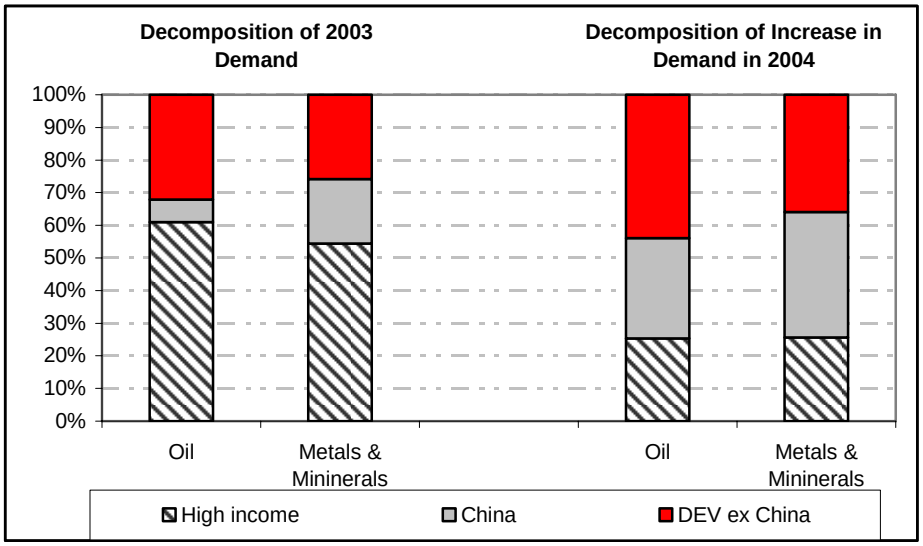
[2] This could be one of the reasons why the effects for countries such as Chile, which has enjoyed windfall revenues from cooper, have been rather subdued.

Figure 1
Commodity Price Indices, January 2003 – December 2005
(January 2003 = 100)



Source: DECPG, Commodities Group

Figure 2
Decomposition of Source of Demand for Commodities



Source: International Energy Agency.

To further test the role of China in the recent evolution of commodity prices, we update the investigation undertaken by Fiess (2005) on the relationship between the industrial production in China and a series of commodity prices. Using monthly data of industrial production from January 1997 to December 2005, we evaluate the impact of year-over-year (y-o-y) changes of monthly industrial production in China on y-o-y changes of monthly commodity prices. Following Fiess (2005) we apply recursive OLS to our data, starting with a window of 36 observations (initial sample period 1998.01 – 2000.12) and evaluate whether the degree of association of the manufacturing activity in China and a series of commodity prices has changed over time.

Figure 3 plots the recursive coefficient estimates of the industrial production index in China for the corresponding commodity price equation. In Figure 3.A we present the relationship between the Chinese industrial activity and groups of commodities as well as the world price of crude oil, whereas figures 3.B and 3.C shows the association between industrial production in China and selected agricultural commodities as well as metals and minerals, respectively. The results are quite striking:

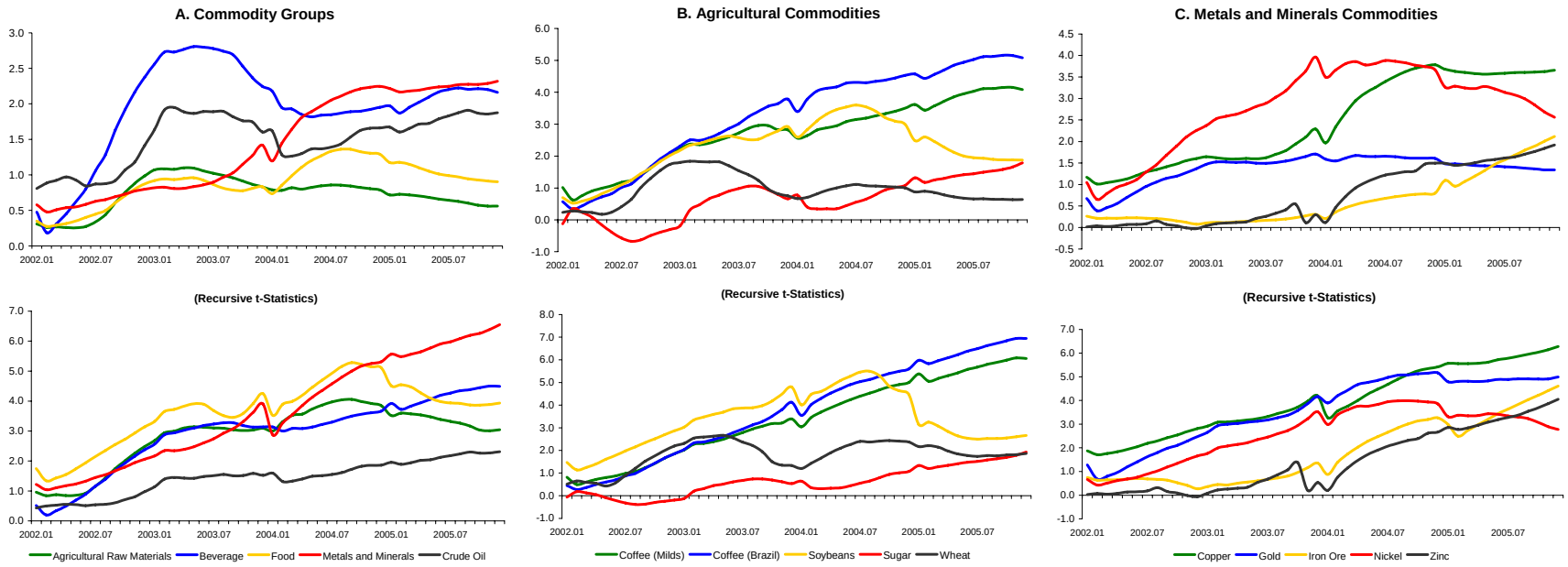
First, we find that 2002-2003 seems to be a turning point in the relationship between economic activity in China and the evolution of commodity prices. Not only the impact of China on commodity prices becomes positive and significant, but also appears to have grown in magnitude.

Second, the largest increases in correlation between industrial production in China and commodity groups are experienced by metals and minerals as well as beverages (with the result for the latter being driven by the correlation with coffee). We also observe that analogous behavior is displayed by the correlation between Chinese industrial production and the world price of crude oil, where the coefficient estimate for industrial production in China increased from 0.81 at the beginning of 2000 to 1.88 by the end of 2005 (see Figure 3.A).

Third, we report the relationship between industrial production in China and the prices of selected agricultural commodities (which include agricultural raw materials, food and beverages). We observe that the degree of association between output in China and coffee (both *Milds* and *Brazil* quotes) is positive and has increased significantly. Also, we note that since 2004, the correlation between production in China and the world price of sugar have been increasing steadily. Finally, we observe that the correlation for the price of soybeans and wheat has declined since the beginning of 2004 although it still remains positive (see Figure 3.B).

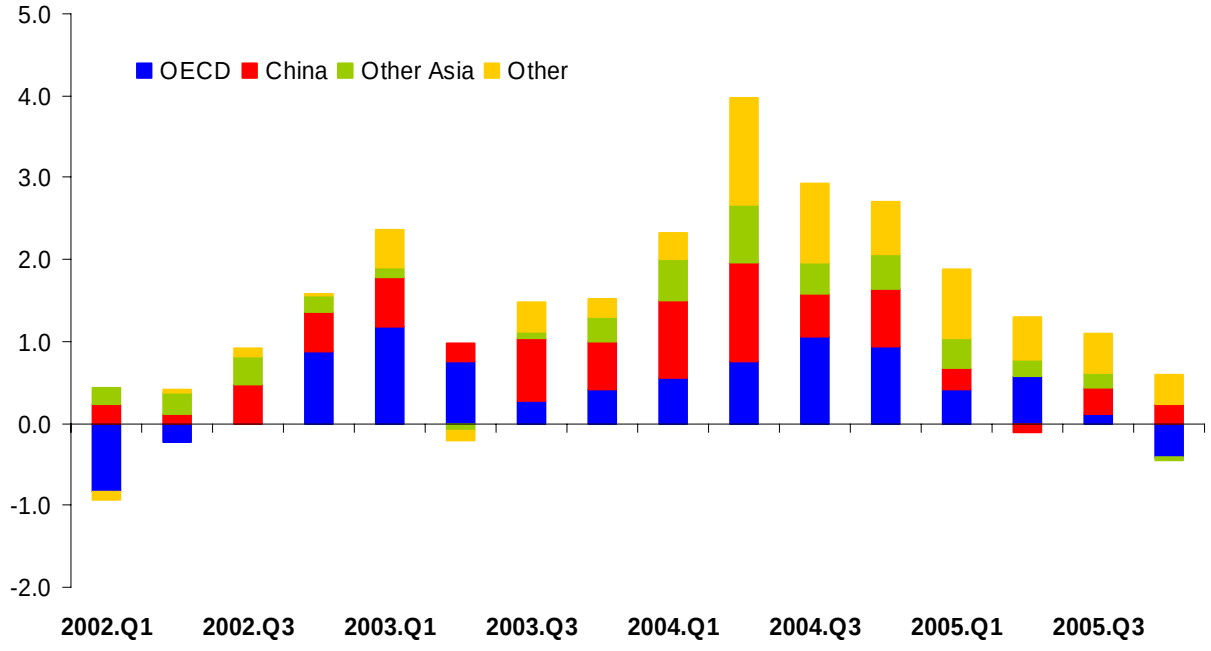
Finally, we observe an increasing trend in the positive relationship between industrial production in China and the prices of selected metals and minerals. The largest increase in correlation is displayed by the price of copper, while iron ore and zing showing a sharp increase in correlation since 2004. Although still showing a positive and significant correlation with Chinese production, the degree of association for the price of nickel and gold has declined slightly since the beginning of 2005 (see Figure 3.C).

Figure 3
The Impact of China on Commodity Prices
(Recursive Regression Coefficients and t-Statistics)



Second, **the supply and processing of oil is facing several constraints and uncertainties**. Recent figures have show that world crude oil consumption seems to have slowed down from approximately 3 million barrels per day (mbpd) in the first semester of 2004 to 0.6 mbpd in the second semester of 2005. Figure 4 shows the evolution of world oil consumption growth in the world as well as in China and OECD countries. In the case of China, oil consumption growth has declined from 1.1 million barrels per day in the first half of 2004 to 0.3 mbpd in the second half of 2005.

Figure 4
Growth in World Crude Oil Consumption
(in millions of barrels per day)

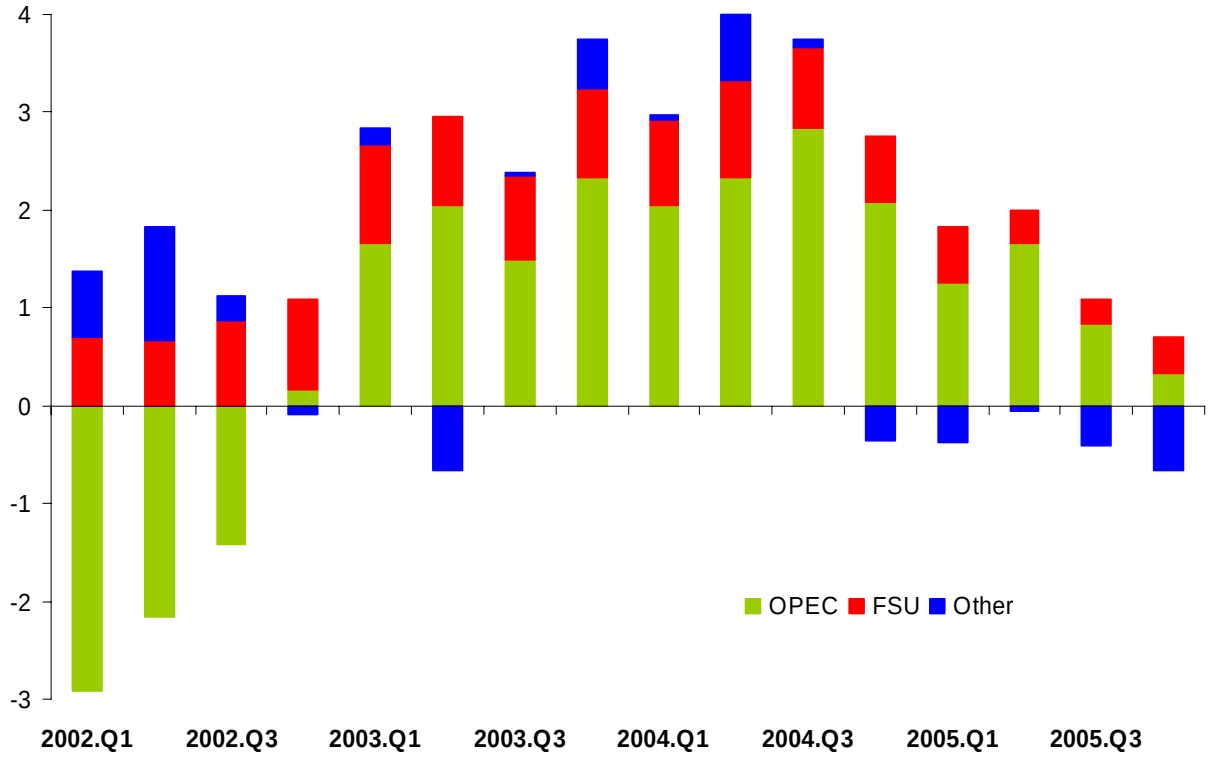


Source: International Energy Agency (IEA), DECPG Commodities Group

In addition, the additional oil supply provided to meet the increasing demand in the period 2003-5 has come from OPEC countries. Figure 5 reports the sources of growth in world crude oil supply by producers. World supply of crude oil increased by 3.5 million barrels per day in the first half of 2004, of which 2.2 mbpd were provided by OPEC countries, 0.9 mbpd by Former Soviet Union republics (FSU), and 0.4 mbpd by other oil producers. On the other hand, world oil supply only increased by 0.4 million barrels per day in the second half of 2005. During this period, 0.6 mbpd were provided by OPEC countries and 0.3 mbpd were explained by FSU, while the production by other oil producers declined 0.5 mbpd (see Figure 5).

Growth in crude oil supply coming from non-OPEC countries other than the Former Soviet Republics has been disappointing over the period 2002-5 in spite of the high oil prices. This may be attributed to the fact that unit costs for exploration, development and production of oil outside the OPEC are considerably higher. For instance, unit costs for oil production are less than US$ 2 per barrel in Saudi Arabia while this cost is higher than US$ 3 in Asia and Latin America and approximately US$ 6 in North America (Sommer, 2005).

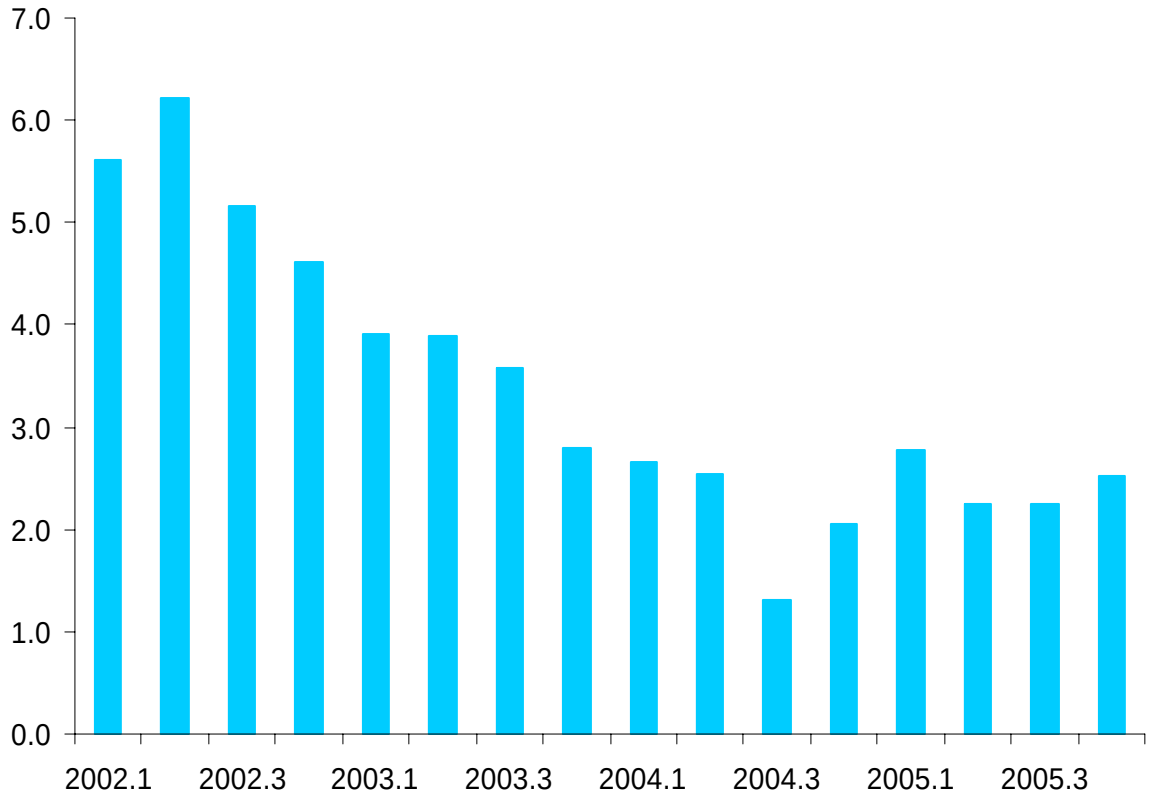
Figure 5
Growth in World Crude Oil Supply
(in millions of barrels per day)



Source: International Energy Agency (IEA), DECPG Commodities Group

On the other hand, production shortfalls in other oil exporters have reduced the spare capacity in OPEC producers (see Figure 6). After the oil shock in the early 1970s, substantial production came on line from non-OPEC countries while OPEC countries reduced their production. The lower supply by OPEC countries and the higher energy conservation on the demand side led to a significant building up of spare capacity by OPEC countries. However, the spare capacity of OPEC countries has decreased over the last years. Figure 6 shows that the OPEC spare capacity has declined from almost 6 million barrels per day in the first half of 2002 to approximately 2.3 million barrels per day in the second half of 2005. Finally, long-run futures prices recently have followed the same pattern as spot prices, indicating that the markets expect tight conditions to remain in place. Moreover, limited downstream capacity is likely to amplify exogenous shocks to supply, as it was the case in the days following Hurricane Katrina.

Figure 6
OPEC Spare Capacity
(in millions of barrels per day)



Source: International Energy Agency (IEA), DECPG Commodities Group

In the face of the current oil price shock, world GDP has remained resilient —it grew at 3.2 percent in 2005 while GDP in developing countries increased by 5.9 percent. Nevertheless, there is concern that leading indicators in most industrialized economies may deteriorate if upward trend in oil prices continues. These developments may have negative consequences for the region through a slowdown of export demand and increased inflationary pressures. In addition, there will be direct pressures on growth, inflation, external accounts, and the fiscal stance of various magnitudes in each country. Indeed, for some, such as oil importers in the Caribbean, rising energy costs could pose a significant threat to their current account sustainability, in particular if they are accompanied by other negative shocks. In some countries the fiscal costs associated with subsidies to protect domestic consumers have been considerable so far. Hence, a better understanding of the effects of high oil prices and potential responses in the region will be among the most important issues of our dialogue with the authorities.

In the present report, we evaluate the effects of oil shocks for a sample of selected LAC countries on economic performance. Obviously, the effects at the country level depend not only on the structural characteristics of the economy, such as the degree of dependence on oil, but also on the policy reactions to rising prices. For instance, have (or will) the governments let the increases in oil prices pass through domestic gasoline prices, or will they be contained through explicit or implicit subsidies? Thus, some specific information for each country (which in some cases will be qualitative) will be presented. At the

same time, in order to obtain results comparable across countries a common methodology will be applied to all countries.

The present report evaluates the impact of higher oil prices and policy responses for a selected sample of countries in the Latin America and the Caribbean region. These countries can be classified in three groups:

(1) Large economies: **Argentina, Brazil, Colombia and Mexico**
(2) Net oil exporters: **Venezuela and Ecuador**
(3) Net oil importers: **Guyana, El Salvador, Dominican Republic, and Honduras**

Finally, the report is divided in five sections. Section 1 provided a brief overview of the current state of the oil markets, putting emphasis on the drivers behind the higher oil prices experienced since 2003. Section 2 describes the evolution of international crude oil prices as well as other commodity prices. Here we distinguish the evolution of commodity prices over the present situation of higher oil prices compared to their evolution during previous oil price hikes. We analyze the co-movement among commodity prices and their relationship with indicators of the world economic activity. Section 3 evaluates the impact of higher oil prices on growth for a cross-section of countries. Our statistical analysis is conducted in three dimensions: First, we evaluate the income shocks of the higher oil prices as well as an increase in the price of other commodities across Latin American economies using both current as well as forecasted prices. Second, we evaluate the short-run response of output, domestic demand and external balance to higher commodity prices (for higher oil prices and for changes in the prices of a basket of commodities) for our selected sample of LAC countries. Third, we use a back-of-the-envelope calculation to measure the possible medium- to long-term effects of changes in oil prices on economic growth using estimates from a cross-country panel data growth regression. Section 4 presents a brief summary of the policy responses to higher oil prices in the areas of monetary and fiscal policy as well as the external sector. This section basically summarizes the results from more detailed country reports for our sample of 10 countries (listed above). The country reports are presented in an Annex that accompanies the present report. Finally, section 5 provides some conclusions and policy implications.

II. Stylized Facts on Oil and Commodity Prices[3]

2.1 Commodities and the Structure of Trade in LAC

Despite the efforts to expand the export base over the last decades, the region's export trade is still dominated by a few primary commodities. The main five export goods represent between 24% (Brazil and El Salvador) and 91% (Venezuela) of total exports. In 16 out of the 27 LAC countries listed in Table 1, five export goods represent more than 50% of total exports in 2004. The heavy reliance on exports of a few commodities is more apparent in South America and the Caribbean. Central America seems to be more open and has a broader export base.

Table 1
LAC: Main Export Commodities and Their Share in Total Commodity Exports (2004)

	Commodity 1		Commodity 2		Commodity 3		Commodity 4		Commodity 5		Total share main 5 commodities
South America											
Argentina	Soyabean oil	17.3%	Oil	12.2%	Soya beans	5.1%	Wheat & meslin	4.0%	Maize	3.5%	42.1%
Bolivia	Petroleum gases	27.7%	Soyabean oil	17.1%	Oil	7.6%	Zinc	6.7%	Tin	5.1%	64.2%
Brazil	Soyabeans	9.1%	Iron ores	5.0%	Motor cars	3.5%	Aircraft	3.5%	Meat	2.9%	24.0%
Chile	Copper	46.1%	Molybdenum ores	3.9%	Wood	3.9%	Fish	3.3%	Wine	2.7%	60.0%
Colombia	Oil	25.2%	Coal	10.6%	Coffee	5.8%	Flowers	4.2%	Ferroalloys	3.8%	49.5%
Ecuador	Oil	54.3%	Bananas	13.5%	Flowers	4.5%	Fish	4.2%	Crustaceans	4.2%	80.7%
Panama	Fish	38.4%	Bananas	12.2%	Crustaceans	10.4%	Melons	8.0%	Iron & steel	2.3%	71.4%
Paraguay	Soya beans	35.6%	Soya-bean oil	17.4%	Meat	9.7%	Cotton	7.7%	Leather	3.3%	73.6%
Peru	Copper	19.0%	Gold	19.0%	Animal feed of meat or fish	7.71%	Oil	4.1%	Zinc	3.9%	53.6%
Uruguay	Meat	20.6%	Rice	6.2%	Leather	5.4%	Oil	4.4%	Wool	3.7%	40.2%
Venezuela*	Oil	83.9%	Iron & steel	4.4%	Aluminium	1.7%	Alcohol	0.5%	Motor vehicles	0.4%	91.0%
Central America and Mexico											
Costa Rica	Office machines	23.7%	Bananas	9.7%	Medical instruments	8.1%	Dates, figs, pineapples, etc.	3.5%	Medicaments	3.4%	48.3%
Guatemala	Coffee	11.4%	Bananas	9.0%	Sugar	8.1%	Oil	6.6%	Medicaments	3.7%	38.7%
El Salvador	Coffee	8.4%	Medicaments	4.6%	Oil	4.4%	Sugar	3.7%	Cereals	3.6%	24.7%
Honduras	Coffee	18.4%	Bananas	11.3%	Palm oil	5.3%	Crustaceans	4.1%	Precious metal	4.1%	43.3%
Mexico	Motor vehicles	15.8%	Oil	10.2%	Data processing machines	6.1%	Telecom equipment	5.9%	Electric conductors	3.7%	41.6%
Nicaragua	Coffee	16.5%	Meat	14.4%	Crustaceans	11.1%	Gold	6.3%	Ground-nuts	5.2%	53.5%
Caribbean											
Antigua and Barbuda*	Telecom equipment	25.1%	Paints & varnishes	4.1%	Machinery	3.4%	Textile	3.3%	Lamps & lighting fittings	2.9%	38.8%
Aruba	Ethyl alcohol	29.3%	Tobacco	15.7%	Sugar	7.2%	Cocoa	6.3%	Iron & steel	3.9%	62.5%
The Bahamas*	Plastics	19.1%	Crustaceans	18.5%	Oil	18.3%	Ethyl alcohol	10.2%	Salt	3.6%	69.7%
Barbados*	Ethyl alcohol	12.4%	Sugar	11.8%	Oil	7.8%	Electrical resistors	6.8%	Cement	6.5%	45.3%
Belize*	Crustaceans	27.2%	Fruit & vegetables juices	19.7%	Sugar	17.6%	Bananas	13.1%	Clothing accessories	6.6%	84.2%
Cuba*	Sugar	32.7%	Nickel	27.8%	Tobacco	14.5%	Crustaceans	4.6%	Fruit juices	3.0%	82.5%
Dominica	Soap	27.0%	Bananas	21.4%	Prep. oral or dental hygiene	13.5%	Paints & varnishes	4.6%	Insecticides, fungicides	4.2%	70.7%
Dominican Republic*	Iron & steel	16.8%	Oil	15.7%	Sugar	7.2%	Cocoa	4.7%	Bananas	4.0%	48.4%
Haiti*	Clothing accessories	37.7%	Essentials oils & resinoids	5.6%	Dates, figs, pineapples, etc.	5.5%	Coffee	5.5%	Articles of paper	4.8%	59.0%
Trinidad and Tobago*	Oil	39.4%	Petroleum gases	21.1%	Ammonia	8.7%	Oils from high temp coal	6.2%	Acyclic alcohols	5.9%	81.3%

Source: COMTRADE database. The nomenclature used is the Harmonized System 2002
*: Harmonized System 1996

[3] The present chapter was prepared by Cesar Calderon and Rodrigo Suescun.

In terms of export earnings, Latin America's main export goods are oil, bananas, sugar and coffee. The export of metals (aluminum, copper, gold, iron and steel, tin, zinc, etc.) also plays a key role in various economies.

Import trade is more diversified but the dependence on fuel and a few industrial imports remains substantial. The main five import commodities represent between 15% (Barbados, Colombia and Venezuela) and 44% (Argentina and Trinidad and Tobago) of total imports. Import trade is highly concentrated in terms of products. Almost every country in the region imports oil, motor vehicles, telecommunication equipment, and computer hardware.

Table 2
LAC: Main Import Commodities and Their Share in Total Commodity Imports (2004)

	Commodity 1	Commodity 2	Commodity 3	Commodity 4	Commodity 5	Total share main 5 commodities
South America						
Argentina	Electrical machinery 31.2%	Motor vehicles 6.7%	Telecom equipment 2.9%	Computer hardware 1.6%	Aircraft 1.6%	44.0%
Bolivia	Motor vehicles 6.5%	Oil 6.4%	Insecticides, fungicides 3.8%	Iron & steel 2.3%	Soya beans 2.0%	21.0%
Brazil	Oil 14.0%	Electrical parts 3.1%	Parts motor vehicles 2.9%	Parts tv, radio apparatus 1.9%	Petroleum gases 1.8%	23.8%
Chile	Oil 16.4%	Motor vehicles 6.9%	Petroleum gases 3.0%	Telecom equipment 2.1%	Computer hardware 2.1%	30.5%
Colombia	Motor vehicles 4.0%	Telecom equipment 3.9%	Aircraft 2.9%	Machinery & mech appl. 2.5%	Computer hardware 2.3%	15.6%
Ecuador	Motor vehicles 7.8%	Medicaments 4.1%	Telecom equipment 4.0%	Petroleum gases 3.5%	Oils from high temp coal 2.9%	22.4%
Panama	Oil 9.9%	Motor vehicles 7.2%	Medicaments 3.8%	Telecom equipment 3.0%	Computer hardware 2.3%	26.2%
Paraguay	Oil 13.8%	Motor vehicles 11.4%	Fertilisers 4.1%	Insecticides, fungicides 3.1%	Computer hardware 2.8%	35.3%
Peru	Oil 16.4%	Wheat 2.6%	Computer hardware 2.4%	Telecom equipment 2.0%	Motor vehicles 1.9%	25.3%
Uruguay	Oil 21.5%	Medicaments 1.8%	Electrical energy 1.8%	Fertilisers 1.8%	Insecticides, fungicides 1.7%	28.6%
Venezuela*	Motor vehicles 8.2%	Medicaments 3.3%	Telecom equipment 2.9%	Computer hardware 2.1%	Ships & boats 1.8%	18.3%
Central America and Mexico						
Costa Rica	Electrical parts 15.7%	Oil 5.6%	Motor vehicles 3.1%	Medicaments 2.9%	Telecom equipment 2.7%	30.0%
Guatemala	Oil 11.7%	Motor vehicles 8.0%	Medicaments 3.5%	Telecom equipment 1.5%	Petroleum gases 1.5%	26.1%
El Salvador	Oil 12.2%	Motor vehicles 5.2%	Medicaments 3.5%	Computer hardware 1.4%	Maize 1.2%	23.5%
Honduras	Oil 14.9%	Motor vehicles 5.4%	Medicaments 3.8%	Food preparations 1.5%	Insecticides, fungicides 1.3%	26.8%
Mexico	Motor vehicles 8.6%	Electrical parts 6.0%	Computer hardware 3.1%	Parts office machines 2.8%	Plastics 1.7%	22.1%
Nicaragua	Oil 18.7%	Medicaments 5.5%	Motor vehicles 4.1%	Telecom equipment 2.3%	Palm oil 1.3%	31.8%
Caribbean						
Antigua and Barbuda*	Petroleum 15.7%	Motor vehicles 4.0%	Computer hardware 3.4%	Beverages-water 1.9%	Telecom equipment 1.8%	26.8%
Aruba	Motor vehicles 6.1%	Ethyl alcohol 5.9%	Precious & semi-... stones 5.0%	Clothing accessories 4.1%	Articles of iron or steel 2.5%	23.5%
The Bahamas*	Petroleum 14.1%	Motor vehicles 4.9%	Telecom equipment 2.1%	Furniture 2.0%	Floating structures 1.6%	24.6%
Barbados*	Motor vehicles 4.6%	Telecom equipment 4.0%	Medicaments 3.1%	Computer hardware 2.3%	Furniture 1.5%	15.4%
Belize*	Oil 15.3%	Motor vehicles 5.9%	Printed books 3.8%	Animal feed 1.9%	Medicaments 1.9%	28.7%
Dominican Republic*	Oil 19.7%	Motor vehicles 8.7%	Petroleum gases 2.6%	Medicaments 2.4%	Parts office machines 1.8%	35.1%
Trinidad and Tobago*	Oil 27.0%	Machinery & mech appl. 10.0%	Motor vehicles 3.1%	Iron ore 2.6%	Articles of iron or steel 1.7%	44.4%

Source: COMTRADE database. The nomenclature used is the Harmonized System 2002
*: Harmonized System 1996

Oil is the most important commodity traded in the region: it is among the top 5 export items in about half of the 27 countries in LAC where data are available (Table 1). On the other hand, 18 out of 24 countries

reporting import data report oil and oil products among the top 5 import items (Table 2). This implies that for many countries in the region oil represents a major production and export sector and, at the same time, a major import activity. This is the case, for instance, of Bolivia, Ecuador, Peru, Uruguay, Guatemala, El Salvador, Bahamas and the Dominican Republic. Oil trade is more important on the import side in countries such as Brazil, Chile, Paraguay, Costa Rica, Honduras, Nicaragua, Panama, Antigua and Barbuda and Belize. Oil trade is more important on the export side in Argentina, Colombia, Mexico, Venezuela and Barbados.

2.2 Evolution of Commodity Prices around "Key Oil Events"

Sharp increases in oil prices driven by strong demand from rapidly growing countries such as China and India have also pushed the demand for other commodities. This is a distinctive feature of the current oil price hike relative to previous oil prices shocks. In the present sub-section we describe the evolution of key commodity prices as well as economic activity in industrial economies around key oil dates. See Table 3 for the key oil events under analysis.

Table 3
Key Oil Dates

October 1973	Yom-Kippur War
October 1973	Arab Oil Embargo
October 1978	Iranian Revolution
September 1980	Iran-Iraq War
August 1990	Persian Gulf War
December 2002	Civil Unrest in Venezuela
March 2003	Iraq War

Source: Kilian (2005)

We argue that the difference between previous and the current oil shock is that the latter one is being driven by a demand shock (instead of a production disruption in oil prices). Note that we use quarterly data instead of monthly data due to the lack of real GDP data at the latter frequency. Figure 7 presents the evolution of real primary commodity prices —normalized by the US producer price index of manufactured goods— and indicators of economic performance in advanced economies —the latter being approximated by real GDP as well as the industrial production index (IPI) in OECD countries.

We first observe that economic performance in OECD countries exhibit an upward trend since the beginning of 2002, jointly with fuel and energy prices (i.e. crude oil and natural gas) as well as the groups of metals and minerals —the latter being primarily driven by the upward trend in the price of copper. For instance, since the oil price hike of 1999.Q2, real copper prices have increased, on average, at a quarterly rate of 2.4 percent, whereas nickel and tin prices have grown in real terms at 3.6 and 1.8 percent.

On the other hand, real prices of food, beverages and agricultural raw materials have increased at a slower pace. Most of these prices have stabilized or even have shown a slight decline after 2003. Since 1999.Q2, real prices for coffee have declined 2.3 and 2.5 percent per quarter (see Table 4).

Figure 7
Evolution of Commodity Prices and Economic Performance of OECD Countries, 1999-2005

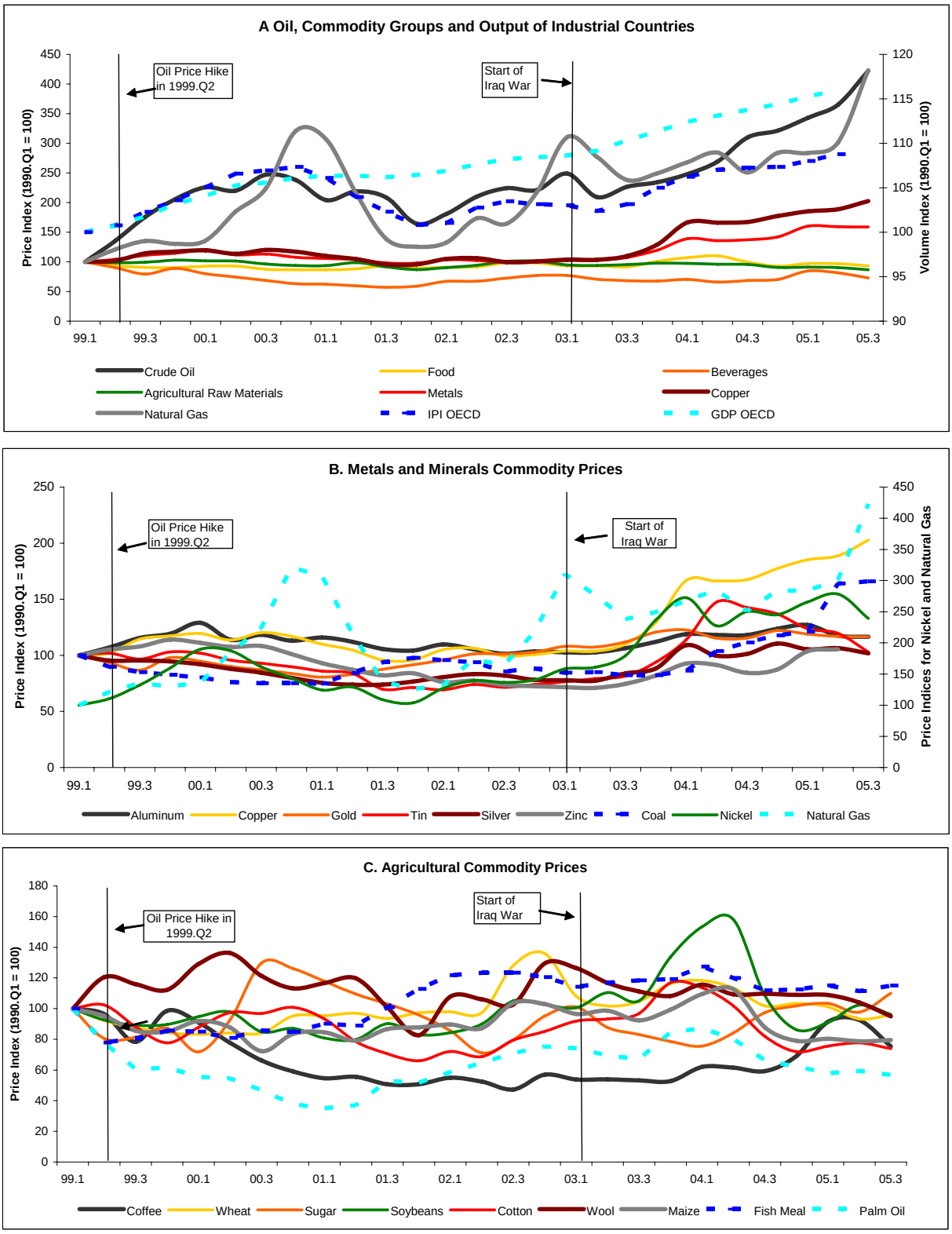


Figure 8
Evolution of Commodity Prices and Economic Performance of OECD Countries around selected Key Oil Dates

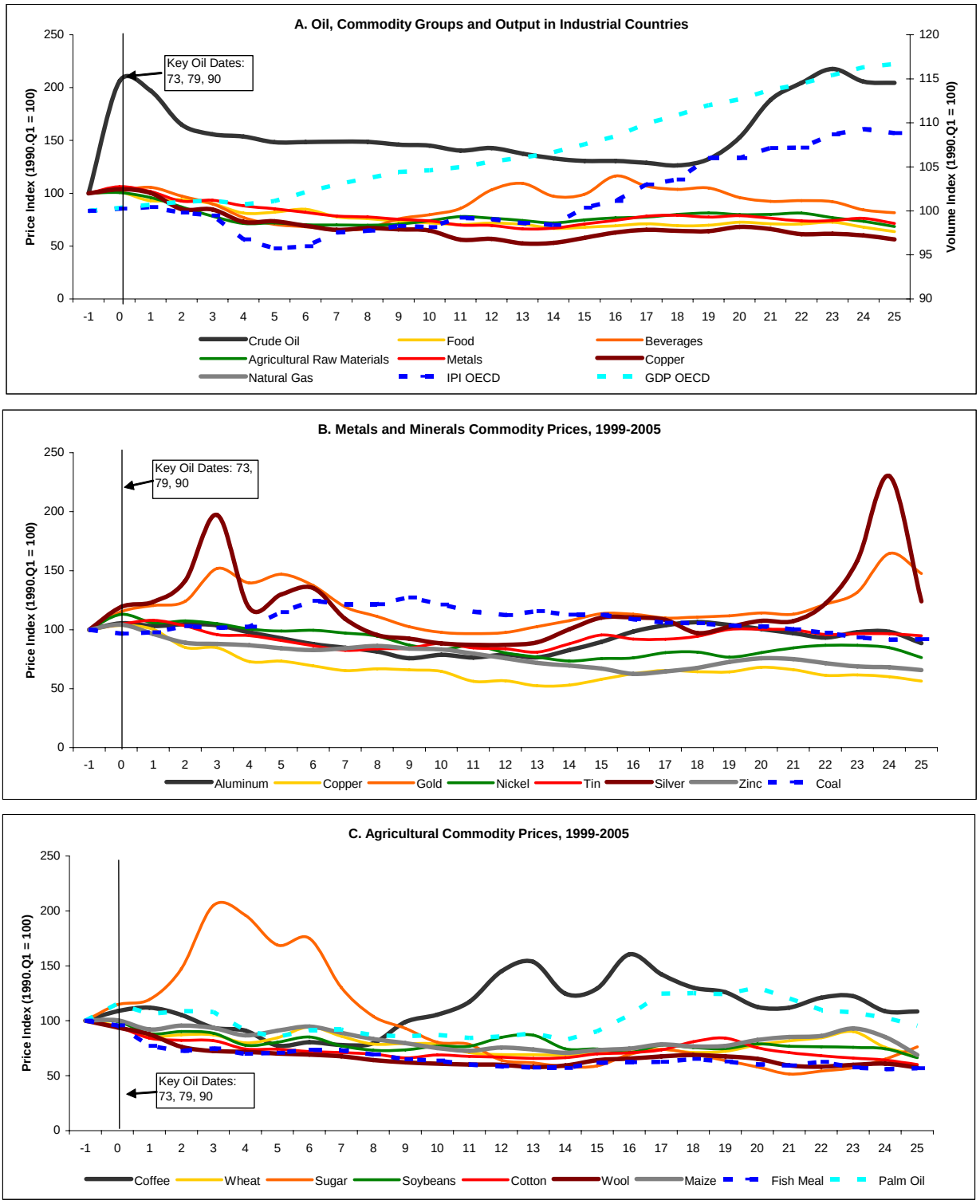


Table 4
Cumulative Variation of Prices after Key Oil Event
(average quarterly percentage change)

	Event: Oil Price Hike in 1999 Average quarterly % change after:					Event: Second Oil Shock, Start of Gulf War Average quarterly % change after:				
	1 year	2 years	3 years	4 years	5 years	1 year	2 years	3 years	4 years	5 years
Agricultural Raw Materials	**0.7**	**0.0**	**-0.4**	**-0.3**	**-0.1**	**-5.9**	**-3.9**	**-1.9**	**-1.1**	**-0.9**
Cotton	-1.2	-3.3	-3.3	-0.6	0.0	-1.6	-2.9	-3.0	-1.0	-0.5
Wool	3.1	-0.1	-1.1	-0.2	-0.5	-4.1	-3.5	-3.4	-1.5	-1.2
Food	**-0.1**	**-0.7**	**-0.2**	**0.0**	**0.8**	**-3.6**	**-1.9**	**-1.9**	**-1.6**	**-1.0**
Bananas	4.3	5.6	4.4	-0.9	1.7	-5.0	-1.5	-2.6	-0.9	-0.8
Beef	1.4	0.6	1.3	-0.6	0.9	-3.7	-3.4	-1.7	-2.2	-2.6
Fish	1.2	-3.6	-2.1	-1.7	-1.0	-1.6	0.1	-1.5	-1.6	-1.8
Fish Meal	0.9	1.7	3.8	2.5	2.2	-3.0	-2.1	-4.2	-2.3	-1.8
Maize	-2.0	-2.3	-0.7	0.2	0.8	-2.5	-1.2	-1.6	-1.0	0.0
Palm Oil	-8.9	-9.3	-1.5	-0.7	0.2	-1.1	0.1	-1.0	1.0	2.1
Rice	-6.1	-6.1	-2.3	-1.9	-0.7	3.5	1.5	-2.5	-1.6	-0.5
Shrimp	2.7	-1.9	-2.2	-1.9	-2.0	-4.8	-1.7	-0.6	0.3	3.4
Soy Meal	5.2	1.1	1.3	1.6	3.3	-3.5	-1.4	-0.5	-1.3	-1.0
Soy Oil	-2.8	-3.5	-0.8	0.7	1.9	-7.0	-4.1	-2.3	-1.7	-0.1
Soybeans	1.4	-1.8	-0.2	1.1	2.7	-5.3	-2.3	-1.3	-1.7	-0.8
Sugar	3.5	3.8	-1.0	0.5	0.2	16.2	2.4	-1.9	-0.5	-1.3
Tobacco	-2.4	-1.5	-1.4	…	…	-1.9	-1.9	-2.0	-1.6	-1.3
Wheat	-2.3	0.6	0.5	0.6	1.0	-0.5	-0.1	-0.5	-0.1	0.5
Beverages	**-4.9**	**-5.2**	**-2.5**	**-1.5**	**-1.6**	**-3.6**	**-5.3**	**-3.1**	**0.9**	**-0.2**
Cocoa	-6.7	-2.2	2.5	2.1	0.4	-6.8	-5.7	-4.2	-1.6	-1.4
Coffee (Brazil)	-3.7	-7.6	-6.2	-4.5	-2.5	-1.1	-3.0	-2.6	2.3	0.3
Coffee (Milds)	-5.4	-6.9	-5.1	-3.6	-2.3	-1.5	-6.9	-2.7	2.0	0.2
Metals and Minerals	**1.8**	**0.0**	**-0.1**	**-0.1**	**1.3**	**-1.3**	**-2.3**	**-3.1**	**-1.5**	**-1.1**
Aluminum	1.5	0.6	-0.1	-0.3	0.5	-4.7	-5.1	-5.1	-2.0	-1.3
Copper	2.7	0.3	0.3	0.1	2.4	-4.7	-3.5	-4.3	-2.0	-1.5
Gold	-1.0	-1.5	0.7	0.9	1.0	7.7	1.7	-0.4	0.5	-0.1
Iron Ore	-0.5	-0.1	0.1	0.3	0.8	1.0	-0.6	-0.4	-1.1	-1.1
Nickel	13.2	2.0	2.0	2.3	3.6	-4.6	-3.7	-4.9	-3.3	-2.0
Silver	-2.0	-3.2	-1.1	-1.3	0.2	3.5	-1.5	-2.2	0.4	-0.5
Tin	-1.6	-2.4	-2.7	-1.6	1.8	-1.3	-1.5	-3.1	-1.8	-1.0
Zinc	0.6	-2.3	-2.5	-2.4	-0.7	-7.9	-3.0	-3.4	-3.2	-1.5
Energy Commodities										
Coal	-4.1	-0.8	0.4	-0.3	0.7	-2.1	-1.3	-1.0	-1.4	-1.1
Crude Oil, Brent	**12.1**	**6.0**	**3.7**	**2.7**	**3.4**	**-2.7**	**-2.7**	**-2.8**	**-2.6**	**-2.4**
Natural Gas	10.5	7.2	3.0	5.2	4.3	…	…	…	…	…
Growth in OECD Countries										
Industrial Production	1.4	0.4	0.2	0.1	0.3	-0.1	-0.1	-0.2	0.0	0.2
Real GDP	1.1	0.7	0.6	0.5	0.6	0.2	0.4	0.3	0.4	0.5

Figure 8 shows the behavior of commodity prices and economic performance on average around three key oil events: the First Oil Shock (1973), the Second Oil Shock (1979) and the Persian Gulf War (1990). In contrast to Figure 7, we observe a more transitory increase in oil prices and a steady decline after the shock in the next 4-5 years. We also observe a recovery of real output in 6-8 quarters after the shock. All prices, with the exception of a few commodities show a downward trend. Specifically, we observe that agricultural raw materials and food commodities declined at a quarterly rate of approximately 1 percent per quarter after the shock. Same decline (1.1 percent) was experienced by metals and minerals (see Table 4). This simple graphic analysis may offer us a first insight at the different nature between the current increase in oil prices and the former ones: that is, the current oil price hike might be driven by demand shock instead of a significant oil production disruption.

2.3 Patterns of Co-Movement among Commodity Prices

Global macroeconomic shocks in world commodity markets are usually responsible for co-movement among commodity prices. Other factors that may explain this association is the complementarity and substitutability in the production or consumption of related commodities. In the present sub-section we focus on the co-movement of changes in crude oil prices and other internationally traded primary commodities.

Fluctuations in crude oil prices can affect the prices of other primary commodities from either the supply or the demand side. From the supply side, certain commodities —e.g. tea, fats and oils— have an energy-intensive production processing stage. Also, the transportation cost of commodities is also affected by shifts in oil prices. From the demand side, synthetic products derived from crude oil —e.g. synthetic rubber, man-made fibers—compete with primary commodities, while gas and coal are also affect because of their substitutability with crude oil. Finally, inflationary pressures due to rising oil prices may raise the demand and the price for precious metals since they may substitute the currency as a store of wealth (Baffes, 2005).

2.3.1 Are there any spillovers from Oil to Other Commodity Prices?

Higher oil prices can be transmitted to the price of non-fuel export commodities due to substitutability or complementary among commodities or due to associated income effects of higher oil prices among the economies in the region. It is important to explore this channel because the impact of higher oil prices in the economy could be offset or reinforced by the behavior of non-fuel commodity prices. Therefore, testing whether there is a significant pattern of co-movement between oil and non-fuel prices becomes an important question. Given the region's heavy export concentration on very few commodities highlighted in section 2.1, a broad understanding of the direction of this effect can be gained by looking at the behavior of some commodity prices.

Methodology

In order to measure the pattern of co-movement for oil prices, we use two statistics: First, we use the (non-parametric) *concordance* statistic, which measures the proportion of time that two series of prices coincide in the same boom periods and in the same slump periods.[4] Thus, the statistic takes values between zero and one. A concordance statistic equal to 0.8, for example, implies that the two series spend 80% of the time in the same state. In other words, the probability that both prices are in the same phase is 80%. Given that only two states are considered (boom phase and slump phase), the expected value of the statistic is 0.5 (or higher, if the price series drift over time) since even two unrelated series may spend about half of the time in the same phase.

To compute the degree of concordance we define $\{S_{O,t}\}$ as a dummy variable that takes the value of 1 when the oil price is in a boom and zero when it is in a slump phase, while $\{S_{P,t}\}$ takes the value of 1 (0) when the other primary commodity experiences a boom (slump). Hence the degree of concordance between the oil price and the other commodity price ($C_{O,P}$) of sample size T is:

$$C_{O,P} = \frac{1}{T}\left[\sum_{t=1}^{T}\left(S_{O,t}S_{P,t}\right)+\left(1-S_{O,t}\right)\left(1-S_{P,t}\right)\right]$$

Second, we use the correlation coefficient, a well-known parametric statistic. Here we compute the correlation between cyclical fluctuations of oil prices and other primary commodity prices. The trend-

[4] For technical information on the degree of concordances see: Cashin, P., C.J. McDermott and A. Scott (1999).

cycle decomposition is obtained using the Hodrick-Prescott filter. We should note that if we are interested in periodicity —proportion of time the 2 price series spend together in booms and slumps— the concordance measure is the appropriate measure. On the other hand, the correlation analysis picks up the amplitude of movements in a given phase (slump or boom) as well as periodicity (Cashin *et al* 1999).

Results

In order to compute the degree of concordance in the cycles of oil prices and other primary commodity prices, we need to detect boom and slump phases on each price series. To this end, we employ the NBER dating algorithm described by Bry and Boschan (1971) to locate turning points.

In Figure 9 we show the dating results of applying the Bry-Boschan algorithm to determine peaks and troughs in some selected world commodity prices, corresponding to those commodities with a highly significant relation with the price of oil. Commodity price peaks and troughs are denoted by solid vertical lines. Periods from peaks to troughs are slumps and distinguished by shaded areas while periods from troughs to peaks are booms.

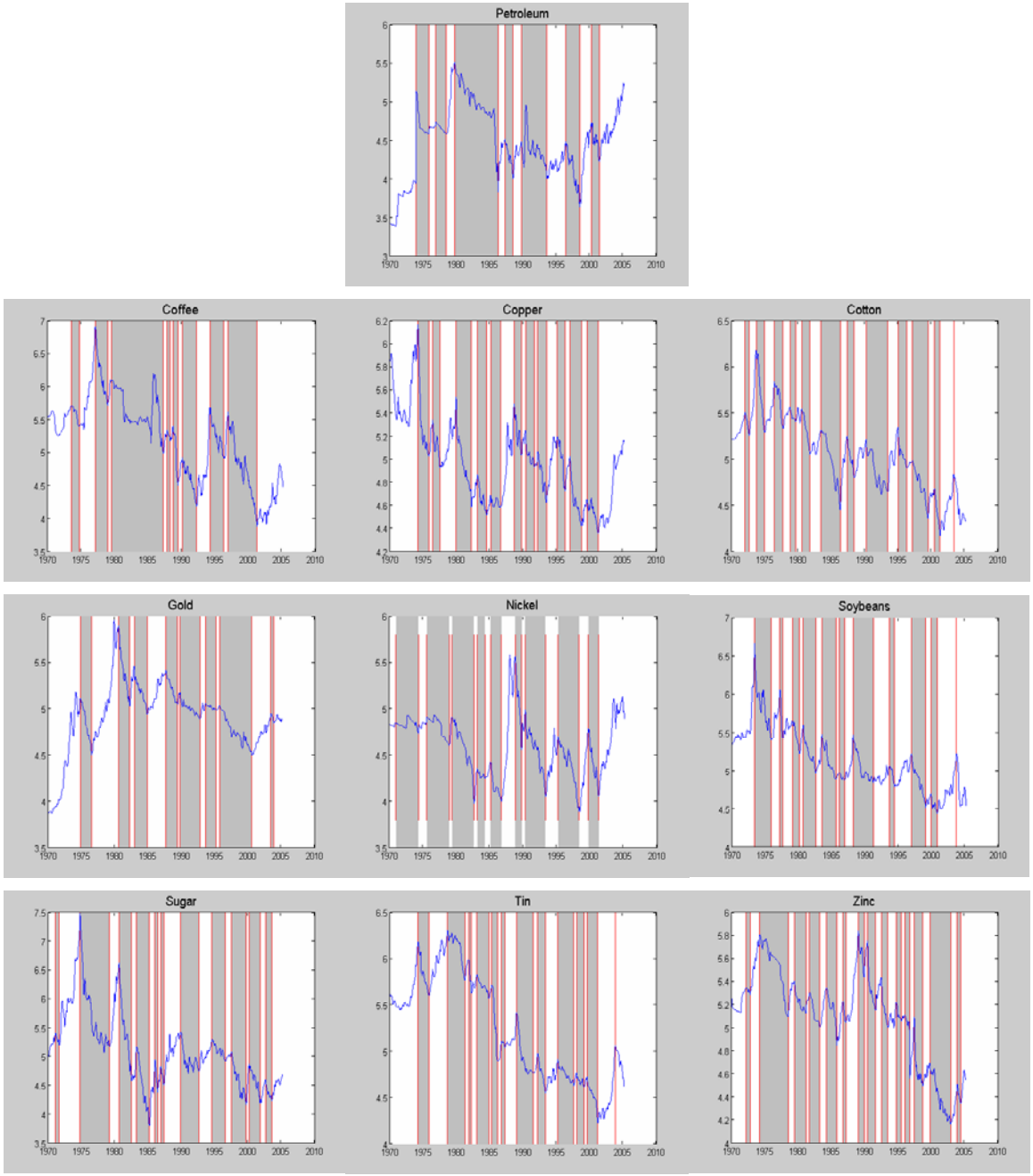
We can now construct concordance statistics to determine the extent to which the cycles of the oil price, on the one hand, and other export commodity prices, on the other hand, rise and fall in unison. Specifically, we use monthly data for 26 non-fuel internationally traded commodity prices over the period 1970-2005. Specifically we consider the prices of aluminum, bananas, beef, coal, cocoa, coffee (milds and Brazil), copper, cotton, fish, gold, iron ore, maize, natural gas, nickel, palm oil, rice, shrimp, soybeans, soybean oil, sugar, tobacco, tin, wheat, wool and zinc.

Table 5 reports concordance statistics when prices are expressed in (log) nominal and real terms. [5] Results indicate that the null hypothesis of no concordance in the bilateral relationship with oil prices is rejected for quite a few export commodities. There seems to be phase synchronization in the movements of many LAC export prices and the price of oil.

In terms of concordance of real commodity prices, we find that 19 out of 26 non-fuel primary commodities display a significance degree of concordance with fluctuations in oil prices. Among agricultural products, the largest degrees of concordance are displayed by cotton and wool (0.65), coffee (0.64), wheat, sugar and soybeans (all with 0.61). On the other hand, oil prices have a high degree of concordance with metals and other energy products such as nickel (0.64), copper (0.63), natural gas (0.63), gold (0.62) and tin (0.6).

[5] Commodity prices have been deflated by the U.S. price index for industrial goods.

Figure 9
Dating for Peaks and Troughs, Commodity Prices with Significant Relationship with Oil Prices
(logarithm of relative price indices)



Note: commodity price peaks and troughs are denoted by solid vertical lines. Periods from peaks to troughs are slumps and distinguished by shaded areas while periods from troughs to peaks are booms.

Table 5
Comovement between the Main Export Commodity Prices and the Oil Price
1970.01 – 2005.07

	Nominal prices		Relative prices[1]					
	Concordance Statistic	Stat. Signif.	Concordance Statistic	Stat. Signif.	Correlation Coefficient[2]	Stat. Signif.	Correlation Coefficient[3]	Stat. Signif.
Aluminum	0.63	***	0.55	*	0.14	***	0.09	*
Bananas	0.53		0.58	**	-0.10	*	-0.03	
Beef	0.66	***	0.55	*	-0.07		-0.05	
Coal	0.54		0.54		-0.28	***	-0.18	***
Cocoa	0.52		0.46		-0.09	*	-0.21	***
Coffee (milds)	0.54		0.54	*	-0.04		-0.17	***
Coffee (Brazil)	0.58	**	0.64	***	-0.09	*	-0.15	***
Copper	0.68	***	0.63	***	0.28	***	0.32	***
Cotton	0.70	***	0.65	***	0.15	***	0.14	***
Fish	0.66	***	0.61	***	0.12	**	-0.03	
Gold	0.61	***	0.62	***	0.17	***	0.24	***
Iron ore	na		0.54		-0.06		0.01	
Maize	0.51		0.54	*	-0.04		0.10	**
Natural Gas	0.53		0.63	***	0.06		0.23	***
Nickel	0.58	**	0.64	***	0.21	***	0.22	***
Palm oil	0.52		0.49		0.08	*	0.03	
Rice	0.49		0.59	***	0.02		0.14	***
Shrimp	0.56	*	0.47		0.00		-0.04	
Soybeans	0.66	***	0.61	***	-0.10	**	-0.10	**
Soybean oil	0.53		0.50		0.08		0.09	*
Sugar	0.56	*	0.61	***	0.10	**	0.24	***
Tobacco	0.56	*	0.48		-0.02		-0.05	
Tin	0.65	***	0.60	***	0.32	***	0.30	***
Wheat	0.58	**	0.61	***	0.02		0.14	***
Wool	0.66	***	0.65	***	0.02		0.04	
Zinc	0.63	***	0.59	***	0.27	***	0.35	***

Notes:
[1] Commodity prices deflacted by the U.S. industrial goods price index
[2] Series detrended using the Hodrick-Prescott filter with smoothing parameter set at 14400 (E-Views default value)
[3] Series detrended using the Hodrick-Prescott filter with smoothing parameter set at 100000 (Maravall and Del Rio, 2001)
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level
na: not available

Table 5 also reports the correlation coefficients of the cyclical fluctuations of oil prices and other primary commodity prices. We use the Hodrick-Prescott filter to obtain the cyclical component of commodity prices. The evidence indicates too that oil prices move together with many commodity prices. Specifically, metals and minerals display the highest (significant) positive correlation with oil price fluctuations —e.g. zinc (0.35), copper (0.32), tin (0.3), and gold (0.24). On the other hand, among energy products, oil prices have a positive and significant correlation with natural gas (0.23) and a negative and significant correlation with coal (-0.18). It is interesting to observe that beverages such as cocoa and coffee display a negative and significant correlation with oil prices that fluctuates between -0.15 and -0.21, while sugar is the agricultural commodity with the highest positive correlation with oil prices (0.24). The latter could be explained to the higher demand of sugar to produce ethanol —a substitute of crude oil.

Commodities with significant concordance and correlation statistics are: coffee (Brazil), copper, cotton, gold, nickel, soybeans, sugar, tin and zinc. Coffee and soybeans tend to move in opposite direction to oil

price fluctuations, whereas the the rest of the mentioned commodities (mainly metals), tend to rise and fall in unison with oil prices.

Finally, we evaluate the co-movement between oil prices and the unit value of exports in order to have a better understanding of the overall effect of oil price developments, not on individual commodities as in the preceding analysis, but on the whole basket of commodity exports of a country. Table 6 presents the measures of co-movement for the small set of countries for which data on the unit value of exports is available.

Table 6
LAC: Comovement between the Unit Value of Exports and the Oil Price

	Nominal prices		Relative prices[1]					
	Concordance Statistic	Stat. Signif.	Concordance Statistic	Stat. Signif.	Correlation Coeficient[2]	Stat. Signif.	Correlation Coeficient[3]	Stat. Signif.
Bolivia	0.73	***	0.79	***	0.3199	***	0.44	***
Brazil	0.56	*	0.47		-0.0465		-0.08	
Colombia	0.64	***	0.52		0.0599		-0.05	
Ecuador	0.80	***	0.79	***	0.6261	***	0.65	***
Peru	0.66	***	0.72	***	0.0792		0.11	**

Notes:
[1] Unit value of exports deflacted by the U.S. industrial goods price index
[2] Series detrended using the Hodrick-Prescott filter with smoothing parameter set at 14400 (E-Views default value)
[3] Series detrended using the Hodrick-Prescott filter with smoothing parameter set at 100000 (Maravall and Del Rio, 2001)
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level
na: not available

Results show that the oil price and the price index of exports move together closely in those economies with substantial exports of metals (Bolivia and Peru) and, obviously, oil (Ecuador).

2.3.2 Co-Movement between Oil and Commodity Prices around key oil dates

In the preceding sub-section we argue that one of the measures of co-movement between series is the correlation coefficient.[6] This statistic provides information on the periodicity and amplitude of movements between series in a given phase. However, the inference from this coefficient could be misleading in the presence of break points. For instance, Perron (1989) considered 1929 and 1973 as dates of key breaks for US macroeconomic time series. In our analysis, we consider some key oil events that may generate a break in the relationship between oil price and other commodity prices as well as with economic performance (see Table 3).

Therefore, we recalculate the correlation between oil prices and other commodity prices around key oil dates identified by Kilian (2005): the first oil shock in 1973 (Arab Oil Embargo), the second oil shock in 1979 (Iranian Revolution in 1978 and Iran-Iraq war in 1980), the Persian Gulf War in 1990, and the Iraq War (March 2003). In addition we analyze the time series properties of international crude oil prices and identified key oil price hikes in the following quarters 1974.Q1, 1979.Q1 and 1979.Q2, 1990.Q3 and 1999.Q2).[7]

[6] Pyndick and Rotemberg (1990) use the correlation analysis to measures co-movement among commodity prices.
[7] We considered increases in oil prices that were 2 standard deviations higher than the mean quarterly change in oil prices.

Using quarterly data from 1970.Q1 to 2005.Q3 we compute 5-year rolling correlations between oil price fluctuations and other primary commodity price changes (20 quarterly observations). Our correlations are computed for real commodity prices that are expressed relative to the US price index for manufacturing goods. From the evidence presented in Tables 7 through 9 as well as in Figure 7, we find some stylized facts.

- **The correlation between oil price fluctuations and the groups of primary commodity prices has either remained stable or increased since the Gulf War, with the exception of beverages (See Figure 10.A)**

We specifically find that the 5-year rolling correlation between oil prices and fluctuations in the price of food items has increased from a median of -0.17 in the period 1990-98 to +0.16 in the period 1999-2000. Note that the year indicates the starting period of the 5-year correlation.

For the group of metals and minerals, the 5-year rolling correlation increased from 0.20 in 1990-98 to 0.56 in 1999-2000. In this group of commodities we find the largest increases in correlation with oil prices fluctuations. For instance, the correlation between oil prices and copper shifted from 0.09 to 0.43, whereas the one for nickel increased from 0.06 to 0.52.

On the other hand, the correlation with oil prices among the majority of agricultural commodities seems to have decline or slightly increased (see Table 7 for more information). Clearly, the pick up in the correlation of metals and minerals with oil prices may reflect an increasing worldwide demand for these commodities.

- **The correlation between oil price fluctuations and the groups of primary commodity prices collapsed after the Second Oil Shock. (Figure 10B and 10C)**

We observe that after displaying a positive and significant association, the correlation between oil prices and some primary commodity groups —such as agricultural raw materials and metals and minerals— collapsed after the Second Oil Shock. In most cases, the correlation shifted to a negative one. Here, crude oil price increases do not respond to a demand for commodity factors in rapidly growing modern sectors of the economy (demand shock) but to oil production disruptions (supply shock) that depressed the worldwide demand for other commodities. This pattern is observed with the generalized decline in the correlation of all major groups (see Figure 10C), with the largest decline observed for beverages.

- **With the exception of beverages, the correlation between primary commodity prices and real output in OECD countries has increased after the Gulf War (see Figure 11A and 12A).**

The largest pick up in correlation between primary commodity price fluctuations and changes in industrial production in OECD economies was registered by copper and crude oil. Their correlations reached 0.6 by the end of 2005.Other commodities that exhibit a high correlation with industrial production index (IPI) in OECD are natural gas and agricultural raw materials (see Figure 11.A and Table 8).

When we perform a similar analysis using real commodity prices and real GDP fluctuation in industrial economies, we observe that the rolling correlation for oil and natural gas are smaller and that for copper (as well as metals and minerals), the correlation is still the largest one (see Table 9).

Figure 10: Rolling Correlations between Oil Prices and other Commodity Prices

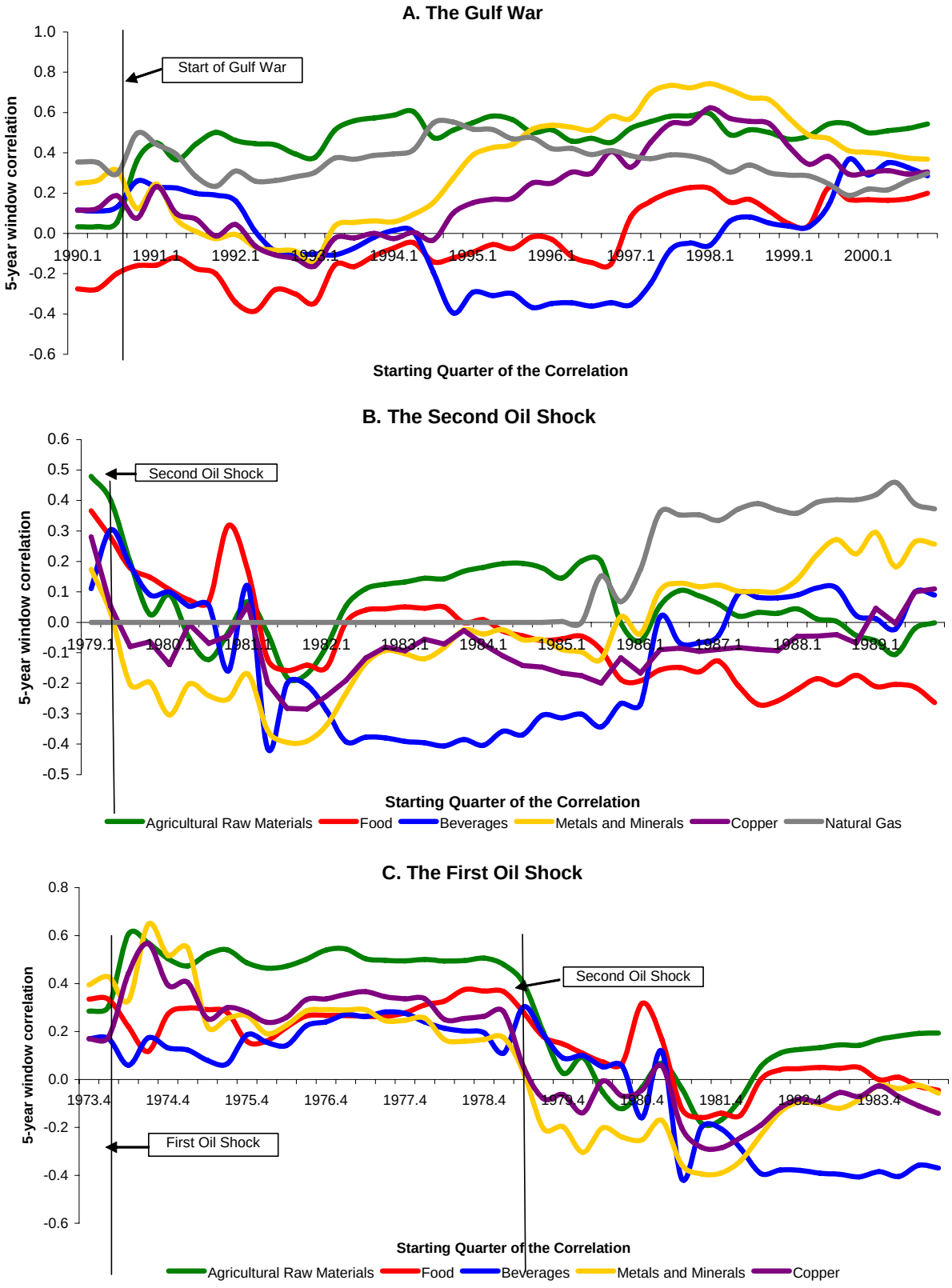


Figure 10: Rolling Correlations between Commodity Prices and IPI OECD

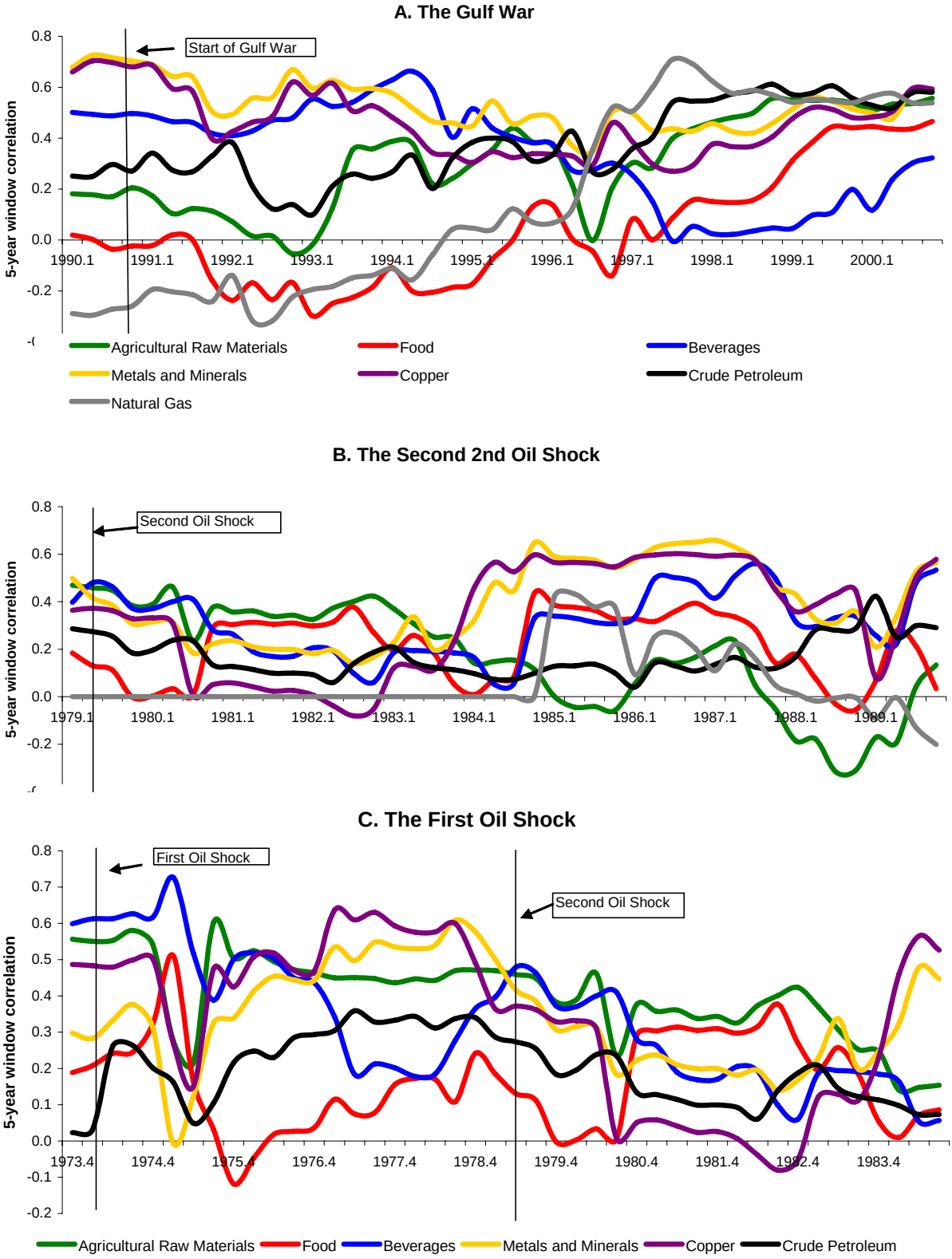


Figure 12: Rolling Correlations between Commodity Prices and Real GDP OECD

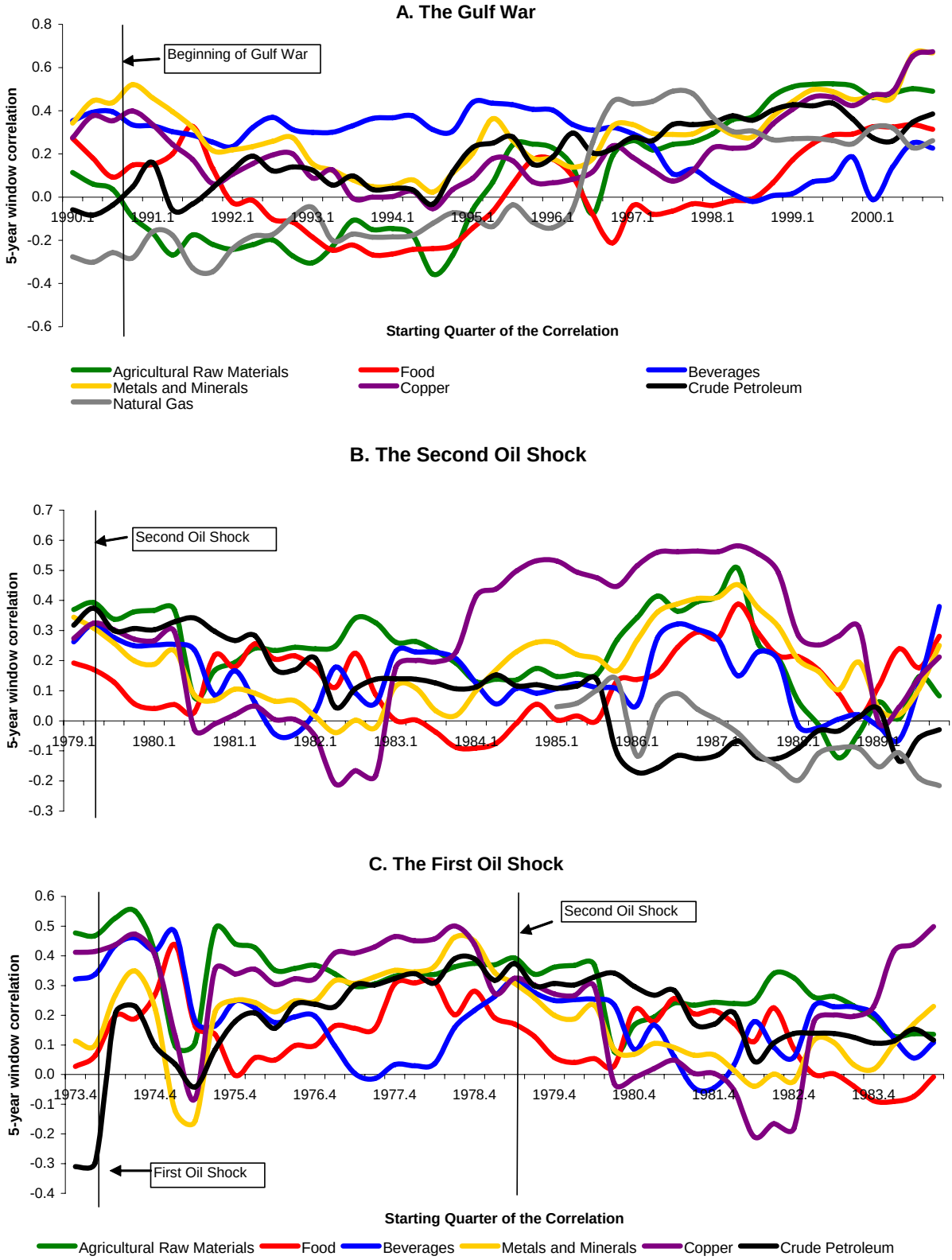


Table 7
Correlation between Oil and Commodity Prices 1/
Median of 5-year window correlation, selected periods

Commodity	1974-1978	1979-1989	1990-1998	1999-2000
Agricultural Raw Materials	**0.499**	**0.049**	**0.438**	**0.528**
Cotton	-0.105	0.111	0.038	0.037
Wool	0.407	-0.024	0.114	0.368
Food	**0.275**	**-0.106**	**-0.168**	**0.157**
Bananas	0.216	-0.208	-0.327	0.009
Beef	0.207	0.056	-0.137	-0.084
Fish	0.101	0.064	0.246	0.117
Fish Meal	-0.065	-0.101	-0.009	-0.355
Maize	0.123	-0.215	-0.344	-0.314
Palm Oil	0.114	0.208	-0.307	-0.223
Rice	-0.087	-0.151	-0.491	-0.219
Shrimp	0.264	-0.432	-0.037	0.131
Soy Meal	0.060	-0.174	0.052	0.107
Soy Oil	0.105	0.008	-0.545	-0.283
Soybeans	0.060	-0.215	-0.269	-0.046
Sugar	0.059	-0.192	0.024	0.099
Tobacco	-0.146	-0.094	-0.068	-0.273
Wheat	0.266	-0.017	-0.275	-0.196
Beverages	**0.190**	**-0.114**	**-0.075**	**0.077**
Cocoa	-0.122	-0.027	-0.236	-0.350
Coffee (Brazil)	0.209	-0.217	-0.089	0.091
Coffee (Milds)	0.293	-0.220	-0.097	-0.030
Metals and Minerals	**0.255**	**-0.057**	**0.197**	**0.562**
Aluminum	0.093	-0.125	0.073	0.369
Copper	0.316	-0.087	0.088	0.427
Gold	0.107	-0.049	-0.067	-0.031
Iron Ore	0.034	-0.132	-0.111	-0.216
Nickel	0.413	-0.063	0.059	0.523
Silver	0.232	0.040	-0.201	-0.003
Tin	0.031	0.114	0.005	0.154
Zinc	0.358	-0.059	0.177	0.286
Other Energy Commodities				
Coal	-0.183	-0.361	-0.254	-0.288
Natural Gas	…	0.365	0.390	0.302

1/ Commodity prices are expressed in log differences

Table 8
Correlation between Real Commodity Prices and Industrial Production in OECD countries 1/
Median of 5-year window correlation, selected periods

Commodity	1974-1978	1979-1989	1990-1998	1999-2000
Agricultural Raw Materials	**0.470**	**0.160**	**0.232**	**0.543**
Cotton	0.283	0.058	0.361	0.466
Wool	0.306	0.353	0.548	0.228
Food	**0.143**	**0.273**	**-0.030**	**0.439**
Bananas	0.160	0.168	-0.115	0.171
Beef	0.169	-0.066	-0.167	-0.093
Fish	-0.048	-0.003	0.080	0.288
Fish Meal	0.297	0.196	-0.008	-0.335
Maize	-0.037	0.266	-0.175	0.074
Palm Oil	0.459	0.298	0.096	-0.093
Rice	0.119	0.232	-0.166	-0.040
Shrimp	0.147	-0.169	0.071	0.404
Soy Meal	0.107	0.013	0.156	0.303
Soy Oil	0.125	0.323	-0.171	0.143
Soybeans	0.120	0.191	-0.025	0.269
Sugar	-0.051	-0.026	0.178	0.091
Tobacco	-0.060	-0.008	0.331	-0.752
Wheat	0.190	0.124	-0.203	0.162
Beverages	**0.443**	**0.315**	**0.434**	**0.158**
Cocoa	0.538	-0.006	-0.007	-0.215
Coffee (Brazil)	0.200	0.188	0.392	0.322
Coffee (Milds)	0.245	0.288	0.468	-0.027
Metals and Minerals	**0.443**	**0.336**	**0.504**	**0.529**
Aluminum	0.381	0.282	0.522	0.226
Copper	0.495	0.375	0.415	0.509
Gold	0.113	-0.141	-0.229	-0.092
Iron Ore	0.145	-0.198	-0.206	-0.134
Nickel	0.313	0.388	0.452	0.493
Silver	0.420	-0.092	0.021	0.220
Tin	0.223	0.132	0.204	0.439
Zinc	0.187	0.266	0.140	0.484
Energy Commodities				
Coal	-0.281	-0.242	-0.288	-0.424
Crude Oil, Brent	**0.279**	**0.134**	**0.316**	**0.574**
Natural Gas	…	0.102	-0.086	0.544

1/ Commodity prices and industrial production are expressed in log differences

Table 9
Correlation between Real Commodity Prices and real GDP in OECD countries 1/
Median of 5-year window correlation, selected periods

Commodity	1974-1978	1979-1989	1990-1998	1999-2000
Agricultural Raw Materials	**0.365**	**0.232**	**-0.068**	**0.507**
Cotton	0.314	-0.114	-0.179	0.276
Wool	0.178	0.289	0.279	0.128
Food	**0.167**	**0.131**	**-0.035**	**0.303**
Bananas	0.250	-0.067	-0.231	0.054
Beef	0.331	-0.104	-0.009	0.060
Fish	-0.184	-0.091	0.085	0.141
Fish Meal	0.102	0.218	0.069	-0.216
Maize	0.082	0.269	-0.115	0.021
Palm Oil	0.393	0.038	0.166	-0.221
Rice	0.165	0.126	-0.326	-0.132
Shrimp	0.139	-0.181	-0.087	0.311
Soy Meal	0.149	0.078	0.036	0.259
Soy Oil	0.149	0.150	0.032	0.054
Soybeans	0.141	0.111	-0.068	0.176
Sugar	-0.141	0.045	0.088	0.023
Tobacco	-0.136	-0.077	0.413	-0.601
Wheat	0.229	0.160	0.030	0.151
Beverages	**0.196**	**0.122**	**0.317**	**0.114**
Cocoa	0.435	0.193	0.209	-0.302
Coffee (Brazil)	0.027	0.093	0.286	0.421
Coffee (Milds)	0.073	0.088	0.304	0.109
Metals and Minerals	**0.287**	**0.169**	**0.269**	**0.477**
Aluminum	0.327	-0.034	0.209	0.232
Copper	0.404	0.276	0.140	0.468
Gold	0.030	-0.052	-0.113	-0.026
Iron Ore	-0.058	0.159	-0.037	-0.017
Nickel	0.295	0.272	0.340	0.510
Silver	0.362	0.083	-0.058	0.326
Tin	0.109	0.001	0.130	0.425
Zinc	0.045	0.309	0.247	0.565
Energy Commodities				
Coal	-0.180	-0.199	-0.228	-0.364
Crude Oil, Brent	**0.233**	**0.110**	**0.146**	**0.374**
Natural Gas	…	-0.091	-0.129	0.267

1/ Commodity prices and real GDP are expressed in log differences

- **The correlation between real primary commodity price fluctuations and indicators of real output in advanced economies declined after the First and Second Oil Shock (See Figure 11B and 11C)**

Within the first year of the oil shock, the correlation between IPI in OECD economies and metals and minerals dipped rapidly from 0.3 to approximately 0. This behavior is also observed in the case of copper, where the correlation for copper that declines from 0.5 by the end of 1973 to 0.15 by the end of 1974.

On the other hand, the correlation between real GDP in advanced economies and energy commodity prices, such as crude oil and natural gas, declined steadily after the Second Oil shock and even became negative since the mid-1980s. This is followed by a major decline in all commodity price correlations with output, although they surge at the end of the 1980s. Food and beverages were the first ones to recover although rather briefly (see figures 12B and 12C).

Recursive Estimations

In addition, we also computed some recursive-correlations based on y-o-y changes in crude oil prices and other commodity prices for the selected time periods specified above. Figure 13 reports these recursive estimates.

- **There is an increase in the correlation between some groups of commodity prices and crude oil prices after the first oil shock, with the largest increase being displayed by metals and minerals (figure 13A).**

After fluctuating around -0.3 in the time preceding the first oil shock, the correlation between metals and minerals and crude oil prices increased to 0.4 in the aftermath of the first oil shock. An analogous behavior was observe for the price of copper —which fluctuated around -0.3 in the period preceding the oil price hike and almost reached 0.2 in the aftermath. On the other hand, the correlation of oil and food prices decline in the period preceding the oil shock and then increase to approximately 0.2 in the aftermath. The correlation for the price of agricultural raw materials oscillated around a zero-correlation in the aftermath of the oil shock, whereas the correlation of beverages and oil prices increased sharply from -0.6 (average in the preceding periods) to 0.1 (average in the aftermath).

- **After the second oil shock, most commodity prices display a positive and slightly increasing correlation with oil prices. Metals and minerals as well as copper show the highest price-correlations (figure 13B).**

The correlation between oil prices and the price of metals and minerals fluctuates around 0.53, while the correlation for copper prices increases from 0.31 to 0.4. The correlation for food prices and beverage prices oscillate throughout the period around 0.2, whereas the correlation between oil prices and the price of agricultural raw materials increased from 0 in the preceding period to the shock and increased to 0.2 in the aftermath.

- **The price-correlation between crude oil and agricultural commodities (raw materials, food and beverages) is negative throughout the period and either constant or increasing. The price-correlation for metals and minerals converges to zero in the aftermath of the shock, while the correlation for copper prices and natural gas prices is positive (figure 13C).**

The price-correlation of beverages and crude oil increases from -0.6 to -0.25, while the price of foods show a declining correlation (-0.05 to -0.2). On the other hand, the price-correlation for copper increases in the aftermath of the oil price shock, whereas it declines for the price of natural gas.

- **The price-correlation between oil and metals and minerals fluctuates between 0.4 and 0.5 in the period 2000-5. On the other hand, the price-correlation for copper and natural gas increases slightly after 2003 (figure 13D)**.

We observe that the correlation between oil prices and the price of agricultural raw materials declines slightly from 0.68 before 2003 to 0.57 in 2005. In addition, the price-correlation for food and beverages is negative before 2003 and increases to a zero-correlation after 2003. On the other hand, the correlation between the price of oil and metals and minerals remains relatively unchanged fluctuating slightly between 0.4 and 0.5. An analogous behavior is displayed by the price-correlation of copper and natural gas.

2.4 Evolution of World Supply and Demand for Oil around Key Events

Figure 14 presents the evolution of world supply and demand for oil around key events in the oil markets. Panel A presents changes in demand and supply in the event of the first and second oil price shocks (**T** represents the average of annual changes in 1973 and 1978), while Panel B shows the changes in supply and demand for oil in the year 2003.

Figure 14.1 depicts the changes in world supply oil for the oil price shocks in the 1970s and the current scenario of higher oil prices. We observe that the disruption in oil production in the 1970s was entirely attributed to a decline in the supply of OPEC countries. For instance, world oil production declined by 1.3 mbpd in the year after the oil price shock, and the decline was even more pronounced (2.9 mbpd) in year 2 after the price shock. The production reduction was higher for OPEC countries —2 and 3.7 mbpd in year 1 and 2 after the shock, respectively. In contrast, world supply —and especially OPEC production— has increased significantly after the initial increase in oil prices in 2003: OPEC supply in 2004 was 2.3 million barrels per day, while non-OPEC countries contributed with an increase of 1 mbpd in oil supply. Note that in 2005 (year 2 after initial increase in oil prices), the oil supply by OPEC countries has grown at a much slower pace (1 mbpd), while supply growth for non-OPEC countries has halted.

Figure 14.2, on the other hand, displays the evolution of the world demand for oil. We observe that the decline in demand after the oil shocks in the 1970s was mainly explained by a decreasing demand from OECD countries. On the other hand, the boom in demand for oil in year one after the initial increase in oil prices in 2003 (see T+1 = 2004) was mainly explained by non-OECD countries (particularly, China). Although the growth in demand has declined, it is still mostly explained by non-OECDcountries.

Figure 13
Recursive (Regression-Based) Correlations between Oil Prices and Other Commodities

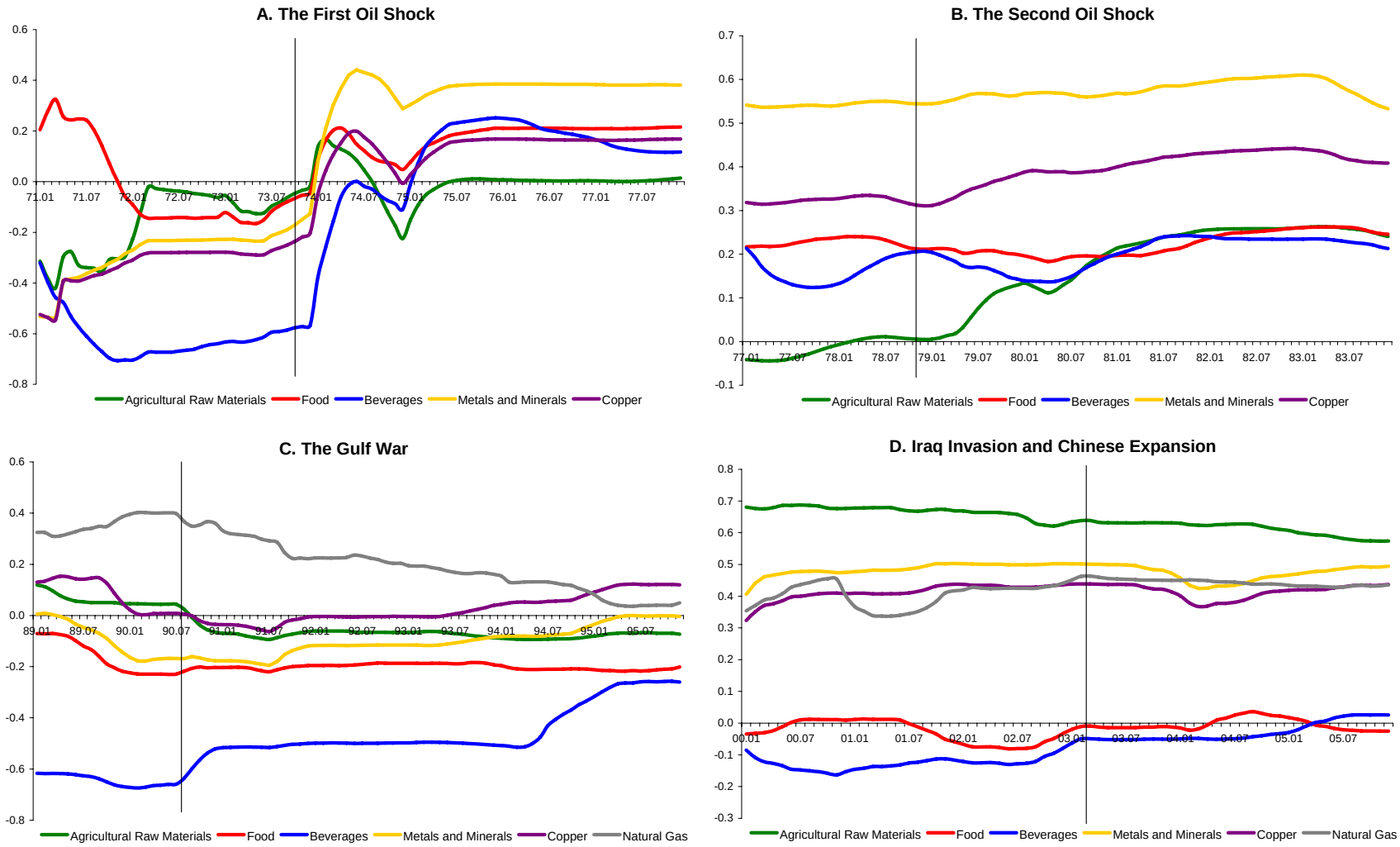
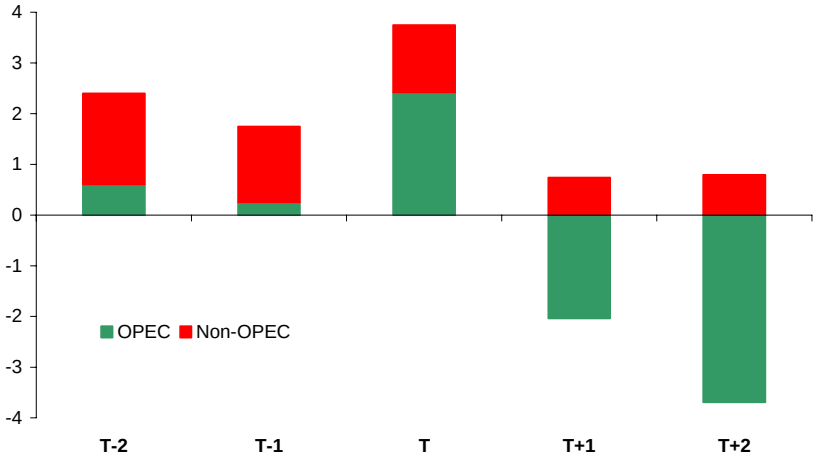


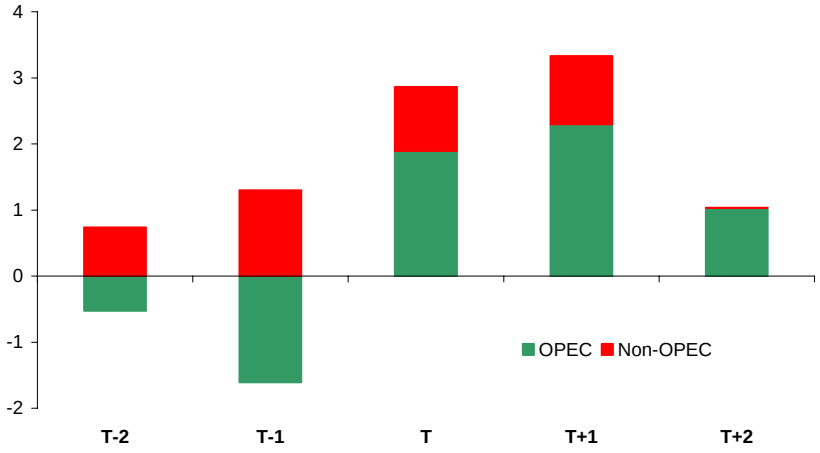
Figure 14
Changes in the World Supply and Demand of Oil around Key Events
(in millions of barrels per day)

11.1 World Supply of Oil

A. First and Second Oil Shock

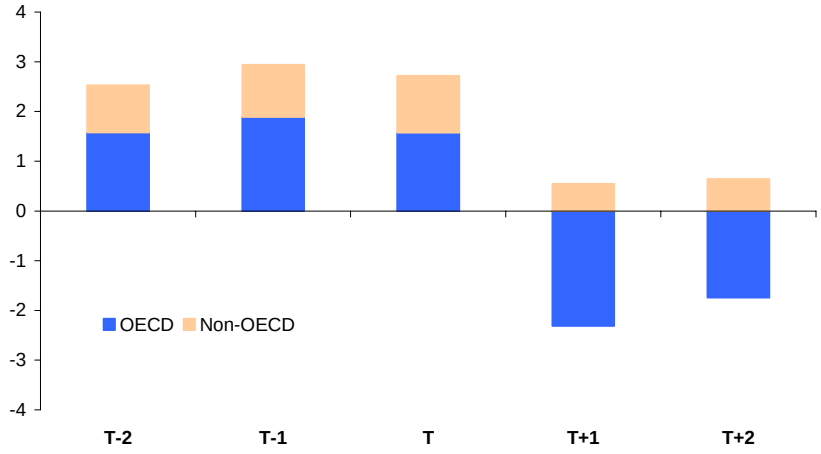


B. Iraq War and Chinese Expansion

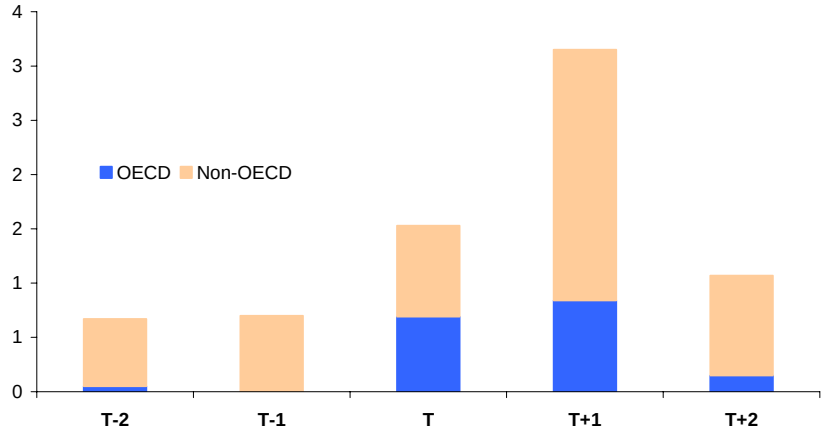


11.2 World Demand of Oil

A. First and Second Oil Shock



B. Iraq War and Chinese Expansion



III. The Growth Impact of Higher Oil Prices: Evidence for LAC

In spite of the near record increase in crude oil prices, economic growth in the world and among developing countries has remained strong. In 2005, world GDP grew 3.2 percent, while real output in developing countries increased 5.9 percent. Economic growth raised by more than 6 percent even among crude oil importers —4.3 percent if we exclude China. However, growth among oil importing developing countries has slowed down from 6.4 percent in 2004 to 3.7 percent in 2005. We should also note that this rise in oil prices has implied a substantial transfer of wealth from oil importers to oil exporters.

The resilience of economic growth in the global economy to the sharp increase in crude oil prices may be attributed to two important developments: First, higher oil prices supported by demand in rapidly growing countries have been accompanied by strong demand and higher prices in other primary commodities — especially metals and minerals. Second, higher oil prices have occurred in a context of continued oil deliveries —unlike the first and second oil shocks where oil deliveries dropped substantially.

In the present section we evaluate the growth impact of higher oil prices in Latin American and the Caribbean from different dimensions: First, we evaluate the direct impact of higher oil prices on real income of LAC countries by analyzing the terms of trade effects. Second, we evaluate the impact on output (and its composition from the demand side) at the business cycle frequency using vector autoregressions (VAR). Finally, we use a back-of-the-envelope exercise to estimate the impact of a permanent upward shift in oil prices on long-term growth through the impact on the terms of trade.

3.1 Oil Price Shock Scenarios

Before calculating the impact of higher oil prices in the short and long run on economic performance in LAC countries we need to define the oil and commodity price scenarios that we will use. Specifically, we use three different scenarios based on forecasts for the evolution of crude oil prices over the period 2006-10. First, we developed time series models (e.g. ARIMA or transfer models) to forecast the evolution of crude oil prices as well as other primary commodities over the forecasting period mentioned above. We will denote this scenario as LCRCE.[8] Second, we use the forecast of crude oil and other primary commodity prices undertaken by the Development Economics Prospect Group at the World Bank (DECPG). Finally, we use the IMF forecasts on crude oil prices (jointly with DECPG forecast on other primary commodities) and we label this scenario as IMF. Figure 15 reports the evolution of oil prices for the period 2000-10 and we can observe that all forecasts are in line with a price for crude oil between 54 and 58 dollars per barrel by 2010.

Table 10 reports the variation of commodity prices for the scenarios that we will be working in our empirical analysis. First we present the results for the cumulative variation in commodity prices from 2004-5 relative to 2000-3. For instance, the price of crude oil increased approximately 74% during that period. We also can also observe that prices of metals and minerals, on average, exhibit sharper increases than agricultural commodity prices. Our next three scenarios (LCRCE, DECPG and IMF) present the cumulative variation in the price of crude oil and other commodities when comparing the average price forecast for 2006-10 with the average price in 2001-5. For instance, starting from an average level of US$ 34.2 per barrel in 2001-5, our three scenarios yield a cumulative increase in crude oil prices of 81% (LCRCE), 69% (DECPG) and 72% (IMF), thus rendering average crude oil prices for the period 2006-10 that range between 58 and 62 dollars per barrel.

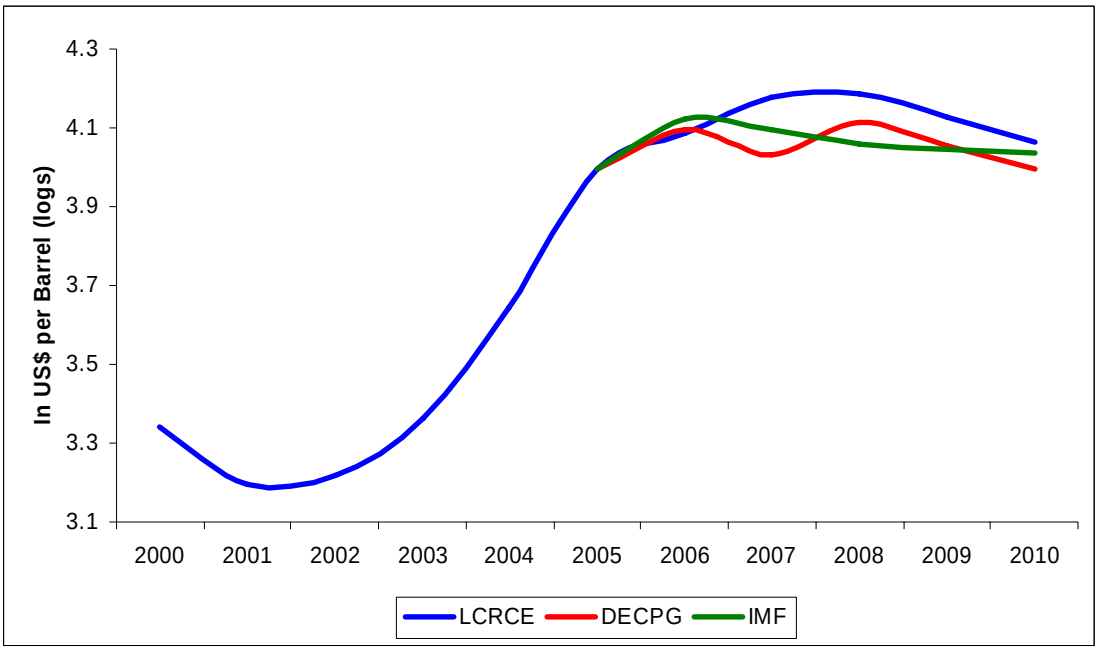
[8] Estimated forecast models for crude oil prices as well as other commodity prices are not reported but are available from the authors upon request.

Table 10
Commodity Prices, 2000-10: Actual and Forecast Price Changes
(In percentages)

Primary Commodity	Actual 2004-05 vs. 2000-03	Forecast Scenario 2006-10 vs. 2001-05		
		LCRCE	DECPG	IMF
Agriculture	**20.2**	**8.2**	**8.0**	**8.0**
Coffee	43.3	84.5	74.0	74.0
Sugar	19.5	27.4	31.6	31.6
Metals and Minerals	**68.1**	**26.8**	**25.9**	**25.9**
Copper	94.2	40.9	37.4	37.4
Gold	39.6	26.8	26.4	26.4
Iron ore	71.5	63.5	61.8	61.8
Nickel	84.4	13.8	13.8	13.8
Zinc	25.8	19.7	21.5	21.5
Energy	**73.1**	**81.5**	**69.4**	**71.6**
Coal	68.6	97.4	73.1	73.1
Gas	73.1	17.0	15.6	15.6
Crude Oil	74.0	81.5	69.4	71.6

We actually forecast 34 primary commodities and we report in the Table only selected commodity prices. The data not reported in the Table is available for the authors upon request.

Figure 15
Forecasting Crude Oil Prices



3.2 Transfer Effects and Impact of Higher Oil Prices at Business Cycle Frequency

The present subsection attempts to use vector autoregressive techniques (VAR) to estimate the effects of a shock to oil prices, as well as price changes in other internationally traded primary commodities, on real output (GDP), domestic demand, trade balance and the current account for a selected sample of LAC countries. The methodology used here has some important advantages: First, it allows us to evaluate the impact on output and its components (from the demand side) not only of a shock to oil prices but also of changes in prices of a primary commodity basket. This feature not only takes into account the currently observed phenomenon of crude oil prices and other commodity prices rising in unison, but also it takes into account the importance of each commodity in the trade structure of the selected countries. Second, it shows how the effects on the macroeconomic variables change over time due to the transitory shock in commodity prices. On the other hand, this methodology has also its short-comings since the model was formulated to explain the effects of terms-of-trade changes for a panel data of countries.

In this section we use the methodology developed by the Development Economics Prospects Group (DECPG) at the World Bank to evaluate: (a) direct income transfers from terms of trade effects originated by the changes in commodity prices, and (b) the response of output, domestic demand and the current account to shocks in either oil prices or in a basket of commodity prices.

3.2.1 Terms of Trade Effects of Oil Prices

The model developed by DECPG uses information on the participation of internationally traded primary commodities in the structure of international trade for LAC countries and allows us to input not only price changes in crude oil but also price fluctuations for up to 40 other different primary commodities. Specifically, we input the price changes of 34 primary commodities —22 agricultural products, 9 metals and minerals, and 3 energy products.[9]

Based on the participation of each commodity in total exports and import of the selected LAC country, we calculate the changes in the terms of trade (TOT). For instance, an increase in the price oil by 100 percent alone results in a TOT improvement by 51.6 percent for Ecuador (an oil exporter) and a deterioration in the TOT for Chile (importer) by 14.2 percent. If, however, we combine this oil price shock with an increase by 100 percent for the price of copper (a major Chilean export), the TOT for Chile improves by 41.6 percent. On the other hand, if we combine it a decrease in the price of bananas (a major export for Ecuador), the TOT for Ecuador only improves by 26.2 percent.

Before analyzing the dynamic effects of higher oil prices, we evaluate their direct income effect by computing the terms of trade effect of changes in commodity prices. In Scenario A we simulate the terms of trade impact of an oil price surge of 86% and we find, as expected, that there is an income transfer from oil importers to oil exporters (see Figure 16.A). Most of the countries with positive income effects are oil exporters. For instance, Venezuela and Ecuador registered the largest income gains due to higher oil prices, with approximately 15 and 10 percent of GDP, respectively.

For our analysis we consider:

(a) A scenario with an oil shock only and with the prices of other primary commodities remaining invariant —which we label "OIL SHOCK" scenario. Here we will evaluate the terms of trade effects of an oil price shock using the shifts in crude oil prices for the period 2004-5 vs. 2000-3

[9] Our list of 34 primary commodities (including oil) consists of: bananas, beef, cocoa, coffee, copra, cotton, groundnut oil, logs, maize, oranges, palm oil, rice, rubber, sawn wood, sorghum, soy meal, soy oil, soybeans, sugar, tea, tobacco, wheat, aluminum, copper, gold, iron ore, lead, nickel, silver, tin, zinc, coal and natural gas.

and the shifts for the 2006-10 vs. 2001-5 period under the LCRCE scenario. Recall that the cumulative variation of crude oil prices for the former scenario is 74 percent whereas for the latter is 81 percent.

(b) A scenario that combines shifts in crude oil prices as well as in other commodity prices —which we denote as "COMMODITY SHOCK" scenario. Here we will evaluate the terms of trade effects of an oil price shock using the shifts in crude oil prices for the period 2004-5 vs. 2000-3 and the shifts for the 2006-10 vs. 2001-5 period under the LCRCE and DECPG scenarios.

Terms of Trade Effects under the Oil Price Shock Scenario

Figure 16 reports the terms of trade effects for LAC countries of an oil price shock, where Figure 16(a) reports the results of the actual increase in oil prices from an average of US$ 27 per barrel over the period 2000-3 to an average of US$ 46 per barrel over the period 2004-5. On the other hand, Figure 16(b) shows the income transfers across LAC countries from increases in oil prices from an average of US$ 34 per barrel during the period 2001-5 to an average of US$ 62 per barrel for the 2006-10 period. These scenarios imply cumulative variation in oil prices of 74 and 81 percent, respectively.

We first observe that the sharp increase in oil prices experienced in 2004-5 relative to 2000-3 in world commodity markets have produced a substantial income transfer from oil-importing to oil-exporting countries —see Figure 16(a). Within the Latin America and the Caribbean region, the countries with the largest positive income effects due to positive terms of trade effects (as a percentage of GDP) are, as expected, the net oil exporters in the region: Venezuela (13.5 %), Ecuador (10.3%). Trinidad and Tobago (8.7%), Colombia (3.7%), Mexico (1.3%) and Argentina (0.9%). On the other hand, 8 out of 10 countries with the largest income losses due to higher oil prices are from either Central America or the Caribbean. For instance, Honduras, Nicaragua and Jamaica have negative terms of trade effects of approximately 5 -6 percent, while Dominica, the Dominican Republic, St. Kitts and Nevis and St. Vincent and the Grenadines have income losses due to deteriorating terms of trade of about 3% of GDP. We should also note that Guyana registers the worst income drop due to developments in the world oil markets.

On the other hand, Figure 16(b) reports the terms of trade effects of oil price shifts forecasted for the period 2006-10 relative to the period 2001-5. Since we are only dealing with an oil price shock, the ranking of terms of trade effects across LAC countries does not change relative to the one presented in Figure 16(a). However, the terms of trade effect in Figure 16(b) are higher since the cumulative change in oil price under this scenario is higher (81 vs. 74%). In this respect, the real income gains due to higher oil prices in Venezuela and Ecuador amount to 15 and 11 percent of GDP, respectively, while Honduras, Nicaragua and Jamaica register income losses that range between 6 and 6.5 percent of GDP.

Terms of Trade Effects under the Commodity Price Shock Scenario

Figure 17 presents a more realistic scenario where other primary commodity prices change along with oil prices —our so-called "Commodity Shock" scenario. Here we present the terms of trade effects for changes in commodity prices for the four scenarios outlined in Table 10.

Figure 16
Terms of Trade Effects for LAC Countries: OIL SHOCK Scenario
(percentage of GDP)

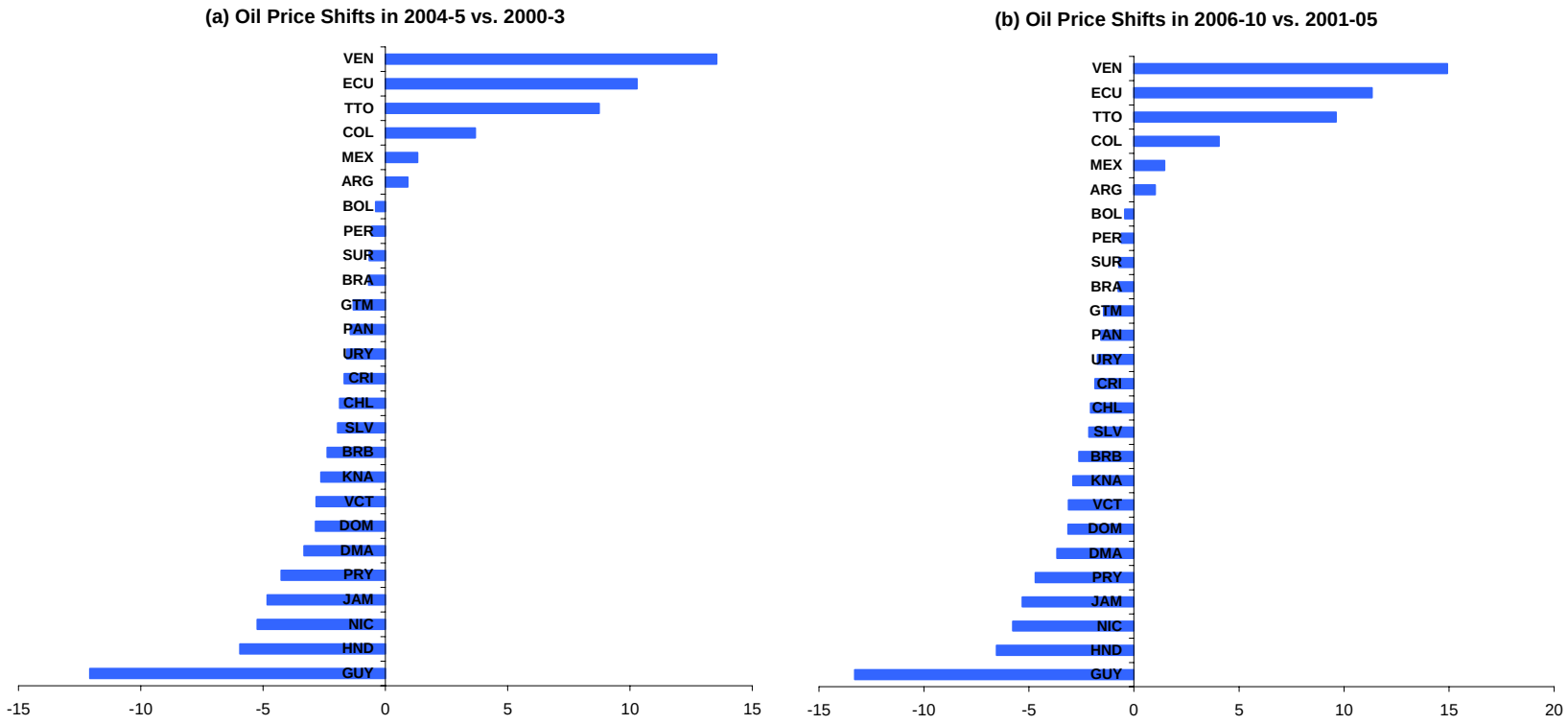


Figure 17
Terms of Trade Effects for LAC Countries: COMMODITY SHOCK Scenario
(percentage of GDP)

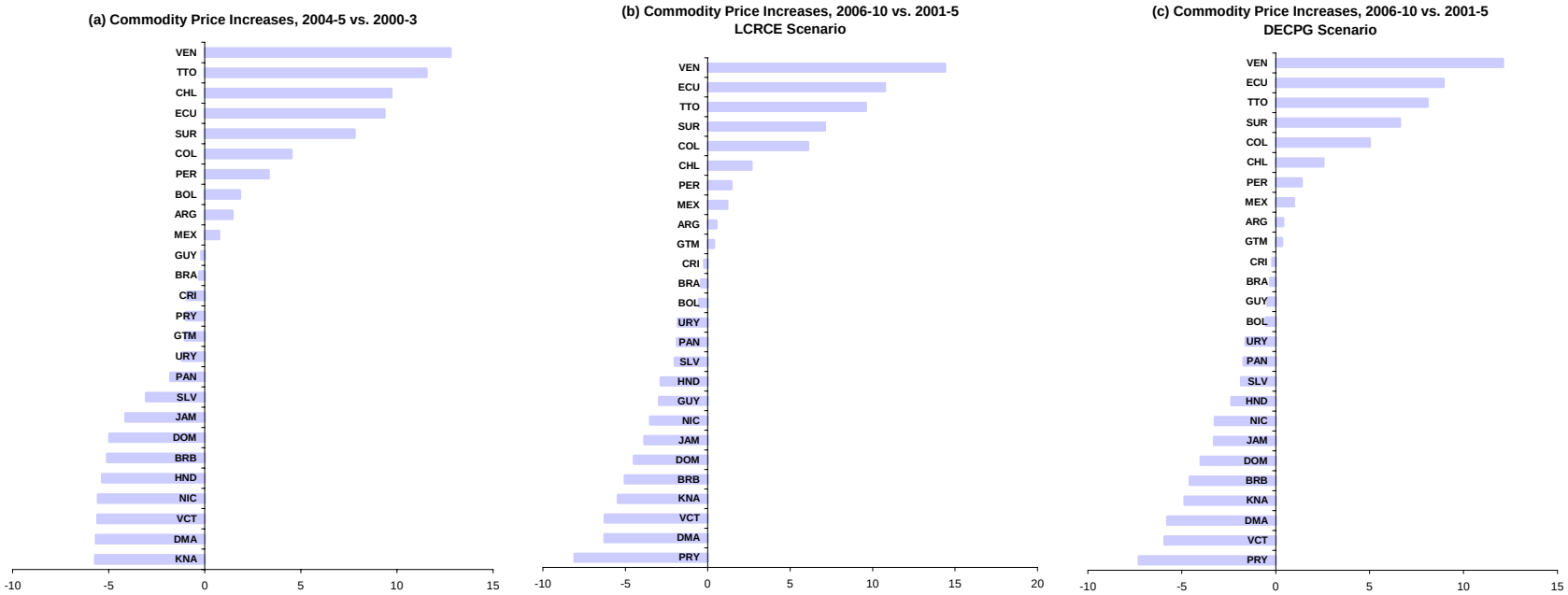


Figure 17(a) depicts the terms of trade effects in terms of GDP for LAC countries of an increase in a basket of commodity prices in 2004-5 relative to 2000-3. We still find that Venezuela is the countries with the largest positive income transfer (12.8 % of GDP) in our "commodity shock" scenario. However, we should note that some countries that registered negative income transfers in the "Oil Shock" scenario now have positive income transfers. For instance, Chile registered income gains of 9.7% of GDP due to positive terms of trade effects of commodity prices shocks. Peru and Bolivia also displayed positive income transfers of 3.3 and 1.8 percent, respectively. The shift from negative to positive income transfers for these three countries is attributed to the sharp price increase in metals and minerals for Chile and Peru as well as for price hikes in natural gas for Bolivia. On the other hand, the top 10 countries with the largest income losses due to deteriorating terms of trade are either from Central America or the Caribbean. Nicaragua, St. Vincent and the Grenadines, Dominica and St. Kitts and Nevis are the countries with the largest income transfers to oil exporters with losses exceeding 5.5% of GDP.

Figures 17(b) and 17(c) report the terms of trade effects for LAC countries when we consider commodity price changes in 2006-10 relative to 2001-05 under the LCRCE and DECPG scenarios. Still the big winners in terms of income transfers are net oil importers. However, the increase in the prices of other commodities is not as sharp as experienced in 2004-5 vs. 2001-3 so that the gains in terms of income transfers for Chile and Peru declined to 2.6 and 1.4 percent of GDP, respectively. In these scenarios, Paraguay is the country with the largest income loss due to terms of trade effects. Again, countries in Central America and the Caribbean are the ones that suffer the most adverse terms of trade effects.

3.2.2 Output Response to Higher Oil Prices: Results from VAR Estimation

Oil price shocks have figured prominently in the business cycle of developed and developing economies, with abundant research claiming that oil price fluctuations have substantial effects on economic performance. However, the growth effects are expected to be different in oil important than in oil exporting countries.

Higher oil prices may have an impact on economic performance through the following transmission mechanisms:

(a) *Supply side effects*. As an input in the production function of firms, a sharp increase in crude oil prices will lead to rising production costs which, in turn, would lower output.
(b) *Demand side effects*. Higher oil prices would affect the disposable income of agents and hence their consumption. If the country is a net oil importer (exporter), its disposable income declines (increases) in the face of higher crude oil prices, thus lowering (raising) its consumption.[10] In addition, oil prices may lower investment by raising the production cost of firms.[11]

Recent evidence for G7 countries shows that exogenous oil supply disruptions typical causes a temporary reduction in real GDP growth that is concentrated in the second year after the shock (Kilian, 2005). On the other hand, evidence for low income countries show that increases in commodity prices would lead significant increases in real output at the business cycle frequency (Raddatz, 2005).

We evaluate the impact of higher oil prices on output, domestic demand and the external accounts using panel vector autoregressions (PVAR) for an ample set of countries formulated and estimated by DECPG.

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[10] Note that the magnitude of the impact on consumption depends on the persistence of the oil price shock —that is, whether the shock is perceived by the agents as a long-lasting shock.

[11] There are other indirect effects of oil prices on economic activity through their impact on exchange rates and inflation and these effects usually involve economic policy reactions. A review of these effects for our selected sample of LAC countries would be reviewed in Section 4.

Using the terms of trade effects of increases in oil prices and other internationally-traded primary commodities we compute the impulse-response function (IRF) for real output, domestic demand, net exports and the current account balance to shocks in oil prices. In this section we will work with the scenarios outlined in Table 10.

For purposes of illustration, we will present the impulse response functions (IRFs) for our sample of selected LAC countries for the "oil shock" and "commodity shock" scenarios for shifts in crude oil and other commodity prices during the period 2004-5 relative to the period 2000-3. See Figures 13 and 14.

Figure 18 shows the response of output, domestic demand, net exports and the current account to an increase in oil prices (with the rest of commodity prices remaining invariant). We assume an oil price hike of approximately 74 percent —which is the one experience in 2004-5 relative to 2000-3. We observe that in response to the oil shock, we observe different responses for net oil importers and net oil importers. For instance, in the case of net oil importers (Guyana, El Salvador, Dominican Republic and Honduras), domestic demand declines while net exports increase. On the other hand, domestic demand increases while net exports decline for net oil exporters (Venezuela, Ecuador, Mexico, Colombia and Argentina).

Figure 19 shows, on the other hand, the response of output, domestic demand and external accounts to an increase in crude oil prices along with other primary commodity prices. Shifts in these commodity prices would match the ones observed in 2004-5 relative to 2000-3 (see Table 10 for price shifts in selected primary commodities). Again, we observe that countries with deteriorating terms of trade (due to higher oil prices and/or higher import prices) show a decline in domestic demand and an increase in net exports, while countries with rising terms of trade (e.g. net oil exporters) display a higher domestic demand an decreasing net exports.

Impulse-response functions from panel VAR can be interpreted as follows. Assume that increase in fuel bills (or rising prices in other import prices) for current-account constrained countries has to be paid from existing sources of foreign exchange —say, export revenues— and that borrowing from capital markets is not an option. In this case, higher oil prices would lead to a decline in the volume of imports. At the household level, higher oil prices would lead to real income losses and, hence, to a drop of the domestic demand. In sum, net exports increase while domestic demand declines. The estimates of the VAR suggest that the transmission of higher commodity prices is very rapid so that changes on domestic demand and imports are largely offsetting, while GDP fluctuations are very small.[12]

Figures 20 and 21 depict the impulse-response of output, domestic demand and net exports for forecast changes in commodity prices for the period 2006-10 relative to 2001-05 under the LCRCE and DECPG scenarios. The median evolution of price changes for commodity groups and selected primary commodities (including crude oil) under these scenarios are reported in Table 10. From the impulse response functions depicted in those figures we find the following:

First, the impact of commodity price fluctuations on GDP is small and the largest impact occurs immediately (in the first period after the shock). For instance, we observe that real output in Venezuela increases by about 0.5 percent over its trend one year after the commodity price hike (see Figure 20). On the other hand, real output in Brazil and Dominican Republic show negligible drops (3 and 1 basis points below the baseline level after the first year).

[12] The strong results shows by VAR impulse-response functions does not seem to be refuted by Raddatz (2005).

Figure 18
Impulse Response Functions for LAC Countries
Scenario: OIL SHOCK
Crude Oil Price Changes in 2004-5 relative to 2001-3

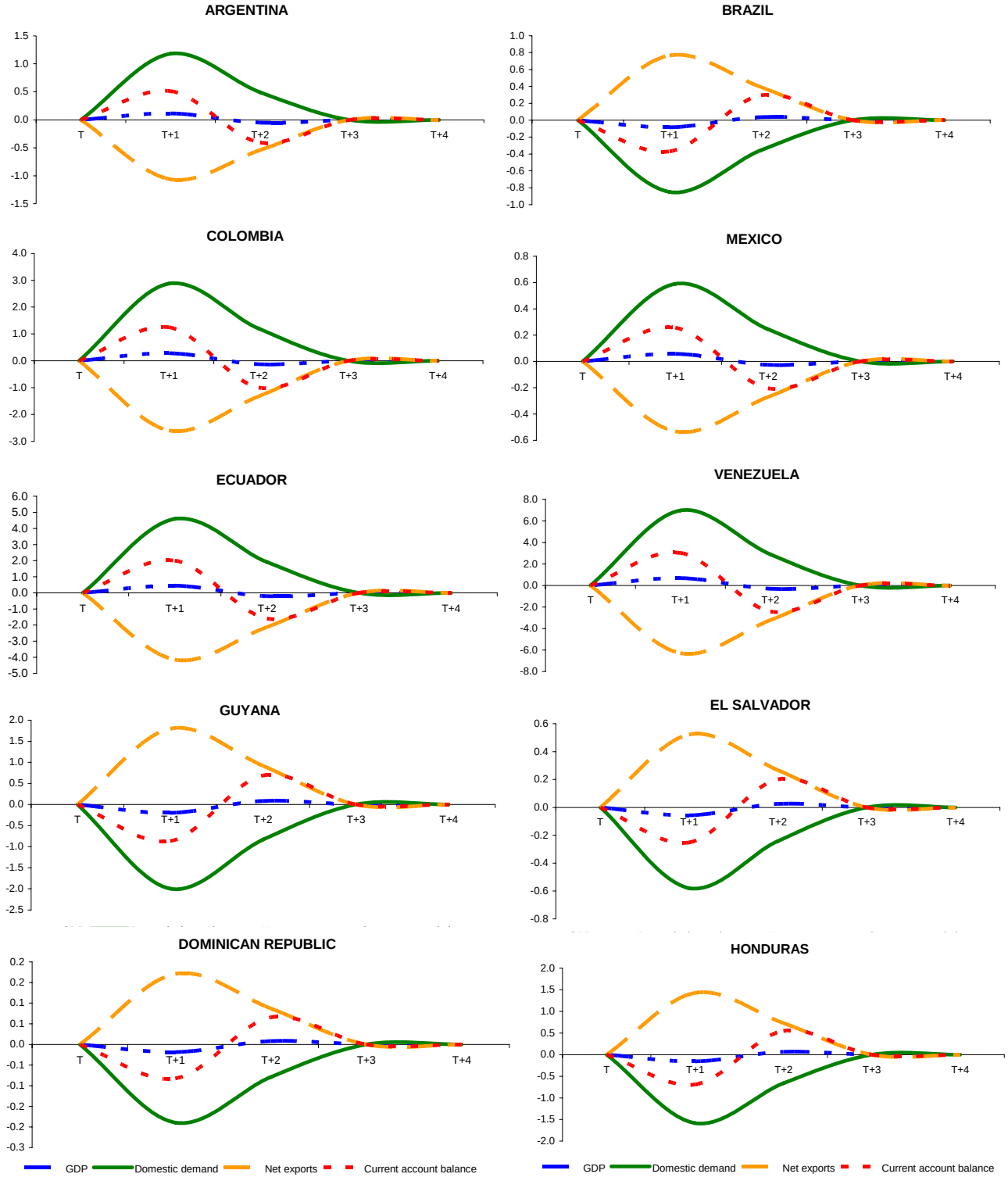


Figure 19
Impulse Response Functions for LAC Countries
Scenario: COMMODITY SHOCK
Commodity Price Changes in 2004-5 relative to 2001-3

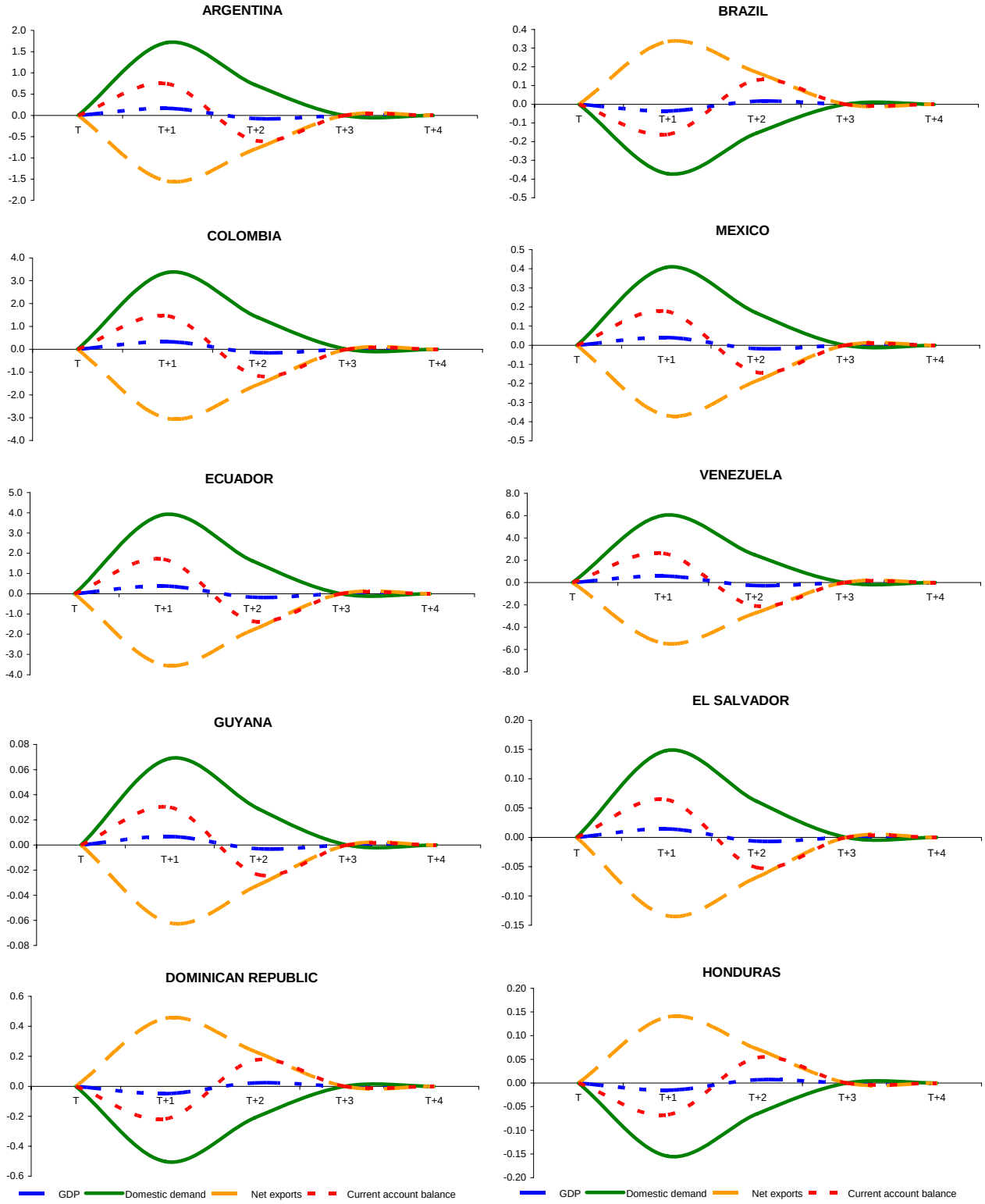


Figure 20
Impulse Response Functions for LAC Countries
Scenario: COMMODITY SHOCK - LCRCE
Forecast Changes in 2006-10 relative to 2001-05

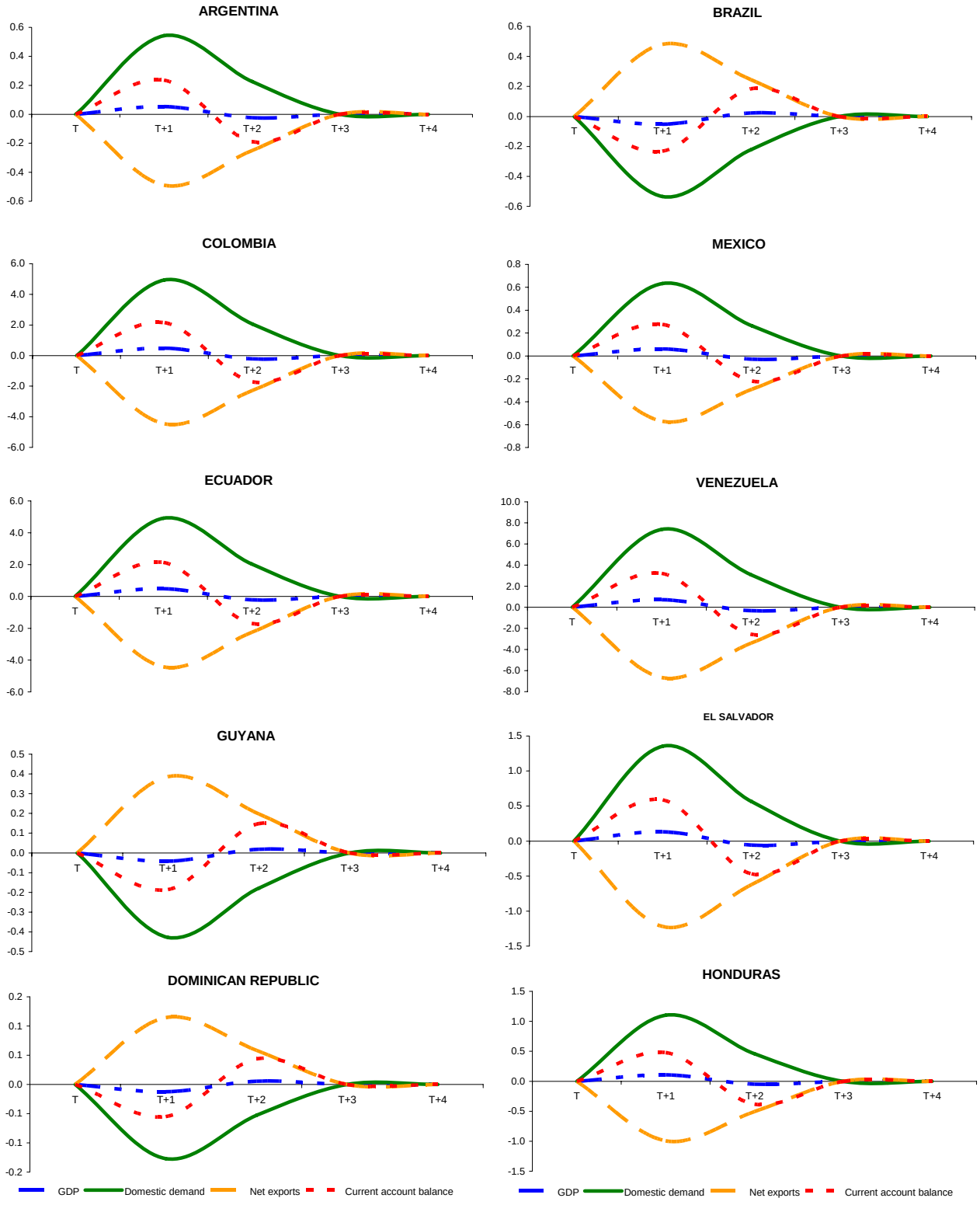
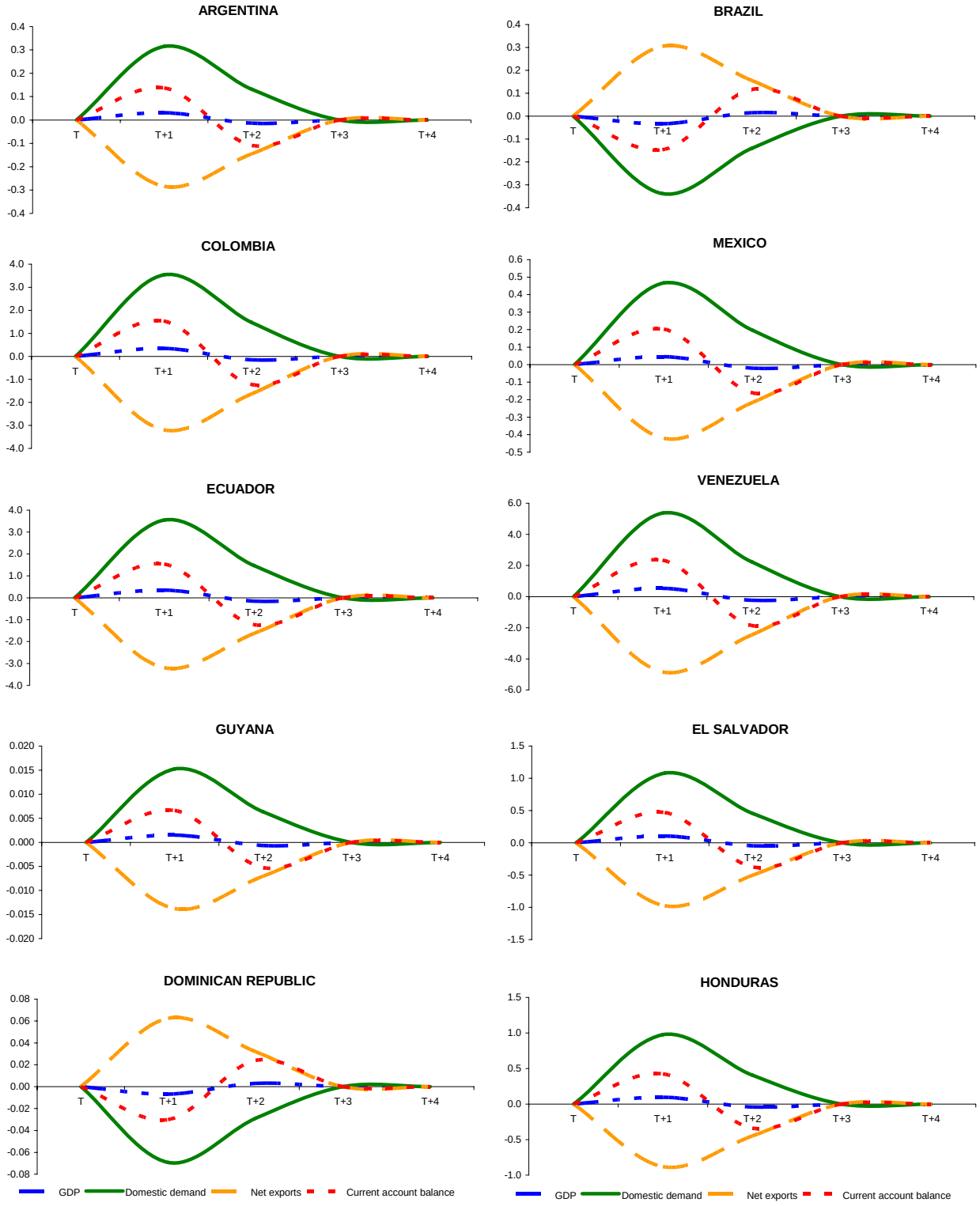


Figure 21
Impulse Response Functions for LAC Countries
Scenario: COMMODITY SHOCK - DECPG
Forecast Changes in 2006-10 relative to 2001-05



Second, shocks to commodity prices have a substantial impact on both domestic demand and net exports through the effect of terms of trade on real income. We observe that net oil exporters —especially, Venezuela, Ecuador and Colombia— display large increases in domestic demand. This is attributed, as we stated above, to real income gains due to the increase in their terms of trade —especially, crude oil prices that increase at a faster pace than other primary commodities for our LCRCE and DECPG scenarios. When taking into account terms of trade effects of prices changes in a broader basket of commodities, only Brazil, Guyana and Honduras show a declining domestic demand (see Figure 20 and 21).

3.3 Growth Effects of Permanent Upward Shifts in Oil Prices

Long-term growth may also be affected by oil price shocks. For instance, the productivity slowdown in the post-Bretton Woods era has been blamed by the First Oil Price Shock, although the evidence is not conclusive (Barsky and Kilian, 2004).[13] Higher energy costs have had a negligible role in explaining the productivity slowdown in advanced economies (Olson, 1988). Others have argued that higher oil prices have turned energy-inefficient capital obsolete, thus yielding (unmeasured) declines in the capital stock.

In the present section we undertake a back-of-the-envelope exercise that estimates the impact of permanent increases in oil prices on long-term growth through its impact on the terms of trade. That is, we calculate the sensitivity of growth to permanent increase in oil prices through deterioration (improvement) of the terms of trade only in oil-importing (-exporting) countries. This effect will depend on the relative importance of exports and imports of oil as well as the degree of openness of the economy to international trade. On the other hand, we assume that export and import volumes remain invariant to these shifts in relative prices. Hence, the impact of higher oil prices on economic performance for each country is given by the following formula:

$$dy_i = \beta_{ToT} * X_i * \left(\frac{1 + \left(s_{X,i}^{Oil} \cdot \varepsilon^{Oil} \right)}{1 + \left(s_{M,i}^{Oil} \cdot \varepsilon^{Oil} \right)} - 1 \right) \tag{1}$$

where dy_i is the growth effect of higher oil prices (via terms of trade effects) in country i, β_{ToT} is the estimated coefficient of terms of trade in a growth regression for a panel data of countries, and X_i is the relative openness of the country compared to the Latin American average —i.e. for a country with half the trade to GDP ratio as the average, the coefficient would be 0.5. Finally, ε^{Oil} represents the oil price change, while $s_{X,i}^{Oil}$ and $s_{M,i}^{Oil}$ is the share of oil exports and imports in total exports and imports, respectively. For instance, assuming a price shock of oil of 100 percent for a net importer of oil accounting for 20 percent for import, with half the degree of openness as the average for Latin America, the effect would be a decrease of GDP growth per capita by around 0.5 percent.

Estimating Growth Equations

In the spirit of Loayza, Fajnzylber and Calderón (2005) we conduct an empirical analysis of growth determinants. Our dependent variable is the average growth rate over the medium term (5-year window) and we would like to estimate the impact of terms of trade on growth. In addition, we would like to investigate whether the growth of terms of trade shocks during times of oil crises are different than during tranquil periods of crude oil price fluctuations.

[13] Olson (1988) argues that the cost of energy is very small with respect to GDP in order to explain the productivity slowdown.

Using a pooled data set of cross-country and time series observations for 82 countries over the 1960-2000 period (with at most 8 non-overlapping 5-year period observations), we use a panel data estimation method that deals with dynamic specifications, controls for unobserved country and time specific effects and accounts for the likely endogeneity of some explanatory variables. The methodology used is the Generalized Method of Moments (GMM) for dynamic models of panel data developed by Arellano and Bond (1991) and Arellano and Bover (1995)

The general growth regression equation to be estimated is:

$$y_{i,t} = \beta' X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \tag{2}$$

where the subscripts i and t represent country and time period, respectively. The dependent variable y is the growth rate and X is a set of time- and country-varying explanatory variables that may include a lagged dependent variable, a set of growth determinants and our variable of interest —terms of trade shocks. Finally, μ_t is an unobserved time-specific effect, η_i is an unobserved country-specific effect, whereas ε_{it} is the error term.

The econometric technique deals with un-observed time effects through the inclusion of period-specific intercepts. Dealing with unobserved country effects is not straightforward since the model is dynamic and contains endogenous explanatory variables. Unobserved country effects are controlled for by differencing and instrumentation. Likewise, this method relies on instrumentation to control for joint endogeneity. Specifically, it allows relaxing the assumption of strong exogeneity of the explanatory variables by allowing them to be correlated with current and previous realizations of the error term ε. The identification of parameters is achieved by assuming that future realizations of the error term do not affect current values of the explanatory variables, that the error term ε is serially uncorrelated, and that *changes* in the explanatory variables are uncorrelated with the unobserved country-specific effect. As Arellano and Bond (1991) and Arellano and Bover (1995) show, this set of assumptions generates moment conditions that allow estimation of the parameters of interest. The instruments corresponding to these moment conditions are appropriately lagged values of both levels and differences of the explanatory and dependent variables (the latter if the model is dynamic). Since typically the moment conditions over-identify the regression model, they also allow for specification testing through a Sargan-type test.

Table 11 shows our economic growth regression which include —following Loayza, Fajnzylber and Calderón (2005)— a transitional convergence effect (the initial GDP per capita) a set of structural policies (education, financial depth, institutions, government burden, and trade openness), stabilization policies (inflation) and terms of trade shocks (our variable of interest which captures external shocks).

Table 11
Determinants of Economic Growth: Panel Data Evidence
Dependent Variable: Growth in Real GDP per capita
Estimation method: GMM-IV System Estimator

Variables	[1]	[2]
Constant	3.866 **	6.510 **
	(1.88)	(2.13)
Initial GDP per capita	-0.227 **	-0.285 **
	(0.09)	(0.08)
Structural Policies and Institutions		
Human Capital	0.622 **	0.923 **
(Secondary Enrollment rate, logs)	(0.10)	(0.10)
Financial Depth	1.237 **	1.188 **
(Private Credit, % of GDP, logs)	(0.09)	(0.10)
Trade Openness	0.368 **	0.361 **
(Exports and Imports, % of GDP, logs)	(0.08)	(0.08)
Institutions	1.386 **	1.088 **
(ICRG Index, logs)	(0.21)	(0.20)
Government Burden	-2.141 **	-2.180 **
(General Govt. Consumption, logs)	(0.10)	(0.11)
Stabilization Policies and External Imbalances		
Inflation	-1.420 **	-1.780 **
(CPI, log differences)	(0.30)	(0.33)
External Shocks		
Terms of Trade Shocks	0.038 **	0.040 **
	(0.01)	(0.01)
Terms of Trade Shocks * Oil Crises	...	-0.013
		(0.03)
Period Shifts		
- 1971-75 Period:	-0.236 **	-0.307
- 1976-80 Period:	-0.896 **	-0.930
- 1981-85 Period:	-2.786 **	-2.799
- 1986-90 Period:	-1.768 **	-1.886
- 1991-95 Period:	-2.324 **	-2.411
- 1996-00 Period:	-2.243 **	-2.369
Countries	82	82
Observations	524	524
Specification Tests (p-value)		
- Sargan	(0.31)	(0.28)
- 2nd. Order Correlation	(0.15)	(0.19)

Notes: Figures in parenthesis below the coefficients are robust standard errors.
** (**) implies statistical significance at the 10 (5) percent level.*

Consistent with the findings of Loayza et al. (2005) we find evidence in favor of conditional convergence and we also find that growth is promoted by higher levels of human capital, financial depth, a more outward-oriented economy, lower government burden, better institutions and lower inflation. In addition, positive terms of trade shocks enhance long-term growth —see column [1] of Table 11. Note that in column [2] we investigate whether oil shocks have a different impact on growth during turbulent and

tranquil times in world oil markets. Unfortunately, we fail to reject the null hypothesis that the growth effect of higher oil prices was analogous during times of price hikes than during tranquil times. Hence, our estimate of β_{ToT} in column [1] of Table 11 (0.038) will be used for our calculation of the growth effects outlined in equation (1).

Growth Effects

Table 10 reports the growth effects of terms of trade shocks under three different scenarios of the future evolution of crude oil prices for 2006-10 (LCRCE, DECPG and IMF). Since our regression analysis considers the average annual growth rate in terms of trade, we consider the average annual price increase in crude oil when comparing the average levels in 2006-10 vs. 2001-05. This implies average annual price increases of 16.3 percent for the LCRCE scenario, 13.9 percent for the DECPG scenario and 14.3 percent for the IMF scenario. As we said before, these simulations would increase the crude oil price from an average of US$ 34 per barrel in 2001-5 to an average between US$ 58-62 per barrel in 2006-10 over the span of 5 years.

Figure 22
Long-Term Growth Effect of Higher Oil Prices
(in percent, per annum)

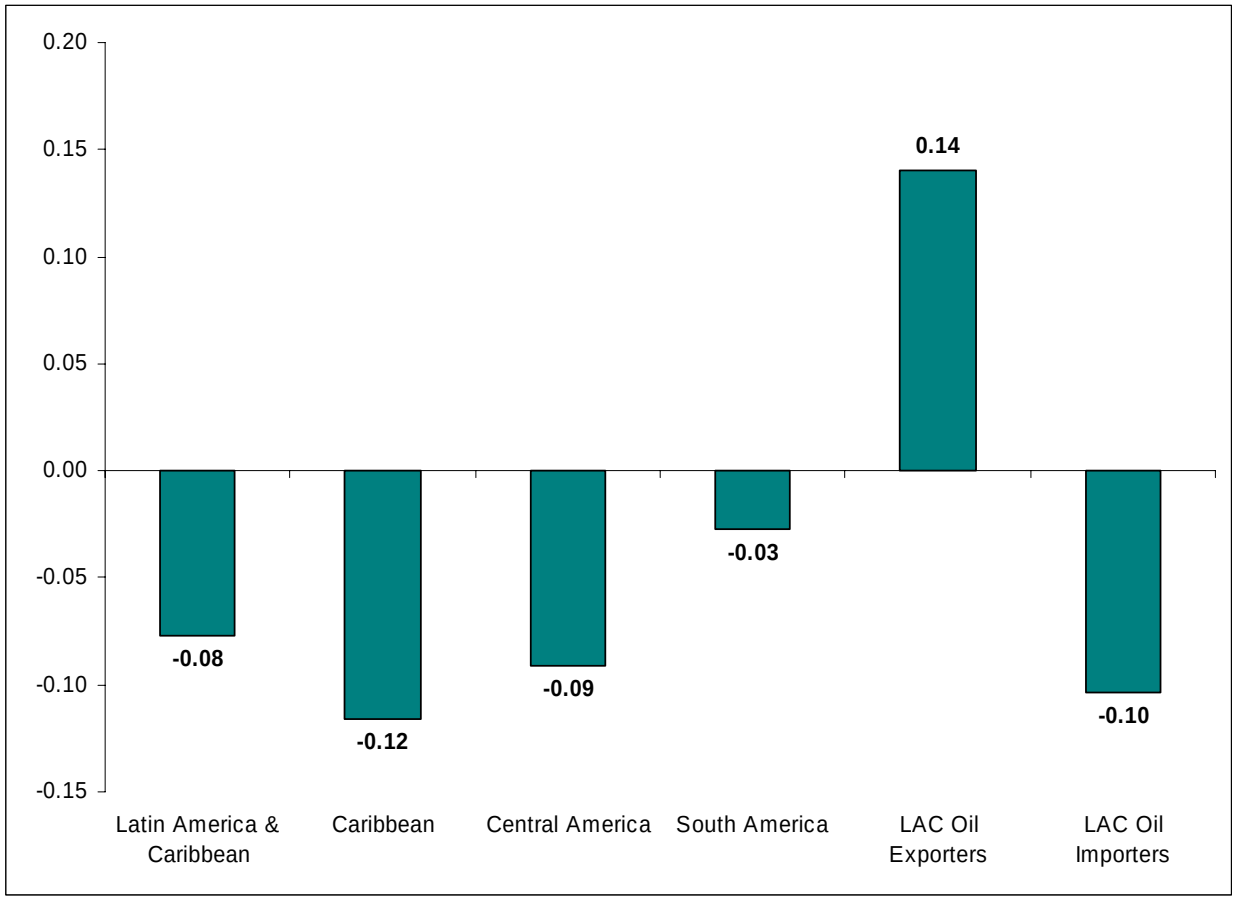


Figure 22 reports some aggregate results for the Latin American region as well as the sub-regions for the LCRCE forecasts on crude oil prices. We find that if crude oil prices continue rising sharply, at the rates described in this scenario, output per capita will decline in the region by 8 basis points per year. It is interesting to note that South America would have the smallest impact on growth per capita (a drop of 3 basis points per year), while the Caribbean would suffer the largest drop in real output per capita (0.12

percent per annum). Finally, we observe that while output per capita among oil exporters in the region grows by 0.14 percent, it declines among oil importers in LAC by 0.1 percent per year.

Table 12
Impact of Higher Oil Prices on Economic Growth
(in percentage per year)

Country	Degree of Openness	Share of Oil in Total		Growth Effect under Scenario:		
		Exports	Imports	LCRCE	DECPG	IMF
Argentina	0.59	12%	4%	0.02%	0.02%	0.02%
Barbados	2.95	6%	10%	-0.05%	-0.05%	-0.05%
Belize	3.05	0%	13%	-0.18%	-0.16%	-0.16%
Bolivia	1.28	17%	5%	0.08%	0.07%	0.07%
Brazil	0.56	2%	16%	-0.04%	-0.03%	-0.03%
Chile	1.61	1%	13%	-0.10%	-0.08%	-0.09%
Colombia	0.98	33%	3%	0.14%	0.12%	0.13%
Costa Rica	2.22	1%	8%	-0.08%	-0.07%	-0.07%
Dominica	3.17	0%	8%	-0.12%	-0.10%	-0.10%
Dominican Republic	2.16	7%	21%	-0.14%	-0.12%	-0.12%
Ecuador	1.51	39%	4%	0.25%	0.22%	0.22%
El Salvador	1.54	3%	12%	-0.07%	-0.06%	-0.06%
Grenada	3.04	0%	8%	-0.12%	-0.11%	-0.11%
Guatemala	1.17	4%	13%	-0.05%	-0.04%	-0.04%
Guyana	5.92	0%	16%	-0.46%	-0.40%	-0.41%
Honduras	2.28	0%	15%	-0.15%	-0.14%	-0.14%
Jamaica	2.67	1%	16%	-0.18%	-0.16%	-0.17%
Mexico	1.35	14%	3%	0.07%	0.06%	0.06%
Nicaragua	1.80	1%	13%	-0.11%	-0.09%	-0.09%
Panama	4.30	4%	15%	-0.22%	-0.20%	-0.20%
Paraguay	1.89	0%	12%	-0.10%	-0.09%	-0.09%
Peru	0.82	7%	11%	-0.02%	-0.01%	-0.02%
St. Kitts and Nevis	3.32	0%	6%	-0.09%	-0.08%	-0.08%
St. Lucia	3.58	0%	8%	-0.14%	-0.12%	-0.12%
St. Vincent and the Grenadines	3.28	0%	7%	-0.11%	-0.10%	-0.10%
Suriname	1.71	3%	13%	-0.08%	-0.07%	-0.07%
Trinidad and Tobago	2.39	56%	16%	0.45%	0.40%	0.41%
Uruguay	1.08	1%	12%	-0.06%	-0.05%	-0.05%
Venezuela, RB	1.33	80%	2%	0.49%	0.43%	0.44%

Table 12 reports the country results of this exercise. We should note that behind this numbers there is significant variation in growth per capita responses to the oil price shock. Net oil exporters in the region are expected to reap the highest growth per capita benefits. For instance, growth benefits of these terms of trade shocks induced by higher oil prices are the largest in Venezuela (0.5%), Trinidad and Tobago (0.45%), Ecuador (0.25%) and Colombia (0.14%). On the other hand, Caribbean islands (mainly net oil importers) suffer the largest losses in growth per capita. Analogous results are obtained when using the DECPG and IMF scenarios.

Finally, we have to be very cautious about the magnitude of these results for several reasons. First, they are based on the estimation of the terms of trade coefficient of a growth regression in a panel of countries

and though efforts are made into incorporating sources of heterogeneity such as the relative openness of the country and the share of oil in the country's trade, it may not accurately estimate the impact of oil price changes on economic growth in the medium term. Second, it does not allow for a more realistic scenario where more commodity prices may fluctuate. As we observed before in subsection 3.2, income transfers due to commodity price fluctuations for some countries become positive when considering increases in other prices (e.g. Chile and Peru).

IV. Policy Responses to Higher Oil Prices: Results from Country Reports of Selected LAC economies

In the present section we present a summary of the evidence from country reports for selected LAC economies reported in our Annex.[14] In particular, we discuss the impact of higher oil prices on inflation and responses in the areas of monetary and fiscal policy as well as on the external sector. We evaluate the degree to which the recent shock to oil prices has affected the price level and the fiscal, monetary and external conditions in each of the Latin American countries in our sample. Each case study follows a broadly common methodology, although some variations were introduced due to country-specific idiosyncrasies. In what follows, we summarize the methodology and the main findings of our case studies.

4.1 The Impact of Higher Oil Prices on Domestic Gasoline and Consumer Prices

An important policy decision for governments facing higher international energy prices is the degree to which they allow the pass-through to domestic prices of derivative products. In some cases, the windfall revenue that an exporter is receiving might be dissipated through the provision of domestic subsidies to protect domestic consumers from higher prices. Indeed, in some instances, the fiscal costs associated with such subsidies can be very significant, and eventually unsustainable if oil prices continue on their upward path.

On the other hand, complete pass-through might have a considerable impact on the inflation level. A related issue is the transmission mechanism from domestic gasoline prices to the overall or the core price indices, which will depend on the structure of the economy, the degree of regulation of domestic prices (such as public utilities), and even methodology behind the calculation of the price indices. Obviously, an increase in inflationary pressures will have important consequences on the management of monetary policy, especially for inflation-targeting countries.

To estimate the degree of pass through from domestic fuel prices to inflation, we regress the overall price index on the fuel price index, allowing for some lags:

$$\pi_t = \alpha + \beta\pi_{t-1} + \delta_1 \hat{p}_t^G + \delta_2 \hat{p}_{t-1}^G + \varepsilon_t$$

where π_t is the overall CPI inflation, and $\hat{p}_t^G$ is the rate of inflation in energy prices. The higher the δ coefficients, the higher the pass-through from energy prices to consumer prices.

We also want to investigate whether the increases in oil prices are not feeding through to *core inflation*. To accomplish this task, we evaluate the level of pass-through from fuel prices to some measures of core inflation (where information is available). Note that a measure of core inflation usually excludes the more variable components of the CPI such as energy costs or food items. This regression analysis will only be undertaken for those countries for which an official measure of core inflation is readily available:

$$\pi_t^C = \alpha + \beta\pi_{t-1}^C + \delta_1 \hat{p}_t^G + \delta_2 \hat{p}_{t-1}^G + \varepsilon_t$$

[14] In the Country Annex we present the accompanying case studies for our sample of countries that includes large economies in the region (Argentina, Brazil, Colombia and Mexico), net oil exporters (Venezuela) and net oil importers (Guyana, Haiti, El Salvador, Dominican Republic, and Honduras).

where π_t^C represents a measure of *core inflation* in time *t*. Again, the estimate of the δ coefficients provides information on the degree of pass through from fuel prices to core inflation. The higher the value of the δ coefficients, the higher the degree of pass-through is.

We conduct the regression analysis for our sample of countries based on monthly data and our results are reported in the Annex. We have evaluate the degree to which: (a) higher international oil prices or gasoline prices in the US have translated into domestic gasoline prices in LAC countries, (b) domestic gasoline prices have translated into overall CPI inflation, and (c) domestic gasoline prices have affected into *core* inflation.[15]

From our inflation regressions and from anecdotal evidence, we summarize the evidence on the pass-through from oil prices to consumer prices in Table 13.

Table 13
The Responsiveness of Consumer Prices to Higher Oil Prices

	Pass-through to:		Oil Pricing Policies	
Country	**Gasoline**	**CPI**	**Oil Price Policy**	**Petroleum Tax Regime**
Argentina	None	None	**Free Prices:** Government exercised *moral suasion* to keep oil prices fixed.	Export taxes, ad-valorem taxes on petroleum and gas, and specific for some fuels.
Brazil	Complete	Limited	**Quasi-regulated:** Petrobras delays adjustment of prices	VAT and specific excises
Colombia	Complete	None	**Regulated:** Prices modified monthly. Reference to medium-term oil price	VAT and excises
Dominican Republic	Complete	Significant	**Partly regulated:** Margins and retail prices fixed by Govt	Specific taxes, ad-valorem on oil imports
Ecuador	None	None	**Regulated:** Last increase of prices in mid-2003	VAT
El Salvador	Complete	Limited	**Free prices.** Moral suasion on refiners, distributors. Electricity subsidies	Specific taxes
Guyana	Complete	Limited	**Quasi-regulated:** Retail price set competitively by distributors. SOE Guyoil has 60% of market.	Ad-valorem
Honduras	Complete	Significant	**Regulated, adjusted frequently:** Weekly.	Specific taxes
Mexico	None	None	**Partly regulated for gasoline**, otherwise indexed to international prices.	Specific: difference between admin. consumer prices and PEMEX costs
Venezuela	None	None	**Regulated**. Last adjustment of gas & diesel in 1997	Ad-valorem taxes

Source: Own calculations, International Monetary Fund – Western Hemisphere Department

We observe that in most cases (6 out of 10), there has been a complete pass-through from international oil prices to domestic gasoline prices. Despite this high pass-through, the impact on CPI inflation has been limited. This small or negligible impact on CPI inflation suggests that oil prices increases are not feeding through to *core* inflation.

[15] Note that our regression analysis is not conducted in countries where prices are highly regulated and have negligible variance over the sample period such as Venezuela.

4.2 The Impact of Higher Oil Prices on the Fiscal Policy Stance

An environment of higher oil prices will have an impact on the fiscal accounts through various mechanisms depending on the idiosyncrasies of each country: there may be political pressures to contain domestic gasoline prices which, in turn, would create fiscal pressures through the provision of either implicit or explicit subsidies. Second, there might be direct benefits or costs to the collection of taxes on domestic consumption of gasoline. In addition, a decrease of economic growth due to lower demand is likely to translate into a deterioration of tax revenues. For oil exporting countries there will be windfall revenues accruing to the state which might increase and/or shift government expenditures to accommodate the higher energy prices.

Given the various effects that may take place, a qualitative discussion of these effects accompanied by some estimates of the revenues and/or costs for the governments. The detailed discussion is presented in the Annex. Specifically, each country report analyzes qualitatively the impact of high oil prices on the fiscal stance. A summary of the results on the fiscal cost of high oil prices is presented in Table 14.

Table 14
The Impact of Higher Oil Prices on Fiscal Balances

Country	Impact on Fiscal Balances	Policy Reaction to Higher Oil Prices
Argentina	[-], limited	Increase crude oil export tax from 20 to 45% in 2004.Q2. Moral suasion to keep retail prices fixed
Brazil	[+], very limited	Oil market deregulated since 2002. Pricing policy delays pass-through to final prices to smooth impact of oil price fluctuations.
Colombia	[+], modest	Implicit subsidy from Ecopetrol to final consumer has been approximately 1.5% of GDP.
Dominican Republic	[-], limited	Specific taxes adjusted for inflation. No changes in taxes but contemplating fuel-saving measures.
Ecuador	[+], significant	Value added tax on petroleum products remain on 12 percent. Last price increase occurred in mid-2003.
El Salvador	[-], limited	Government has subsidized electricity and exerted moral suasion on refiners and distributors.
Guyana	[-]	GUYOIL (SOE) reduced retail price of gasoline by 8% (financed by cutbacks in Guyoil profit margin). Consumption tax rates reduced 3 times in 2005.
Honduras	[-]	Congress: Roll-back of fuel price increases and freeze fuel prices at pre-Katrina level. Commission to change fuel price-setting mechanism.
Mexico	[+], significant	Steady reduction of gasoline taxes since mid-2003.
Venezuela	[+], significant	Excise taxes remain 30% of administered price. Prices have not changed since 1997.

Source: Own calculations, International Monetary Fund – Western Hemisphere Department

We observe that for some countries —especially in Central American and the Caribbean— the impact of higher oil prices on the fiscal balances has been adverse. The high intensity in the use of energy and the high dependence on imported oil has had a severe impact on the oil bill. Hence, many countries have responded to higher oil prices by freezing prices, modifying taxes, increasing the (implicit) subsidy on gasoline prices, and revising price-setting mechanisms. On the other hand, oil producers have had, as

expected, an increase in the fiscal balance. The economic consequences of the higher oil prices for net oil-exporters will depend on the way they spend their large windfall incomes. For instance, Venezuela is currently withdrawing substantial resources from the macroeconomic stabilization fund (FEM) to finance populist fiscal spending. Mexico is using their increasing oil revenues to finance the reduction of the fiscal deficit.

4.3 The Impact of Higher Oil Prices on Monetary Policy

To the extent that higher oil prices translate into higher inflation levels, one would expect monetary authorities to apply a contractionary monetary policy in order to contain these inflationary pressures. In particular, countries with formal inflation targeting settings (e.g. Brazil, Chile, Colombia and Peru) would raise their interest rates to contain inflation. At the same time, if the monetary authorities consider the oil price shock to be transitory and interest rate responses focus on core inflation measures, interest rate hikes would be less obvious.

We assess the monetary policy reaction by running the following regression:

$$i_t = \alpha + \phi_1 \hat{p}_t^G + \phi_2 \hat{p}_{t-1}^G + \varepsilon_t$$

where i_t is the short-term interest rate (or policy rate where available), and $\hat{p}_t^G$ is rate of inflation of domestic fuel prices. Our parameters of interest, the ϕ coefficients, provide a measure of the reaction of monetary authorities to the changes in fuel prices.[16] Our results are reported in the Annex and Table 15 summarizes the evidence.

Table 15
The Impact of Higher Oil Prices on Monetary Policy

Country	Impact on Interest (Policy) Rates	Monetary Framework	Exchange Rate Regime
Argentina	None	…	Managed Float
Brazil	None	Inflation Targeting	Flexible
Colombia	None	Inflation Targeting	Managed Float
Dominican Republic	Significant	…	Flexible
Ecuador	n.a.	No independent MP	Full Dollarization
El Salvador	n.a.	No independent MP	Full Dollarization
Guyana	Modest	…	Fixed (de facto)
Honduras	None	Exchange Rate Targeting	Crawling Peg
Mexico	None	Inflation Targeting	Flexible
Venezuela	None	Exchange Rate Targeting	Fixed, Forex Controls

We observe that higher oil prices have had no impact so far on monetary policy in most countries of our sample (6 out of 8 countries with independent monetary policy). However, the steady increase in oil prices threatens to affect inflation in the future and would lead monetary authorities to apply contractionary policies.

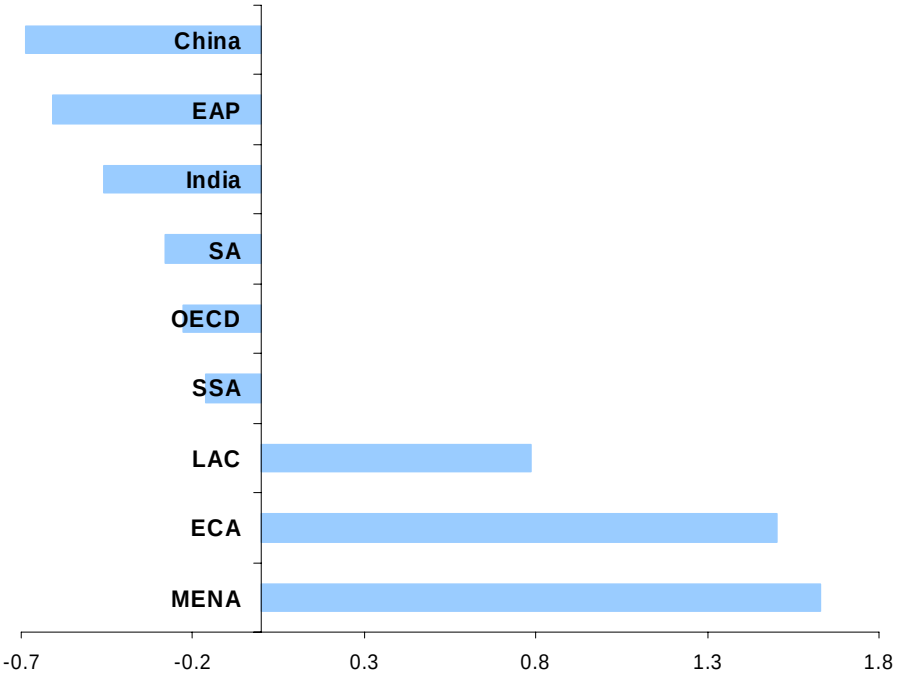
[16] In addition, the country studies provide a brief description of the current monetary policy regime, and how it has responded to the increases in the prices of oil.

4.4 Effects on the External Sector

Now we describe the impact of the increase in international oil prices on the current account balance and the real exchange rate —though mostly from a qualitatively perspective. We describe the magnitude of the shock in terms of the current account balance —including an analysis of the factors that may have contributed to mitigate or worsen the effects of oil price shocks. In addition, we evaluate the extent to which the real exchange rate has fluctuated during the period or rising prices and whether these fluctuations could be attributed to oil price movements.

Rising oil prices have increased the oil import bill for oil importer countries throughout the world. For instance, if we evaluate the change in net oil exports in 2003-4 with respect to 2001-2, we observe that the fuel bill has increased an annual average of 0.7 percent of GDP in China and approximately 0.5 percent in India. Figure 23 also reports changes in net oil exports for major regions across the world. East Asia and South Asia are among the regions where the fuel trade balance has deteriorated in the last four years. On the other hand, the fuel trade balance in LAC appears to have improved in 2003-4 by 0.8 percent of GDP relative to 2001-2.

Figure 23
Changes in Net Oil Exports Across Regions, 2003-4 vs. 2001-2
(as percentage of GDP)

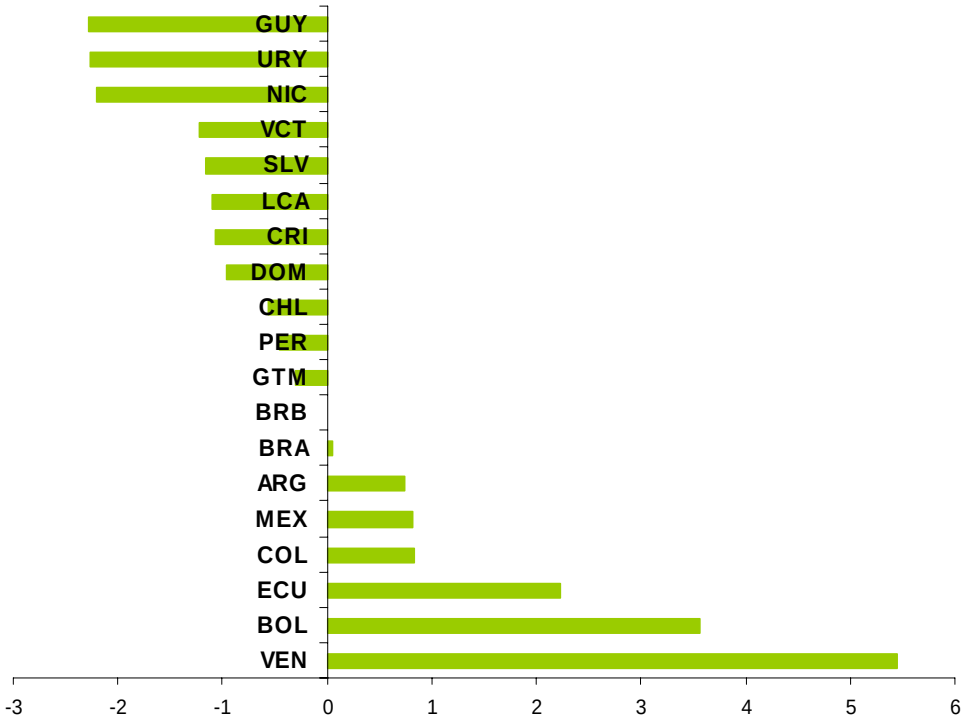


Rebucci and Spatafora (2006) argue that the pattern of external imbalances in the current episode of higher oil prices is different from the episodes of the 1970s. During the first and oil price shocks, current account deficits were concentrated among oil-importing developing countries. On the other hand, higher oil prices are currently widening the already significant external imbalance in the United States.

Note that the aggregate performance of the fuel trade balance in LAC may conver wide cross-country variation in terms of oil balances. Figure 24 reports the changes in oil next exports among Latin American

countries in 2003-4 relative to 2001-2.[17] We find that 11 out of 19 countries presented in Figure 24 show a deterioration of the oil trade balance, with 8 of these 11 countries located in the Central America and the Caribbean region. Guyana, Uruguay and Nicaragua are the countries where the fuel bill has had the largest impact on the oil trade balance (with all countries having a deterioration of the oil trade balance larger than 2 percent of GDP). On the other hand, oil trade balance in Ecuador, Bolivia and Venezuela has increased by more than 2 percent of GDP.

Figure 24
Changes in Net Oil Exports across LAC Countries, 2003-4 vs. 2001-2
(as percentage of GDP)



Note that for some Central American and Caribbean countries, the deterioration in the oil trade balance has not affected the current account balance due to: (a) more favorable prices in other commodities, and (b) a surge in workers' remittances. In section II we already presented the favorable evolution of international prices of metals and minerals (especially, copper) as well as some specific agricultural commodities (e.g. coffee and sugar). On the other hand, inflows of remittances have increased substantially in Latin America —rising from US$ 24.4 billions in 2001 to US$ 42.4 billions in 2005 (an increase of 74%). Remittances are particularly important in Central American and Caribbean countries. In 2004, remittances to Haiti represent 24.8 percent of GDP, 17.4 percent of GDP in Jamaica, 16.2 percent of GDP in El Salvador, 15.5 percent of GDP in Honduras, 13.2 percent of GDP in Dominican Republic, and 11.9 percent in Nicaragua (World Bank, 2006).

The qualitative analysis of the impact of higher oil prices on the external accounts for our sample of LAC countries is reported in detail in the Annex. Table 16 presents a summary of these results.

[17] Note that we computed these figures only for LAC countries where we can find complete data on fuel exports, fuel imports and GDP over the 2000-4 period in the World Bank's World Development Indicators.

Table 16
The Impact of Higher Oil Prices on the External Accounts

Country	Effect of the external accounts
Argentina	[+], moderate
Brazil	[+], moderate
Colombia	[+], moderate
Dominican Republic	[-], moderate
Ecuador	[+]
El Salvador	[-], moderate
Guyana	Negative and significant
Honduras	[-], moderate
Mexico	[+]
Venezuela	[+], significant

V. Conclusions and Policy Implications

International oil prices have risen sharply since 2003 due to an increasing demand for oil —especially coming from fast-growing nations like China— and, more recently, concerns about the future supply of oil. The positive demand shock due to the emergence of China and India in the global economy not only has increased the international price of oil but also of other commodities —especially, metals and minerals. On the other hand, there have been concerns about the world supply of oil since the beginning of 2005 due to the lower spare capacity in OPEC countries and the lack of investment as well as the insufficient supply provided by non-OPEC countries.

The current episode of higher oil prices is different from previous episodes of oil price hikes in several dimensions: First, the current episode is characterized by a significant expansion in the demand for oil as well as other commodities by non-OECD countries. In particular, fast-growing nations such as China and India are increasingly demanding not only oil but also metals and minerals. Second, the additional demand from fast-growing nations have been met by an increase in the provision of oil in the world markets by OPEC countries, which has led to a severe decline in OPEC's spare capacity. In the 1970s, oil supply by non-OPEC countries would increase after the price shock while the production by OPEC will decline in order to build up some spare capacity. Third, large external deficits were amassed by oil-importing developing nations in the oil crises of the 1970s. Currently, higher oil prices have expanded the already large external deficit of the United States. Finally, oil crisis episodes in the 1970s (along with the excessive tightening of the monetary policy by the end of the 1970s) were associated with rising inflation and declining output. Currently, the world economy has shown some resilience to the higher oil prices: World GDP growth reached 3.2 percent in 2005 while growth in developing countries was 5.9 percent. On the other hand, inflation has increased only moderately so far.

In Latin America, we also find that growth has been resilient thanks to favorable international prices in their export commodities. Latin America grew 5.9 percent in 2004 and 4.2 percent in 2005, and the region is expected to growth 4.4 percent in 2006 according to *Consensus Forecast*. On the other hand, inflation in the region was 5.6 percent in 2005 and it is expected to be slightly lower in 2006 (5.2 percent). However, there is substantial variation in the response of growth and inflation across countries within the region.

We undertake a cross-country analysis on the impact of higher oil prices on economic performance for a selected sample of Latin American countries that include large economies in the region (Argentina, Brazil, Colombia and Mexico), net oil exporters (Ecuador and Venezuela) and net oil importers (Dominican Republic, El Salvador, Guyana, and Honduras). The main results are:

- **Income Effects**. As expected, the income of oil exporters increase significantly in a scenario where only the international oil price increases in a commodity basket. For instance, if we assume an increase in the crude oil prices of 74 percent (corresponding to the increase in oil prices for the period 2004-5 relative to 2000-3), the largest terms of trade effects are experienced by Venezuela, Ecuador and Trinidad and Tobago, whereas 8 out of the 10 worst terms of trade effects belong to Central American and the Caribbean countries. However, once we account for the changes in other commodity prices (for instance, over the same period as the one specified above), some countries now have positive income transfers. It is worth mentioning that Chile (with terms of trade effects of almost 10% of GDP) now trails only Venezuela and Trinidad and Tobago in terms of income gains due to terms of trade shocks.

- **Short-Run Output Response**. Using panel VAR estimations we estimate the short-run response of output, domestic demand and net exports to changes in commodity prices under several

scenarios. We find that rising oil prices will deteriorate the terms of trade of oil importing countries. Real income in these countries will decline and, hence, domestic demand and imports will be reduced. On the other hand, rising oil prices would raise income and domestic demand in oil-exporting countries, while net exports will decline.

- **Permanent Growth Effects**. We use a back-of-the-envelope approach to compute the impact of rising oil prices on the economic growth rate of LAC economies. We find that the simulated rising oil prices would raise the growth rate of oil exporting countries by 0.14 percentage points per year and reduce the growth rate of oil importing countries by 10 percentage points. Growth rate in Central America and the Caribbean will be reduced by 0.09 and 0.12 percentage point per annum. We also find a large variation in growth performance across countries. For instance, growth benefits are high for oil-exporting countries: the increase in the average annual growth for Venezuela is 0.5 pp per year, Trinidad and Tobago is 0.45 pp, Ecuador is 0.25 pp and Colombia is 0.14 pp. Caribbean islands, on the other hand, suffer the largest losses in growth per capita.

In addition, we evaluate the policy responses to higher oil prices in the areas of monetary and fiscal policy as well as their impact on the external accounts. We can summarize the evidence (presented in detail in the Annex of the Report) in the following points:

- **Pass-through to domestic prices**. Although the pass-through from international oil prices to domestic gasoline prices has been high for most countries in the region, the responsiveness of overall consumer prices has been limited. In addition, we also find that higher gasoline prices have not spilled over other sectors of the economy since it has not affected core inflation. In some cases, the lack of pass-through to consumer prices is attributed to implicit subsides or the imposition of price caps.

- **Fiscal Policy**. Rising oil prices have had a limited effect on the fiscal balance of large LAC economies that were registering already important primary surpluses before the oil shock. On the other hand, the higher fuel bill faced by Caribbean nations and some Central American countries has led to modification of taxes, and the revision of price-setting mechanisms by the government.

- **Monetary Policy**. In most countries, higher oil prices have not affected yet the conduct of monetary policy. This reflects the low pass-through to consumer prices (as well as the negligible impact on core inflation). However, a steady increase in oil prices would threaten to affect inflation.

- **External Accounts**. Rising oil prices have increased the oil bill of oil-importing countries and generated windfall revenues for oil exporting countries. Although we observe a deterioration in the fuel trade balance for several Central American and Caribbean countries, the current account balances remain healthy. This could be attributed either to higher international prices in other commodities (especially, metals and minerals) and a substantial inflow of workers' remittances.

Finally, we draw some policy recommendations and challenges from the evidence presented in the Annex:

- More transparent rules would be favorable for countries where the government or a state-owned enterprise sets the wholesale and/or retail prices (e.g. Petrobras). This would avoid potential fiscal costs of price management.
- Governments in oil-exporting countries should reduce the vulnerability of their fiscal accounts in the event of a decline in oil prices. For instance, Ecuador and Venezuela should be running higher

primary surpluses. Actions should be taken in terms of widening the tax base, lower fuel subsidies, and reduce the wage bill.

- Oil-exporting countries should eliminate legal uncertainties in order to promote higher private investment in the oil sector. For instance, it is recommended the de-regulation of domestic fuel prices in Ecuador. In addition, lack of investment in Venezuela is reflected in the problems of production sustainability faced by Petroleos de Venezuela (PDVSA). Note that Venezuela is producing below the quota assigned by the OPEC.

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Assessing the Impact of Higher Oil Prices in Latin America

Prepared by:
Latin American and the Caribbean Region

Office of the Chief Economics (LCRCE)
Economic Policy Sector (LCSPE)

Annex: Country-Specific Analysis

I. Large Economies in LCR

1. Argentina
2. Brazil
3. Colombia
4. Mexico

II. Net Oil Exporters in the LCR

1. Ecuador
2. Venezuela

III. Net Oil Importers in the LCR

1. Dominican Republic
2. El Salvador
3. Guyana
4. Honduras

I. Large Economies in the Latin American and the Caribbean Region (LCR)

I.1. ARGENTINA[18]

The policy response to higher oil prices in Argentina has been characterized by serious efforts from the government to isolate domestic consumer from the sustained increase in the price of crude oil in international markets. Indeed, domestic fuel prices have remained virtually constant since early 2003 due to limits imposed by the government to prevent retailers from raising domestic prices. This has limited substantially the pass-through from domestic gasoline prices to CPI inflation. The imposition of controls on domestic fuel prices in Argentina have taken place through the application of different export tax rates for crude oil and refined products as well as through agreements between retailers and the government. Since the sensitivity of CPI inflation to changes in domestic fuel prices is almost negligible, the monetary policy stance has not been affected by the high oil prices in international markets. Finally, the positive shock to fuel exports in Argentina has led to a substantial increase in the fuel trade balance during 2003. The trade balance in fuels, on the other hand, has increased only moderately afterwards.

I.1.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

Figure I.1.1 plots price indices for international prices of crude oil as well as domestic gasoline prices in Argentina for the period 2002-2005. We observe that domestic gasoline prices have remained virtually invariant in Argentina since January 2003. Since 2003 the price of low-octane gasoline has remained between 1.68 and 1.70 Argentinean pesos per liter, whereas the price for the high-octane gasoline has oscillated between 1.94 and 2 pesos per liter. This contrasts with the sharp rise in fuel prices in international markets —which have increased from US$ 33 to US$ 65 per barrel during the period. Therefore, the level of pass-through from international oil prices to domestic gasoline prices has been virtually zero.

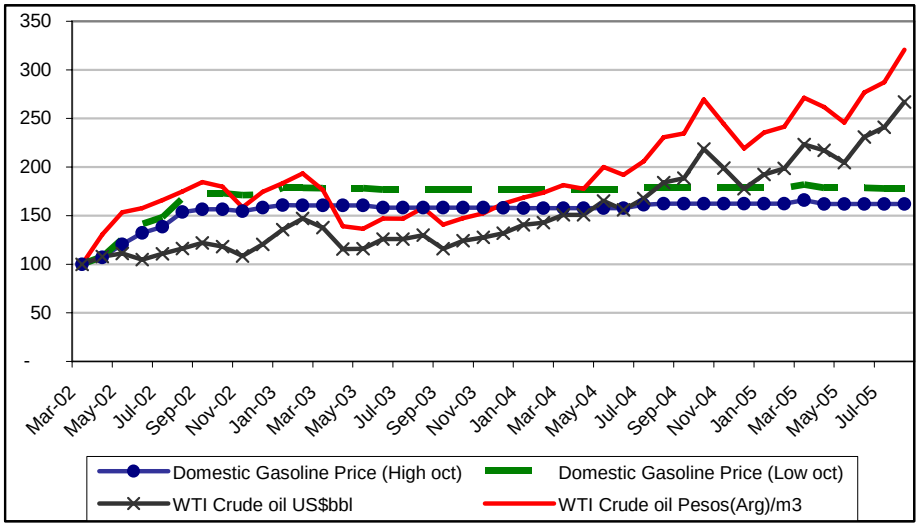
The government has been able to impose limits on prices increases by: (i) raising taxes on crude exports that can be as high as 45 percent, and (ii) threatening to exempt companies that increase fuel prices from tariff-free imports of diesel during the winter. In fact, the US fuel distributor ESSO rolled back the increase in the price of fuel in April 2005 in order to remain included among the companies exempted to pay export taxes. If not, ESSO would have had lower sales and faced possible fines for failing to meet its commitments to supply diesel. Finally, the government called for a boycott of SHELL products in March 2005 after the company announced a similar increase in fuel prices. Again, SHELL was forced to a policy reversal due to plummeting sales during the boycott.

Figure I.1.1
International Oil and Domestic Gasoline Prices 2002-2005

[18] The country report on Argentina was prepared by Alvaro Vivanco.

(March 2002 = 100)

International Oil and Domestic Gasoline Prices: 2002 - 2005 (Mar 2002=100)



Source: Secretaria de Energia, MECON.

b. Estimating the pass-through from domestic gasoline prices to overall inflation

Since domestic gasoline prices have remained constant during the period of rising oil (that is, since January 2003), domestic CPI inflation has not been altered by changes in international oil prices. Thus, a regression of overall CPI inflation on changes in the price of domestic gasoline seems futile for the period 2003-05 since the variance of the explanatory variance is negligible. Using monthly information on annual inflation in the overall CPI, gasoline prices, the nominal exchange rates as well as the output gap and lagged real exchange rate overvaluation for the period 1995-2005, we estimate the following inflation equation,

$$\hat{P}_{t,t-12} = \underset{(-17.0)}{-0.875} + \underset{(5.66)}{0.104}\ \hat{g}_{t-1,t-13} + \underset{(23.8)}{0.161}\ \hat{e}_{t-1,t-13} \underset{(-0.73)}{-0.057}\ (y_t - \bar{y}_t) \underset{(-2.76)}{-0.032}\ (q_{t-1} - \bar{q}_{t-1})$$

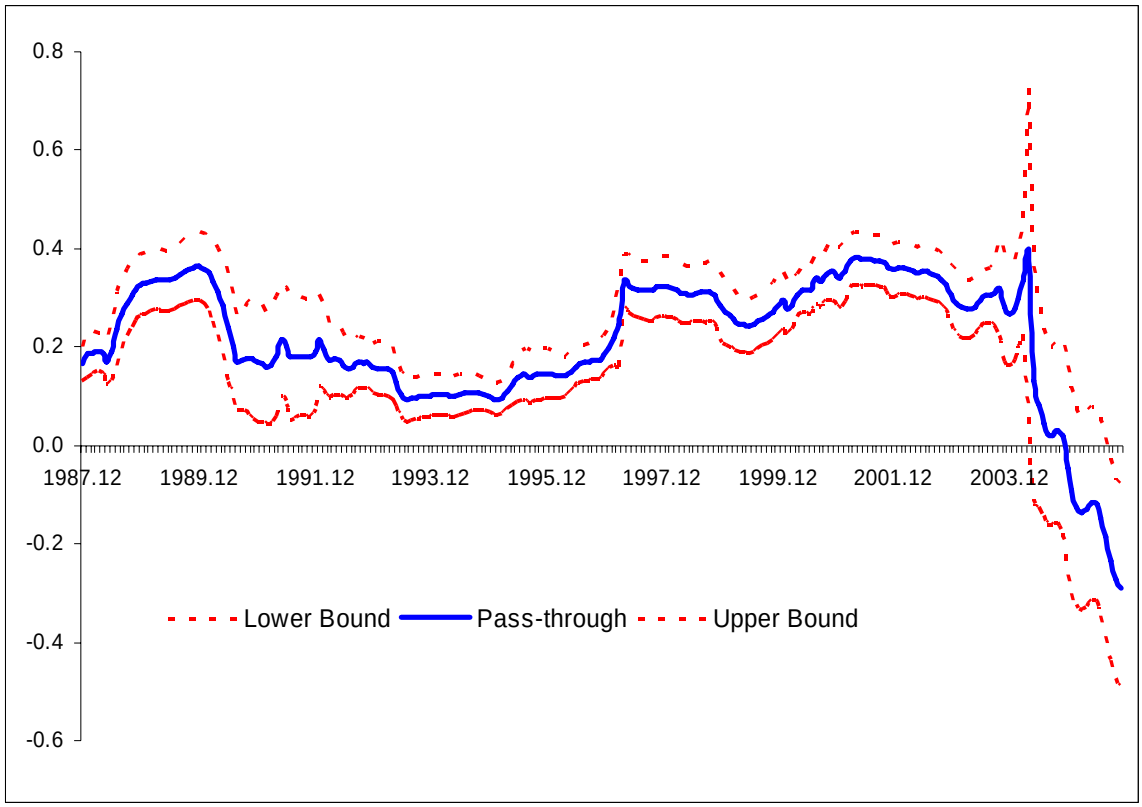
$$+\underset{(5.66)}{0.104}\ P_{t-1}\ ;\quad R^2 = 0.95,\quad N = 131$$

where $\hat{P}_{t,t-12}$ is the annual CPI inflation from period *t-12* to *t*, $\hat{g}_{t-1,t-13}$ is the increase in gasoline prices lagged one period (that is, from period *t-13* to *t-1*), $\hat{e}_{t-1,t-13}$ is the annual change in the nominal exchange rate lagged one period, $(y_t - \bar{y}_t)$ is the output gap at period *t*, $(q_{t-1} - \bar{q}_{t-1})$ is the RER overvaluation in period *t-1*, and P_{t-1} is the CPI level (in logs) at period *t-1*. Note that the number in parenthesis represent robust t-statistics.

We find that our parameter of interest —the coefficient of changes in gasoline prices— is positive (0.104) and significant. It implies that if the annual change in gasoline prices in period t is 10%, the annual CPI inflation for next month is equal to 1.04%. However, as we stated above, the intervention of the government —by limiting the changes in gasoline prices— may have affected the coefficient of pass-through over time.

Figure I.1.2 reports the "rolling" coefficient estimates of $\hat{g}_{t-1,t-13}$ for a 5-year window period over the period1983-2005. We presented not only the rolling coefficient estimate but also its confidence interval at the 5 percent level of statistical significance. We clearly observe that after reaching a high value of almost 0.4 by the end of the year 2003, the coefficient of pass-through decreases sharply and becomes not statistical significant.

Figure I.1.2
Pass-through from Domestic Gasoline Price Changes to CPI Inflation (y-o-y)
5-year window rolling correlation



Inflationary pressures in Argentina —which have led to an annual inflation of 12.3 percent by December 2005— have been mostly attributed to a strong recovery in the domestic demand and an expansionary monetary policy. Regarding the latter, currency in circulation has sharply increase at an annual rate of almost 30 percent by the end of 2005 and most of the increase in the monetary base has been attributed to building up reserves. To control the inflationary pressures without running the risk of an economic slowdown, the government has implemented price agreements with retailers and producers. For instance, the government has reached agreements with supermarkets to limit price increases. However, most analysts agree that this type of measures is only likely to delay —rather than decrease— the rising price pressures.

I.1.2 Domestic Policy Responses to Higher Oil Prices

a. Effects on the Fiscal Stance and Potential Policy Responses

Since the economic crisis and accompanying devaluation of the peso, crude petroleum exports have been subject to a rising level of taxation. In August 2004, the government imposed an export tax on crude oil which included a sliding scale of rates depending on the price level. Under the current environment of high oil prices, the *ad valorem* tax rate on crude oil exports is close to 45 percent. One of the objectives of this high tax rate is precisely to compensate gasoline retailers for the revenue foregone due to *de facto* controls imposed by the government on domestic fuel prices, as discussed above.

In addition, the government has subsidized imports of diesel and fuel oil, which increased due to the demand by electric generating plants, as well as by industrial and agricultural producers following a shortage of natural gas in 2004. In particular, the government has provided subsidies to electricity plants importing fuel, while diesel imports up to maximum limit were exempted from import taxes. Although the government has benefited from the higher revenues from taxation, these policies have also reduced the incentive for the private sector to invest in the energy and fuel sectors.

b. Effects on Monetary Policy of Higher Oil Prices

Due to the controls imposed on the domestic fuel prices, monetary policy in Argentina has not taken into account a possible response to a deterioration of inflation or weakening domestic growth prospects due to rising oil prices. Rising inflation attributed to excess liquidity in the market has been tried to control through non-orthodox measures such as price agreements.

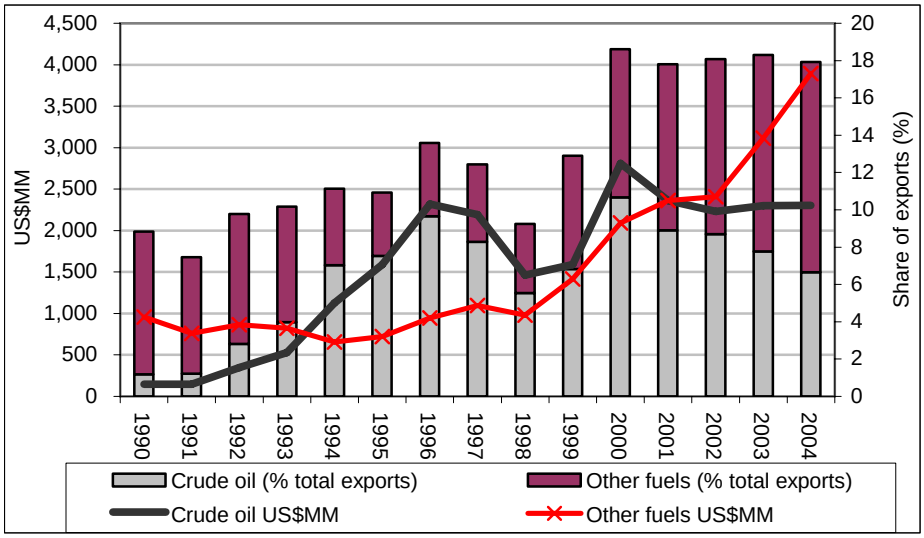
c. Effects on the Exchange Rate and the Current Account

Argentina is a net exporter of fuel, with crude oil comprising around 7 percent of total exports, and other fuels – particularly carburant and gas – accounting for an additional 11 percent in 2004 (see Figure I.1.3). Since 2000, exports of crude oil have decreased from US$2.8bn to around US$2.3bn last year, but they have been more than compensated by exports of other fuels, which have increased from US$2.1bn to US$3.9bn during the same time period. Hence, there has been an increase in exports of fuels by more than 26 percent during the period 2000–2004, which is roughly equivalent to the increase in total exports, leaving the share of fuel exports roughly constant at around 18 percent.

The sharp increase in fuel exports since the year 2000 is mostly attributed to price effects following the devaluation of the Argentinean peso. Indeed, the volume of fuel exports in 2004 was virtually the same as that of 2000 (although it increased in the years in between) while their price increased by 25 percent.

Figure I.1.3
Fuel Exports of Argentina, 1990-2004

Argentina: Fuel Exports



Note: Fuel exports comprise primarily crude oil, gas from oil, carburant as well as other hydrocarbo

Source: MECON.

Table I.1

Argentina: Current Account and Trade Balance

	2002	2003	2004	2005 (1H)
Current Account	8,673	7,659	3,332	1,797
Merchandise Balance	17,178	16,448	13,239	6,172
Fuel Balance	4,131	4,864	5,192	2,303
as a share of total balance	24%	30%	39%	37%
Exports fob	25,651	29,566	34,550	19,037
Fuel exports fob	4,613	5,412	6,196	3,132
Imports fob	8,473	13,118	21,311	12,865
Fuel imports fob	482	547	1,003	829
Services	-1,582	-1,396	-1,644	-1,138
Profits	-7,484	-7,970	-8,950	-3,561
Current tranfers	562	577	687	325

Source: MECON.

Finally, if we examine the fuel trade balance during the 2002-5 period, we observe that fuel trade surplus has increased substantially since 2003 (see Table I.1). Fuel trade balance increased by 18 percent in 2003 due to exports increasing at a faster pace than imports. Fuel imports in 2004, however, grew substantially —*i.e.* from US$ 174 to US$ 391 million between the 2003.Q2 and 2004.Q2— leading to an increase in the oil trade balance of only 7 percent relative to the previous year. During the first semester of 2005, the fuel trade balance has reached US$ 2.3 billion. This positive fuel balance has helped to compensate for a merchandise trade surplus that continues to narrow, notwithstanding the strong growth of exports. However, the contribution from fuel to the trade balance is rather moderate compared to the effect of a rising import bill.

I.2. BRAZIL[19]

Brazil, the largest country in the Latin American region and a net oil importer, has been able to dampen the effect on its economy of rising world oil prices. This could be explained by two important features of the Brazilian economy:

(1) Brazil has implemented a policy to develop a fuel supply system largely based on ethanol that started in the 1970s.
(2) The partial opening of the Brazilian oil (including the partial privatization of *Petrobras*) has contributed to rising investment and production in the sector since the late 1990s.

As a result, Brazil has transformed itself from a major oil importer to an *expected* net exporter (in the near future): the oil production has reached 1.5 million barrels per day in 2004, compared to 1.1 million in 1999 and 0.7 million in 1994. Net oil imports, on the other hand, have fallen from 3 percent of GDP in the 1970s and 1980s to approximately 1 percent today.

I.2.1 The Impact of Higher Oil Prices on Domestic Prices

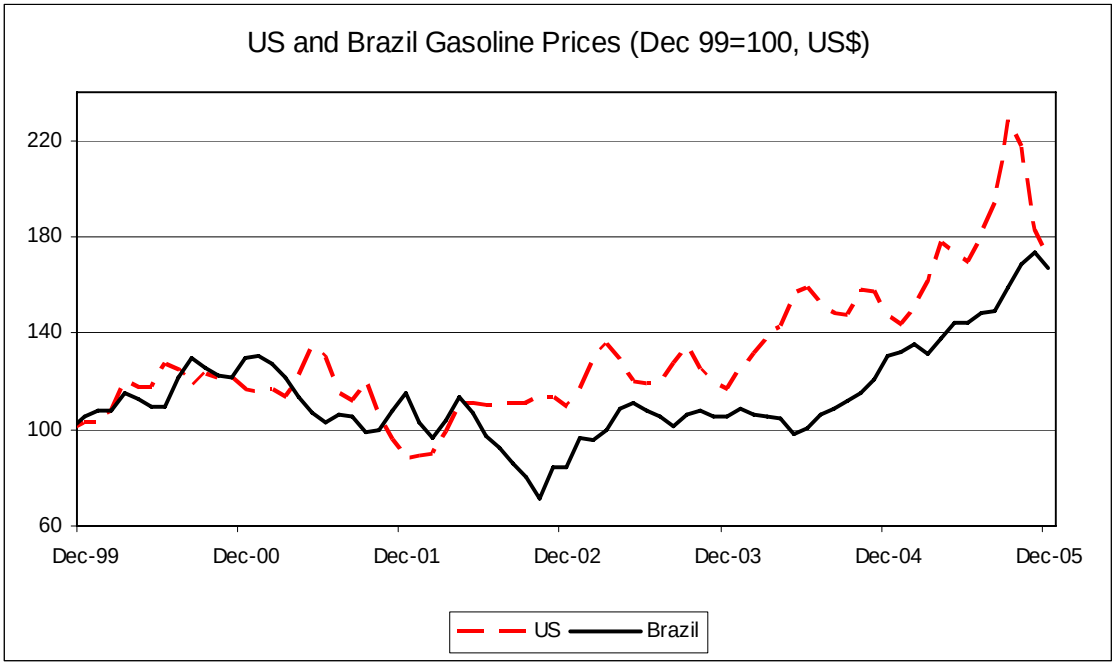
a. Estimating the pass-through of world oil price changes to domestic gasoline prices

The prices of gasoline and other oil products were administratively set by the Brazilian government up to the 1990s. In 1997, the domestic oil markets were substantially reformed with the partial privatization of *Petrobras* and the creation of the *National Agency of Oil* (ANP) as a regulatory agency. Since then, wholesale gasoline prices have been determined by Petrobras. On the other hand, the gasoline retail market has become more competitive and prices have tended to reflect more closely world oil and gasoline prices in spite of the still heavy dominance of Petrobras in the market. The partial privatization of Petrobras implied a major change in oil pricing policies.[20] Due to an increasing autonomy from the Federal Government, Petrobras has started to change the prices of oil and wholesale gasoline periodically (at a quarterly or even monthly frequency). This pricing policy has the goal to keep domestic prices in line with fluctuations in international prices and in the exchange rate.[21]

In order to compute the pass-through coefficient of international oil prices to domestic prices of gasoline, we compare the price levels of gasoline in Brazil and the United States (see Figure II.2.1). The rationale behind is that the pass-through in the United States is expected to be close to one since it is a more competitive market. Although taxes —and especially ad-valorem taxes— are likely to distort the comparison of the pass-through in these two countries, it still seems to be a good approximation. In this respect, Figure II.1 presents the evolution of US and Brazilian gasoline prices for the period 1999-2005. We observe that gasoline prices seem to have changed in the same direction over the last 5 years, with the exception of September 2005 as a result of the effects of Hurricane Katrina in the US refineries.

[19] The country report on Brazil was prepared by Julio Revilla.
[20] Note that the percentage of outstanding shares owned by the Government in Petrobras has decreased from 50 percent (at the beginning of the privatization) to 30 percent in 2005.
[21] On the other hand, growing competition in the refining of oil is still limited, although it is more significant at the retail level.

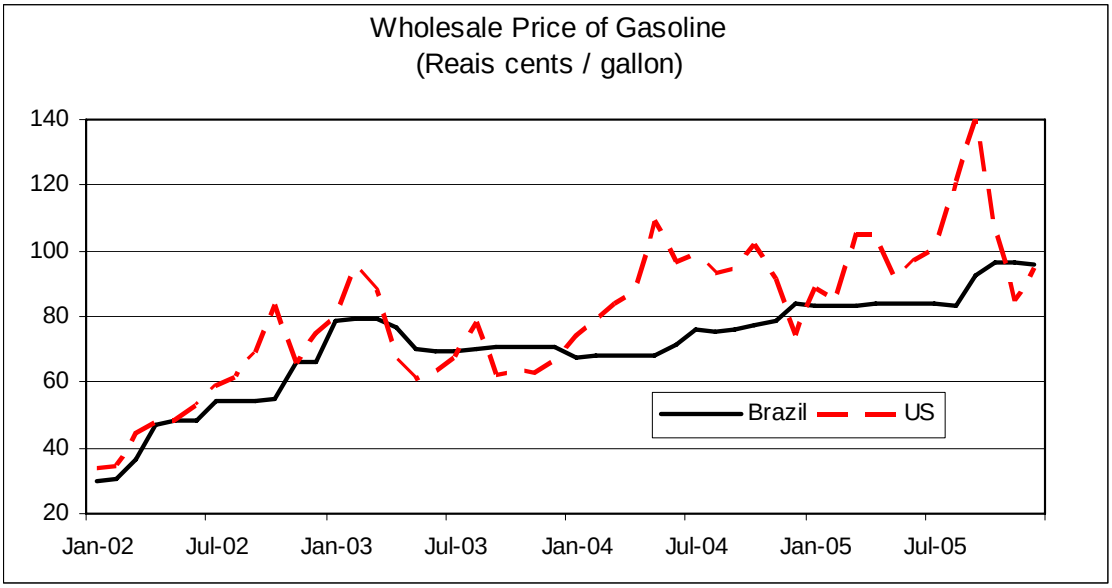
Figure II.2.1



Sources: U.S. Bureau of Labor Statistics and Brazil, IBGE

Although consumer prices of gasoline in Brazil show a substantial co-movement with US prices, the behavior of wholesale prices shows a weaker degree of association: Petrobras will change the wholesale price of gasoline only once per quarter following changes in US gasoline prices. Figure II.2.2 shows the monthly average wholesale price for gasoline expressed in reais cents (and excluding taxes). We observe that US prices change more frequently than Brazilian comparable prices, with wholesale prices in Brazil not showing a pattern of adjustment at fixed periods of time.

Figure II.2.2



Source: U.S. Department of Energy, EIA (Gulf Coast) and Brazil, Agência Nacional do Petróleo (average price for Brazil). Wholesale prices excluding taxes.

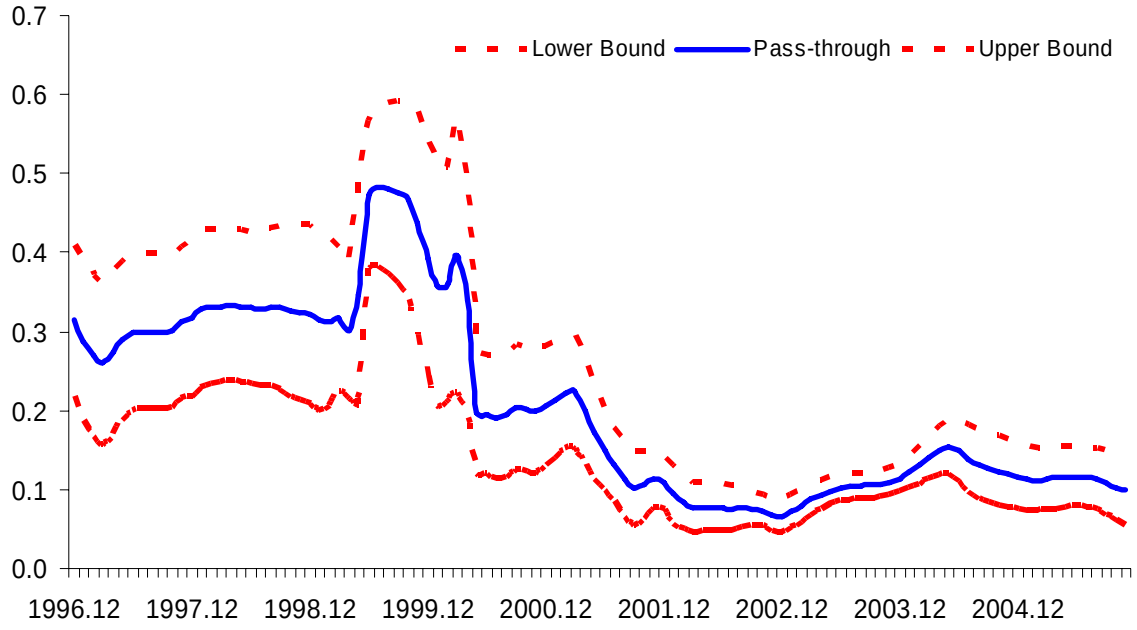
b. Estimating the pass-through coefficient from domestic gasoline prices to overall and core inflation

To analyze the effect of gasoline prices on overall consumer inflation, we set up an equation in which current inflation is explained by current gas prices and last month inflation. To avoid autocorrelation problem, we look at the first differences and find that a 10 percent increase in fuel prices would raise overall CPI inflation (in a statistically significant way) by about 8 percent:

$$\Delta\pi_t = -0.004 + 0.114\ \Delta\pi_{t-1} + 0.084\ \Delta gp_t + \varepsilon_t$$
$$\quad (-0.10)\ \ (1.36) \qquad\qquad (9.19)$$
$$R^2 = 0.557,\ N = 71$$

where $\Delta\pi_t$ is the first difference of inflation in period *t*, Δgp is the first difference of changes in domestic gasoline prices, and ε represents the error term. Note that robust t-statistics are reported in parenthesis below the coefficient estimates.

Figure II.2.3
Pass-through from Domestic Gasoline Price Changes to CPI Inflation (y-o-y)
5-year window rolling correlation



To analyze the effect of gasoline prices on core inflation (which excludes gasoline and other seasonal and price-regulated goods and services), we set up an analogous equation:

$$\pi_t^C = +0.131 + 0.735\ \pi_{t-1}^C + 0.011\ gp_t + \varepsilon_t$$
$$(2.64) \quad (9.13) \qquad (1.54)$$
$$R^2 = 0.553,\ N = 72$$

We are unable to find a statistical impact of gasoline prices on core inflation despite running different specifications of the regression equation for core inflation. This is likely the effect of tight monetary policies but it needs to be empirically tested. Since *core inflation* represents the trend or long-term inflation, we can argue that rising gasoline prices have had no significant effect over long-term inflation. Although in order to prove this assertion we will need to test a more detailed specification, including as system of equations. By the same token, we will have to test a model of the effect of interest rates (monetary policy) on overall and core inflation.

I.2.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

Fiscal costs of rising oil prices have been relatively small in Brazil. This is mostly due to the fact that the domestic price of oil has been set by Petrobras (since 1997) so as to not deviate significantly from world oil prices, and without a political aim to avoid oil price increases. However, potential for major deviations should be considered since Petrobras lacks a well-defined policy to set prices and it is still heavily influenced by the Brazilian government.

Although Petrobras operates as a profit-maximizing private company, the Brazilian government still owns 30 percent of its shares and has control over the Board of Directors.

The Brazilian government has not introduced any substantial misalignments in prices so far, and it has benefited from the royalties and growing taxes paid by Petrobras as the price of oil has risen in the last three years. Due to the rising oil prices, profits in Petrobras have increased from US$ 2.3 billion in 2002 to US$ 6.2 billion in 2004 while income tax paid by the oil company rose from US$ 1.2 billion to US$ 2.2 billion over the same period.

The fiscal accounts have actually benefited from Petrobras's dominant position in the Brazilian oil market, with the surplus in Petrobras (partly owned by the Government) contributes significantly to the primary surplus:

- The primary surplus attributed to federal public enterprises has risen to 0.79 percent of GDP in the first nine months of 2005 from 0.31 percent and 0.39 percent in the same period of 2003 and 2004, respectively.
- The Government has not established an oil stabilization fund, so that the pass-through is not affected and the fiscal accounts are not likely to be impacted by changing political decisions over the funding or the use of such a fund.

b. Effects of Rising Oil Prices on Monetary Policy

In principle, it is expected that rising oil prices may have an impact on the stance of monetary policy through its effect on inflation —especially if the inflation targeting framework constitutes the monetary policy regime. In the case of Brazil, with a relatively successful monetary policy that has reduced CPI inflation since 2002 —a period characterized by rising oil and gasoline prices— it is reasonable to assume that the ensuing tightening of the monetary could be explained (at least, partially) by the higher oil prices.

The Central Bank of Brazil has followed closely the evolution of oil prices in the international and domestic markets and its effect on inflation as reported in the Minutes of the Committee on Monetary Policy (COPOM). As the central bank has maintained a relatively tight monetary policy over the period, based in part on the need to contain fiscal pressures, it is difficult to disentangle the impact of fiscal pressures from the one of rising oil prices on the tightness of monetary policy.

Different specifications of the relationship between gasoline prices (*gp*) and the policy rate, SELIC (*r*) fail to account for a meaningful statistical explanation,

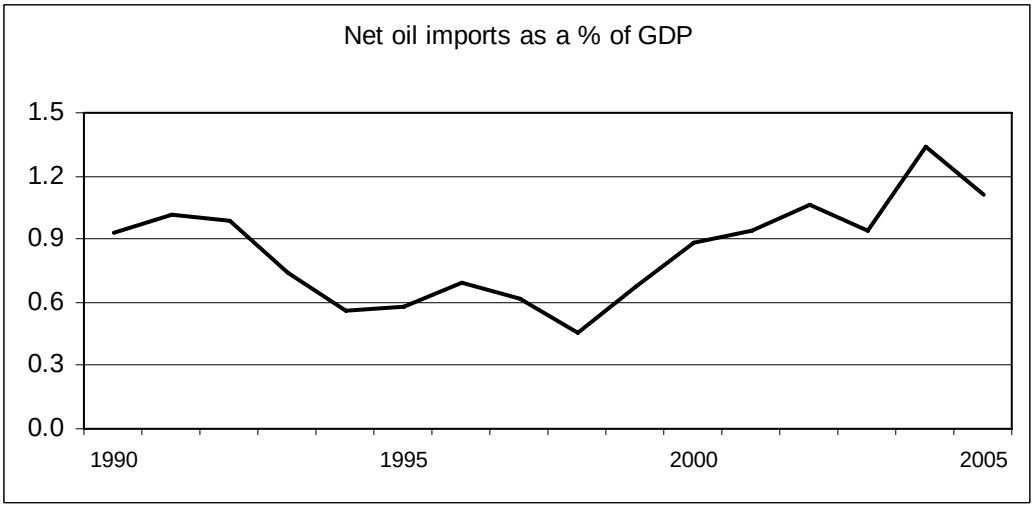
$$\Delta r_t = -0.072 + 0.031\, gp_t + 0.030\, gp_{t-1} + \varepsilon_t$$
$$\quad (-0.78) \quad (1.16) \qquad (1.14)$$
$$R^2 = 0.05, \ N = 72$$

This is in part due to the longer term effects of the interest rate to overall inflation (and not the other way around), and the fact that monetary policy is following the expected inflation in addition to short-term shocks.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

Being a net oil importer, rising oil prices may potentially affect adversely the external accounts of Brazil. However, the growth in oil exports ahs reduced the net impact of rising oil prices. In 2005, oil exports represented approximately 27 percent of oil imports relative to 15 percent in the year 2000. As a result, net oil exports amounted 1.1 percent of GDP in 2005 compared to 0.9 percent in 2000 in spite of the increase in oil prices by more than 200 percent over that period (see Figure II.2.4)

Figure II.2.4



The impact of rising oil prices on the Brazilian trade balance is likely to diminish over time due to the following forces:

- The persistent growth in oil production and exports
- The moderate growth in oil consumption and imports as a result of rising production and consumption of ethanol due to substitution effects.

The effect on the exchange rate of rising oil prices has also been relatively minor as a consequence of the small impact on the trade balance. The domestic currency in fact has appreciated substantially in Brazil over the last three years, however, the appreciation of the Real has been explained by the strength of the international prices of commodities exported by Brazil as well as the high domestic interest rates. Over the medium term, oil is not expected to play a major role in the exchange rate if oil production continues to increase and Brazil becomes a net oil exporter in the near term, as it is expected.

I.2.3 Policy Implications

Despite the overall comparatively minor negative impact of rising oil prices on the Brazilian economy, partly due to the increase in domestic oil production as well as the increase in ethanol consumption as an alternative fuel, Brazil could benefit of a more transparent rule on price determination of oil products by Petrobras.

Although wholesale prices of gasoline and other oil by products, as determined by Petrobras, have followed with certain lag international prices, there have been periods of significant misalignment (mostly below international prices). Changes in prices of gasoline and other oil products have been made sporadically and without any established pattern.

The introduction of a clear rule by the government-controlled Petrobras in determining prices of oil-products, could not only increase transparency in the effect of oil prices in the economy, but also avoid potential fiscal costs of managing prices. Rules of price determination could be introduced so as to minimize the high volatility of international prices without the potential costs to Petrobras and the fiscal balance.

I.3. COLOMBIA[22]

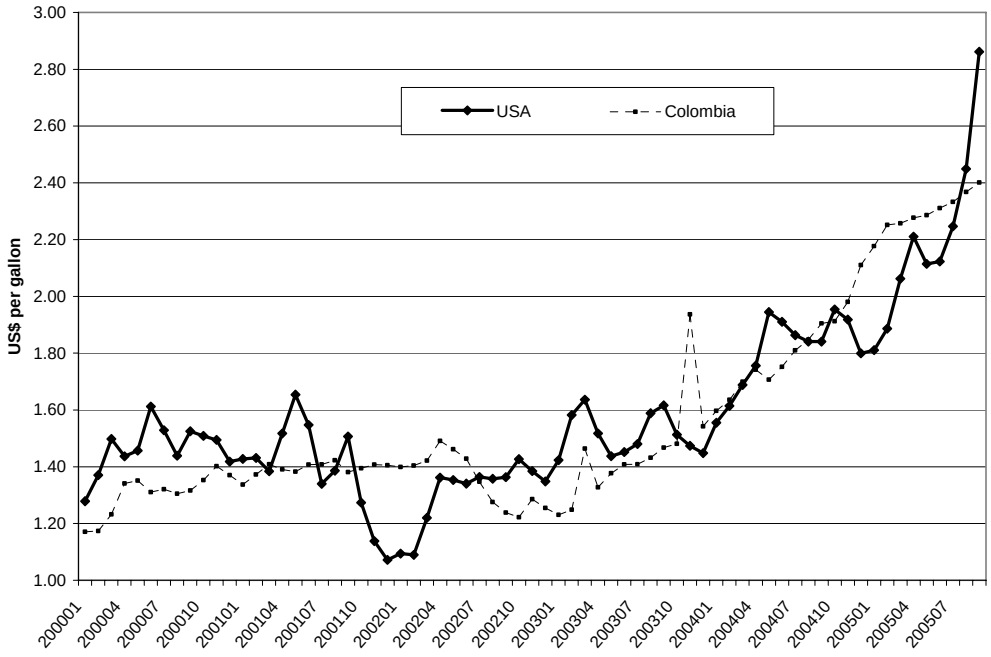
Colombia has been a net exporter of oil since 1986 and recent studies have shown that the country could become a net importer by 2010 if proper investments are not made in the oil sector. According to Ecopetrol about 80 percent of the country has not been explored and estimates that there are reserves of about 47 billion barrels.

I.3.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

The prices of gasoline and diesel are administratively set by the government. Both prices are determined by a formula which depends mainly upon the moving average of indexes of US Gulf Coast waterborne of the past 30 days published by Standard and Poor's. Since the formula changed in 1998, retail gasoline prices in Colombia have been, on average, similar to those prevailing in the United States (see Figure I.3.1).

Figure I.3.1
Retail Gasoline Prices



Source: Ministry of Mines and Energy

Behind this retail price comparison, there are two issues worth mentioning. First, Colombian tax rates on gasoline are higher than in the United States; and, second, there are still some price

[22] The country report on Colombia was prepared by Christian Yves Gonzalez.

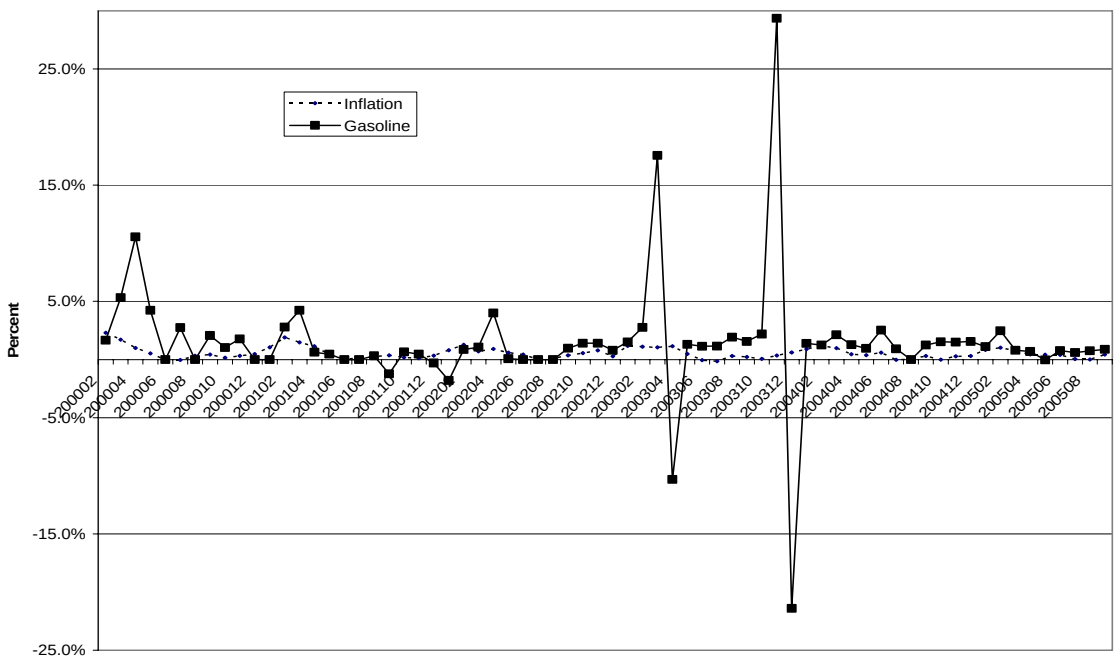
distortions at the producer level. Indeed, price subsidies at the producer level used to be larger prior to 1998 when the government began to implement a pricing formula based on mark-ups over the border import price. Despite the formal calculation, the Ministry of Energy has made discretionary adjustments to the actual price set for producers.

Ecopetrol, which is a state-owned industry, is the only supplier of gasoline and diesel in Colombia. Until 2003, Ecopetrol was in charge administrating the oil resources but now the National Agency of Hydrocarbons has been in charge of this function. Ecopetrol has been a net exporter of gasoline but a net importer of diesel.

b. Estimating the pass-through of domestic gasoline prices to overall inflation

Periodic increases of gasoline and diesel prices have responded more to the evolution of international prices and the exchange rate as well as the discretion of the Ministry of Mining and Energy than to inflation. Figure I.3.2 shows the retail price change of gasoline and inflation. As it can be seen there is a weak relationship between gasoline prices and inflation.

Figure I.3.2
Inflation and Changes in the Retail Gasoline Prices.



Source: Ministry of Mines and Energy.

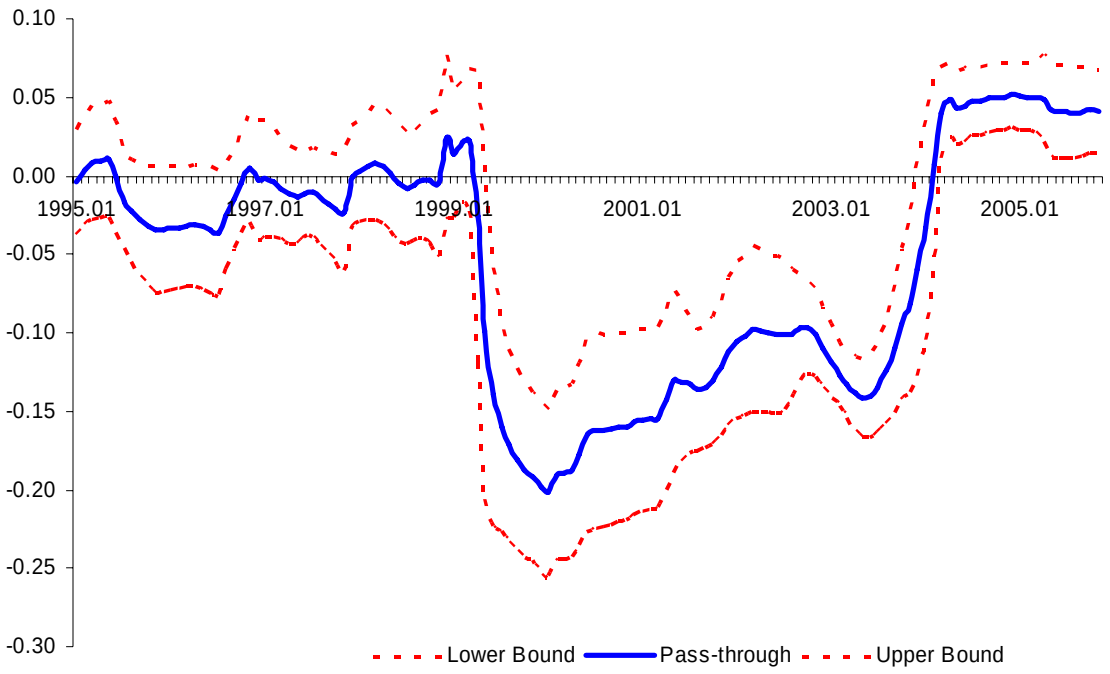
To confirm the hypotheses, we run a regression of monthly CPI inflation on changes in domestic gasoline prices (actual and lagged) and lagged CPI inflation, and we report the t-statistics below the estimated coefficients.

$$\pi_t = 0.0018 + 0.6308\ \pi_{t-1} - 0.0000648\ gp_t - 0.0000689\ gp_{t-1} + \varepsilon_t$$
$$(2.86) \quad (7.62) \quad (-0.01) \quad (-0.01)$$
$$R^2 = 0.4892, \ N = 67$$

Despite different specifications, we found no statistically significant influence of gasoline prices on overall inflation. This could be attributed to tight monetary policy. In addition, the productive sectors intensive in fuel use comprise a relatively small share of both GDP and the consumption basket for consumer price inflation.

Figure I.3.3 reports 5-year rolling regressions of 12-month CPI inflation on 12-month changes in domestic gasoline prices from 1990 to 2005. We find that the pass-through coefficient has been unstable throughout the period but it has been increasing in the last 5 years. By the end of 2005, we find that the coefficient estimate for the pass-through is 0.041 and statistically significant. This implies that a 10 percent increase in domestic gasoline prices over a year would be associated with a 4.1 percent increase in the domestic consumer price index.

Figure I.3.3
Pass-through from Domestic Gasoline Price Changes to CPI Inflation (y-o-y)
5-year window rolling correlation



I.3.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

So far oil prices have had a modest impact on the fiscal stance. Oil revenues represent approximately 20 percent of the Government revenues. However, when oil prices rise there is not only a positive effect on fiscal revenues but also increases on government subsidies. This renders a very modest net fiscal effect.

There is an increasing debate in Colombia on the size of the subsidy. According to the government, the subsidy is equal to the difference between the import price of gasoline and the producer price set by the Ministry of Mining and Energy. Note that this subsidy depends upon the evolution of international prices and the nominal exchange rate. The size of the subsidy will be larger is there is any increase in the international price or a depreciation of the local currency. On the other hand, consumers pay a retail sales price which is determined by adding taxes to the producer price. In Figure I.3.1 we showed that Colombia's gasoline prices have had a strong pattern of co-movement with US gasoline prices. Therefore, the net subsidy has been modest (See Table I.3.1).

Table I.3.1
Subsidies, Taxes and Operating Surplus of ECOPETROL
(as a share of GDP)

	1998	1999	2000	2001	2002	2003
A. Subsidy	0.0	0.4	1.2	0.9	0.6	1.2
B. Tax	0.5	1.0	1.1	1.2	1.1	1.1
Difference (A-B)	-0.4	-0.7	0.1	-0.3	-0.5	0.1
Operating Surplus			3.0	2.5	2.3	2.9

Source: Rincon and Garavito (2004) and IMF

In 2000 and 2003, when oil prices were relatively high, we can see that net subsidies have increased to 0.1 percent of GDP while the operating surplus increase about 0.5 percent of GDP. Therefore, there was a positive effect of 0.4 percent of GDP in the government finances, which is relatively modest.[23] Since 2004, the government has been taking action to reduce the subsidy.

b. Effects of Rising Oil Prices on Monetary Policy

It is expected that rising oil prices may have an impact on monetary policy through its effect on inflation. In Colombia, monetary policy has succeeded to reduce and maintain CPI inflation in single digits since 1999. It is highly likely that monetary tightening could be partially attributed to the rising oil prices.

We run several specifications for the relationship between changes in domestic gasoline prices and the short-term interest rate in Colombia during the 1999-2005 period (t-statistics are reported in parenthesis below the coefficient estimates).

$$r_t = \underset{(30.37)}{0.09428} \underset{(-0.02)}{-0.00104}\, gp_t \underset{(0.02)}{+0.00093}\, gp_{t-1} + \varepsilon_t$$

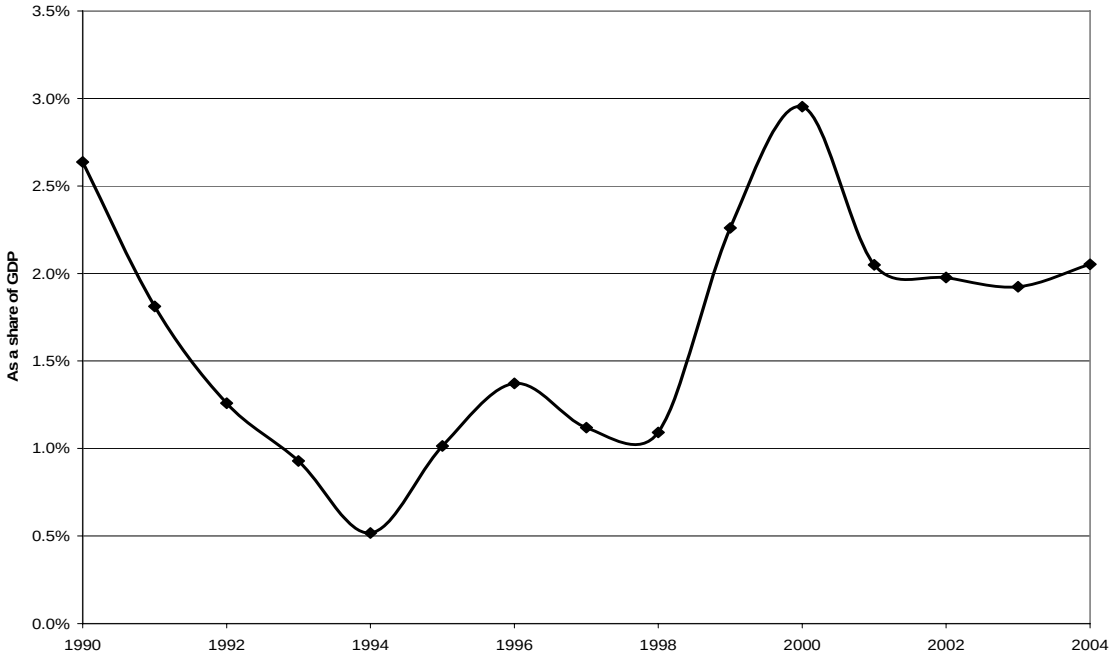
We find that changes in domestic gasoline prices are not significantly associated to the short-term interest rate. This result holds to changes in the specification.

[23] Note that even if the post 1998 formula for producer prices were applied with rigor, there still could be subsidies during times of rapidly rising international prices. This is because the formula is backward looking, taking an average international price of the previous 30 day period.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

As a net oil exporter, rising oil prices have affected Colombia's trade and current account balance. In the last 4 years, net oil exports have remained at almost 2 percent of GDP. Figure I.3.4 shows the evolution of net oil exports (as a share of GDP) in Colombia for the period 1990-2004.

Figure I.3.4
Net oil exports as a share of GDP.



Source: Ecopetrol

Table I.3.2 shows the evolution of the current account in Colombia for the period 2000-5. We observe that even though petroleum exports have increase since 2001, the trade balance have declined in 2004 while the current account deficit has widened (see Table I.3.2).

Recent IADB-CAF study shows that Colombia would stop being a net exporter of crude oil in 2010 if the country does not discover new reserves in the next three years. Crude oil reserves of Colombia dropped to 1,478 million barrels in 2004 from 1,542 million barrels in 2003. Therefore, it is necessary that Colombia starts increasing investment in oil exploration. Since oil exploration it is open to the private sector the government could generate the necessary incentives to increase investment.

Table I.3.2
Colombia's Current Account
(US$ millions)

	2000	2001	2002	2003	2004	2005p
Current account balance	**572.0**	**-1,086.0**	**-1,332.0**	**-969.0**	**-951.0**	**-1,262.0**
Trade Balance	**2,444.0**	**579.0**	**239.0**	**567.0**	**1,368.0**	**740.0**
Exports fob	13,099.0	12,848.0	12,316.0	13,825.0	17,246.0	20,744.0
Coffee	1,069.0	764.2	772.0	809.4	949.5	1,460.0
Petroleum products	4,569.0	3,285.0	3,275.0	3,383.1	4,179.6	4,987.0
Nontraditional	6,388.0	6,613.0	6,287.0	6,250.0	8,223.0	9,539.0
Other	1,073.0	2,185.8	1,982.0	3,382.5	3,894.0	4,758.0
Imports fob	10,655.0	12,269.0	12,077.0	13,258.0	15,878.0	20,004.0
Services (net)	**-1,259.0**	**-1,404.0**	**-1,427.0**	**-1,423.0**	**-1,773.0**	**-1,817.0**
Income (net)	**-2,286.0**	**-2,615.0**	**-2,848.0**	**-3,446.0**	**-4,193.0**	**-3,984.0**
Interest (net)	-1,663.0	-1,738.0	-1,905.0	-2,001.0	-2,009.0	-1,766.0
Current transfers (net)	**1,673.0**	**2,354.0**	**2,704.0**	**3,333.0**	**3,647.0**	**3,799.0**
Worker Remittances	1,578.0	2,021.0	2,454.0	3,060.0	3,170.0	3,419.1

Sources: IMF and Banco de la República

Regarding the exchange rate, the domestic currency has appreciated substantially in Colombia over the last two years, probably explained by the strength of commodity prices of its export products. Over the medium term, oil is not expected to play a major role in the exchange rate either, if oil production continues to decrease and Colombia becomes a net oil importer in the near term. In any case the transition to net importer is likely to be gradual and therefore should not have an abrupt impact on net foreign exchange earnings.

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I.4. MEXICO[24]

Mexico is an oil exporting country: oil exports currently represent 14 percent of total exports and approximately 3-4 percent of GDP. As an oil exporter, the Mexican economy obtains a positive income shock from increasing in international oil prices (and, hence, from more favorable terms of trade). However, to the extent that international oil prices slow down the global economy — and, in particular, the United States— the loss of external demand may start to weigh heavier on the Mexican economy than the income gains from increased oil revenue in view of the relatively smaller size of the oil sector in exports and the overall economy. Within the Mexican economy, the benefits from rising international oil prices are largely obtained by the public sector since the oil producting company *Petróleos Mexicanos* (PEMEX) is a fully state-owned enterprise — which is critical to the country's fiscal accounts. Last year, its gross revenue (including taxes on domestic sales of oil related products) represented 36% of total federal public sector consolidated budgetary revenue.

Higher world oil prices are also likely to have an impact on the Mexican economy as long as these price shocks are transferred to the domestic use of energy. With some (recent) exceptions in the distribution and retailing of natural gas and the generation of electricity for industrial use, the Mexican energy sector is dominated by state-owned enterprises. Their pricing policies are largely determined by the Secretaría de Hacienda y Crédito Público (SHCP) that takes into account both fiscal and price stability objectives. These pricing policies have largely dampened the impact of external or international price volatility on those products with a major and direct incidence on final consumption (gasoline, diesel, liquefied petroleum gas and residential electricity rates) while allowing international price movements to be reflected on energy products predominately used by industry (natural gas, fuel-oil, aviation fuel, petrochemicals and industrial electricity rates). Clearly, this separation according to product category is less than perfect as gasoline is also used as an intermediate input by manufacturing and services sectors, whereas natural gas is increasingly used by domestic consumers.

In what follows we provide a brief overview of the impact of higher world oil prices and oil price volatility on the Mexican economy. We specifically discuss the impact on domestic price inflation, monetary policy and the country's fiscal and external accounts. A brief explanation of domestic energy pricing policies is included in the section on the impact on domestic inflation.

I.4.1 The Impact of Higher Oil Prices on Domestic Prices

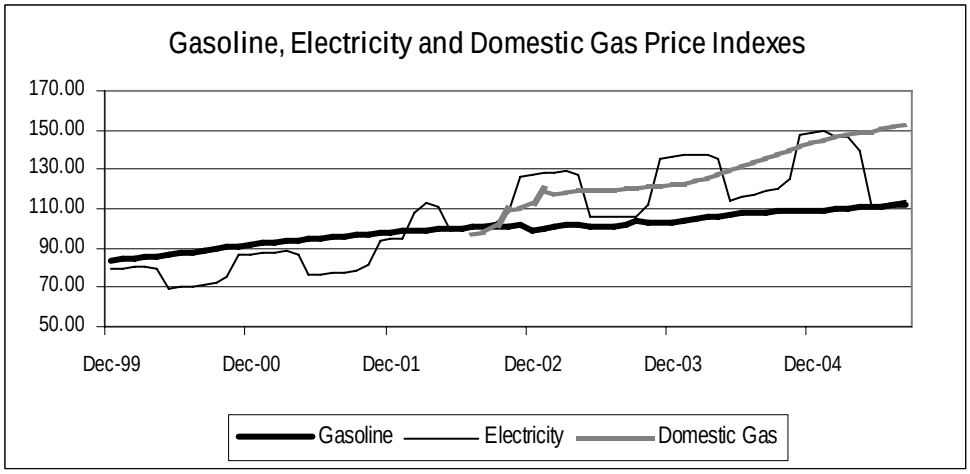
a. Estimating the pass-through of world oil price changes to domestic gasoline prices

The pass-through of world oil and energy prices on domestic energy prices and inflation is strongly mitigated in the case of Mexico as a result of long-standing, public sector pricing policies for the energy sector in the country. Gasoline and diesel prices are the clearest example of this policy which does not necessarily imply subsidies, but does isolate domestic consumption from international price movements. The final price (at the pump) for these products is set by SHCP at exactly the same level throughout the country with small monthly increases determined

[24] The country report on Mexico was prepared by Joost Draaisma and Rocio Lavalle.

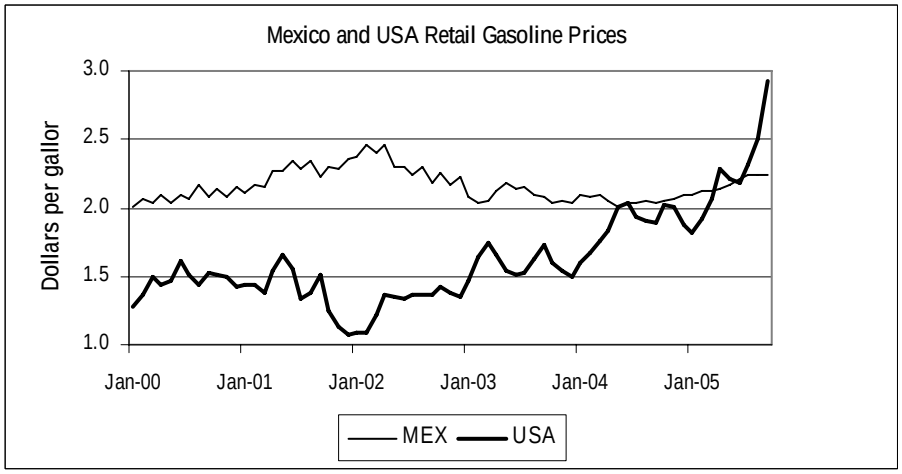
at the beginning of the year (largely according to expected or targeted inflation). As a result one is able to observe a steady increase of the price level of gasoline and diesel in domestic currency terms (figure I.4.1).

Figure I.4.1



The price of gasoline is technically made up of the production or opportunity cost for PEMEX (at an international reference price), transport cost to destination, a sales spread for gas stations and a value added and excise tax. In order to keep a fixed final consumption price, the excise tax is adjusted on a monthly basis to reflect changes in the production costs to PEMEX and differences in transport costs within the country. While normally gasoline prices have been above international prices leaving considerable room for the mechanism of the adjustable excise tax to operate, the recent price hike of world oil and gasoline prices has fully wiped out such space (figure I.4.2). As a negative excise tax does not exist, the adjustment has taken place by allowing for a lower production price for PEMEX. This is even more relevant as domestic production of gasoline only covers about 70% of domestic demand with the remainder made up by imports.

Figure I.4.2

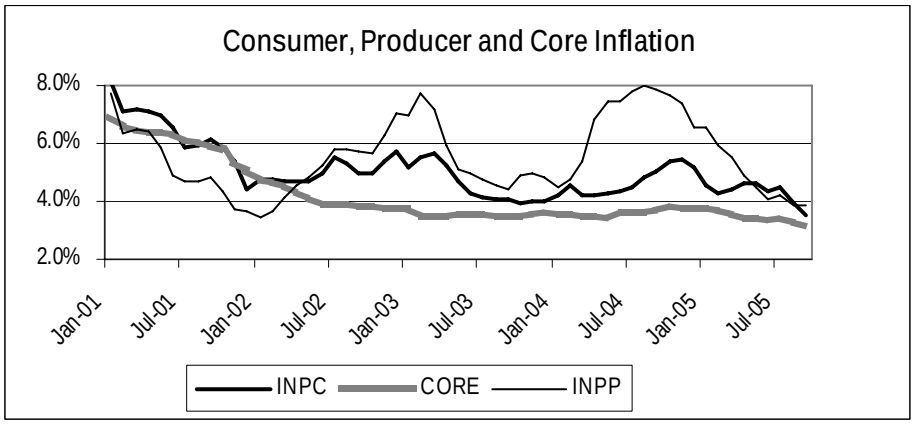


Other energy products used for domestic consumption, such as electricity rates for residential use and liquefied petroleum gas (for domestic use), are also set by SHCP. Even though both show a steeper price increase than gasoline (figure I.4.1), this is due to a policy of reducing subsidies through gradual real price increases rather than reflecting international energy price movements.

b. Estimating the pass-through of domestic gasoline prices to overall inflation

The prices of gasoline, electricity and liquefied petroleum gas make up an important part of the consumer price index with respective weights of 3.7, 2.3 and 1.8 percent. Since all these prices are administrated or regulated they do not make up part of the *core* consumer price inflation. They are included the producer price index, which also includes other energy and petroleum related products. A visual inspection of the evolution of year-on-year consumer, producer and core inflation over the past few years shows that there might have been some impact of world oil and energy price volatility and price increases on consumer and particularly producer prices, though this has practically not been transferred to core inflation (figure I.4.3).

Figure I.4.3



Even though there might have been an impact of world energy prices on consumer and producer prices, this was not transmitted through gasoline prices due to prevailing domestic pricing policies.

We use monthly information on the changes in domestic gasoline prices, overall CPI inflation and core inflation over the period 2000-5 and we find the following:

<u>*Overall CPI Inflation Regression*</u>

$$\pi_t = 0.0023 + 0.9435\ \pi_{t-1} + 0.0072\ gp_t + 0.0503\ gp_{t-1} + \varepsilon_t$$
$$(1.80) \quad (45.4) \quad (0.14) \quad (0.97)$$
$$R^2 = 0.971,\ N = 68$$

<u>*Core Inflation Regression*</u>

$$\pi_t = 0.0026 + 0.9217\ \pi_{t-1} - 0.0016\ gp_t - 0.0092\ gp_{t-1} + \varepsilon_t$$
$$(7.79) \quad (153.5) \quad (-0.08) \quad (-0.50)$$
$$R^2 = 0.997,\ N = 68$$

In sum, we are unable to find a statistically significant impact of gasoline price on either overall CPI or core inflation using monthly variation in those price indices.

Figure I.4.4
Pass-through from Domestic Gasoline Price Changes to CPI Inflation (y-o-y)
5-year window rolling correlation

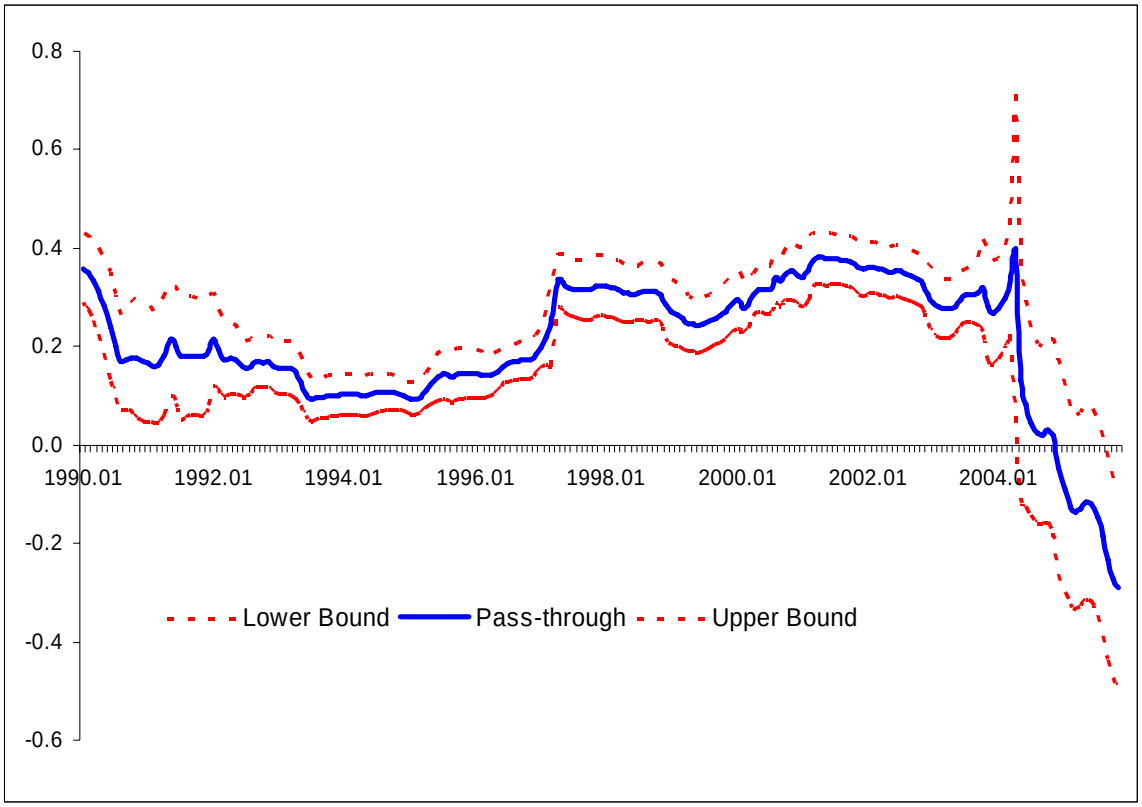


Figure I.4.4 reports the rolling regression coefficient of annual CPI inflation on y-o-y changes in domestic gasoline prices for Mexico using a more complete specification (that includes nominal depreciation, lagged CPI, output gap, among others) using 5-year windows of information (60 overlapped observations). We observe that after fluctuating approximately around 0.3 during the 1998-2004 period, the pass-through coefficient from y-o-y changes in domestic gasoline prices to y-o-y variation in CPI not only declines but also becomes not statistically significant.

I.3.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

Oil is an important source of revenue for the public sector in Mexico. Total sales by PEMEX amounted to $65 billion last year, of which approximately 65% has been transferred to the Federal Government in fees and taxes (including the excise tax on domestic gasoline sales). Exports, mainly of crude oil, generated 37.5% of gross sales, with the remainder coming from the domestic market.

Table I.4.1
Public Sector Revenue and Expenditure 2001-2005
(in percent of GDP)

	2001	2002	2003	2004	2005
Budgetary revenue	**21.9**	**22.1**	**23.2**	**23.2**	**23.3**
Oil revenue	6.7	6.5	7.7	8.4	9.1
non-oil tax revenue	9.8	9.8	9.8	9.4	9.3
non-oil non tax revenue	5.5	5.8	5.6	5.5	4.9
Budgetary expenditure	**22.6**	**23.3**	**23.9**	**23.5**	**23.5**
Traditional budget balance	**-0.7**	**-1.2**	**-0.7**	**-0.3**	**-0.2**

As a fully state-owned enterprise under direct budgetary control, PEMEX finances are fully incorporated and consolidated in the Federal Public Sector budget. The oil price hike over the past three years, from an average price of Mexican crude oil in 2002 of $21.5 to $43 in 2005, resulted in an increase in Federal Public Sector Oil revenues of 2.6 percentage points of GDP (see Table I.4.1). If we do not account fro movements in the real exchange rate as well as changes in the volume of exports or domestic sales, this suggests that a $1 change in the crude oil prices would raise public sector oil revenues by 0.12% of GDP.

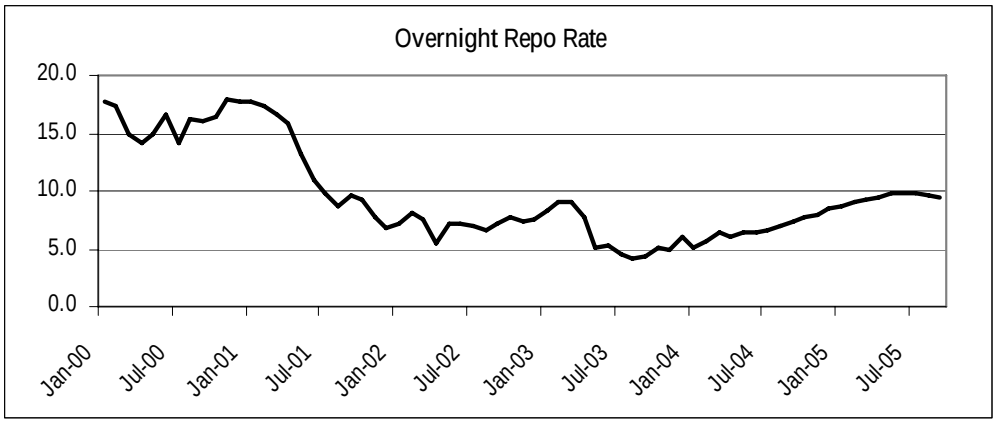
A major part of this windfall revenue has compensated the reduction of other tax and non-tax revenues (of approximately 1.4 percent of GDP), with the remainder effectively used for budget deficit reduction by about a full percentage point of GDP. Mexico has not yet adopted an explicit longer term fiscal oil revenue stabilization policy. Instead, on an annual basis, the budget includes a generally conservative estimate for next year's oil price as well as rules on how to distribute any excess revenue once shortfalls in other revenue categories and expenditure overruns have been compensated. This mechanism assures meeting the annual fiscal deficit targets, but has not led to saving a major part of the multi-year oil windfall.

b. Effects of Rising Oil Prices on the Monetary Policy

Following the 1994/95 financial crisis, the Mexican authorities adopted a floating exchange rate in which monetary policy should provide the nominal anchor. A restrictive monetary policy effectively managed to bring inflation down gradually and, in 2002, *Banco de México* formally adopted an inflation targeting framework with a long term CPI inflation target of 3% with an interval of plus/minus 1% to reflect the transitory impact on inflation of relative price adjustments.

Even though the Central Bank adopted for a long time the peculiar monetary policy instrument called the "*corto*" —a target amount on the cumulative balance of commercial banks' current accounts at the Central Bank— this policy has always been associated with the direction (without specifying the magnitude) that the monetary authority would like interest rates to move. Gradually this policy is being replaced by a more direct and generally more transparent instrument: the overnight interest rate, which is being determined by the monetary authority. In any case, the nominal overnight interest rate provides a good picture of the monetary policy stance over the past few years (see Figure I.4.5).

Figure I.4.5



From the second quarter of 2004 to (at least) the second quarter of 2005, a cycle of monetary policy tightening was induced, increasing the overnight interest rates from about 5 to 10 percent. This tightening was closely related to increasing consumer and producer price inflation throughout 2004. The increase in inflation was attributed not only to increasing prices of energy but also of agricultural products and other commodities as well as to negative supply shocks.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

Mexico is an oil exporting country and as such obtains a terms of trade and income benefit from higher international oil prices.[25] Mexico exports 55% of its total production of crude or a volume of 1,850 thousand barrel per day, a volume that has remained unchanged over the past three years but is higher than the average volume of 1,550 thousand barrel per day attained over the previous decade. As more than 90% of oil and oil related exports is obtained from the exports of crude, a $1 change in the annual average price of crude implies an export revenue increase of $675 million per year.

However, in order to be able to supply the domestic demand for oil products PEMEX is importing an increasing amount of gasoline, natural gas, liquefied petroleum gas and other oil products and petrochemicals. As a result of such imports and assuming that the prices of imported oil products and natural gas increase in the same proportion as crude oil, the net external benefit and windfall from a price increase in crude oil would probably be only about 75% of the figure mentioned above reducing the net benefit of a $1 increase in the annual average price of crude to about $500 million per year or 0.07% of GDP. The increase in Mexican crude oil prices by an estimated $21.5 per barrel over the past three years has allowed for an improvement of the trade and current account balance by slightly over $10 billion between 2002 and 2005 or 1.5% of GDP.

Table I.4.2
Mexico: Current Account Balance, 2000-2005

[25] Mexico mainly exports crude oil of a generally heavier type and therefore of a lower value. The average price of Mexican oil exports during 2005 has been $42 per barrel compared to an average WTI over the same period of $56.

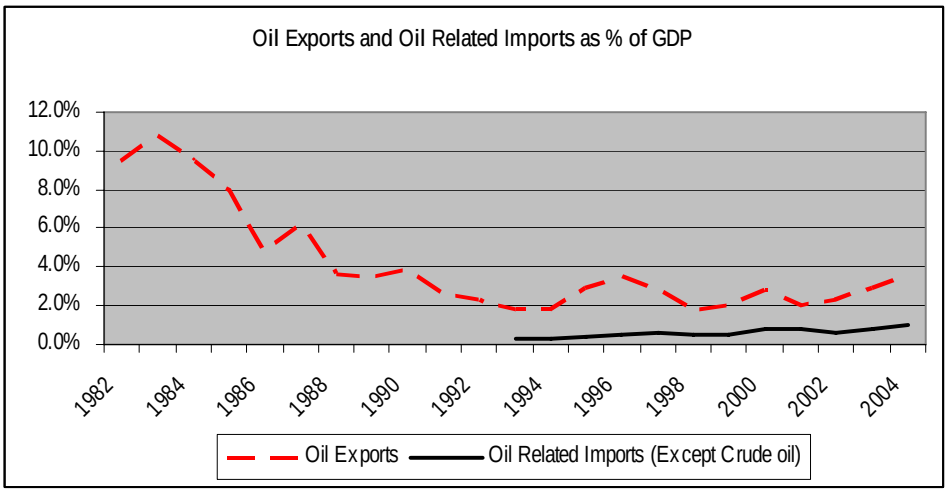
(US$ billions)

	2000	2001	2002	2003	2004	2005
Exports	166.1	158.8	161.0	164.8	188.0	213.7
Imports	174.5	168.4	168.7	170.5	196.8	221.3
Trade Balance	-8.3	-9.6	-7.6	-5.8	-8.8	-7.6
Turism Receipts	8.3	8.4	8.9	9.4	10.8	11.8
Turism expenses	5.5	5.7	6.1	6.3	7.0	7.6
Turism Net Balance	2.8	2.7	2.8	3.1	3.8	4.2
Other non factor services (net balance)	-5.1	-6.3	-6.8	-7.7	-8.4	-9.4
Factor services (net balance)	-15.0	-13.8	-12.1	-12.1	-10.8	-13.4
Transfers (net balance)	7.0	9.3	10.3	13.9	17.0	20.5
o.w. remittances	6.6	8.9	9.8	13.4	16.6	20.0
Current account	-18.6	-17.6	-13.5	-8.6	-7.2	-5.7

Source: Banco de Mexico

Finally, note that although the recent price hike increased oil export revenue as a proportion of GDP, the ratio is still below 4% as has been the case for more than a decade-and-a-half and very different from the early eighties when this ratio was over 10% (see Figure I.4.6).

Figure I.4.6



II. Net Oil Exporters in the LCR Region

II.1. ECUADOR[26]

II.1.1 The Impact of Higher Oil Prices on Domestic Prices

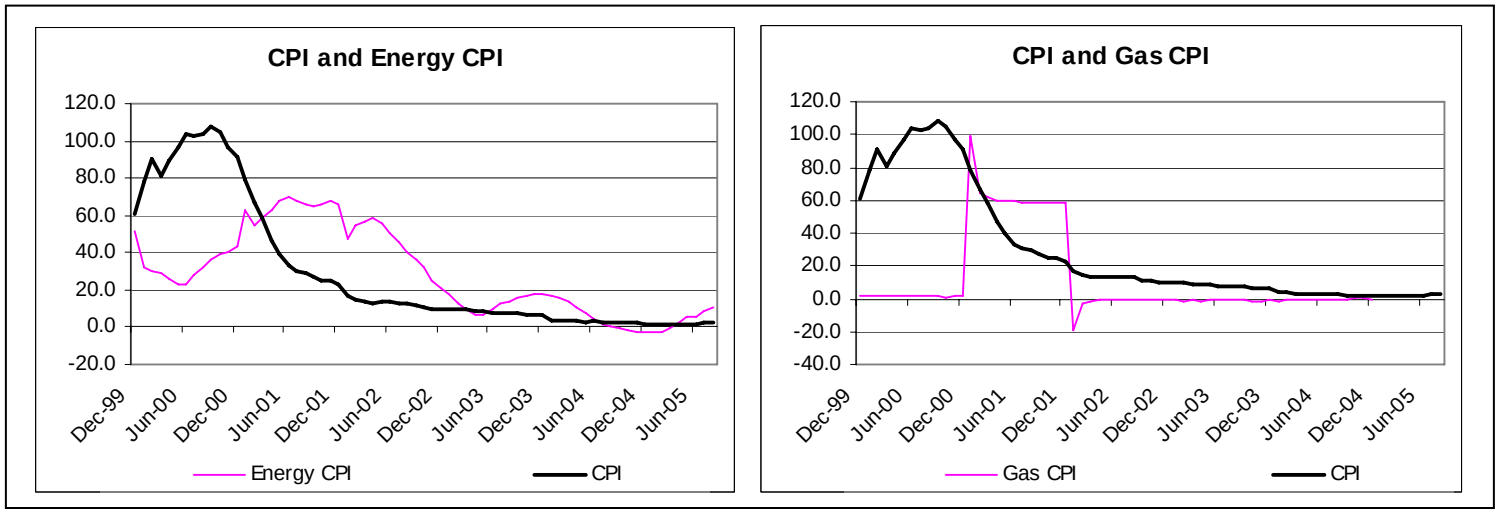
Fuel prices in the domestic market are set quarterly by Presidential Decree and, as we can observe in Table II.1.1, there has been almost no change in fuel prices over the past five years and domestic fuel prices have remained below market levels. As a result, Ecuador has been isolated from the impact of international oil prices.

Table II.1.1
Domestic Gasoline Prices at Terminal
(US$ per gallon)

	June 2001	July 2003	July 2005
GASOLINA PESCA ARTESANAL	0.60	0.80	0.80
GASOLINA EXTRA	0.85	1.31	1.31
GASOLINA SUPER	1.10	1.68	1.68
US Regular Retail Gas	1.63	1.48	2.29

Source: ECUADOR SUBGERENCIA DE COMERCIALIZACION, EIA. DOE.GOV

Figure II.1.1
Evolution of CPI, Energy and Gas Prices in Ecuador, 1999-2005



Source: INEI

Despite the steady rise in Ecuador's crude oil price, changes in prices (as measured by the CPI) continued on a downward trajectory. This result was mainly attributed to the dollarization

[26] The country report on Ecuador was prepared by Elaine Tinsley.

process in the country. The price differential between domestic and border prices creates significant incentives for smuggling of oil products.

Figure II.1.2 shows annual prices changes for the overall CPI, energy and gas prices. The Energy component of the CPI —with a weight of 11% in the index— includes electricity, gas and other fuels. We can observe that energy prices have risen lately at a faster pace than overall consumer prices. However, gas prices have remained stagnant relative to CPI and at times they have declined.

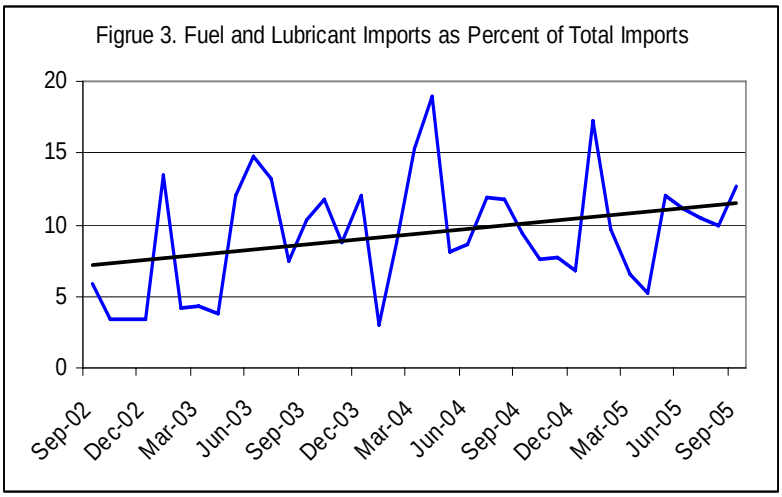
II.1.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

In contrast to other Andean countries, the central government in Ecuador retains nearly all of its oil rents —about 97 percent compared to 36-59 percent in the other Andean countries. As a result, higher oil prices feed directly into central government revenues. In the mid-90s, extensive earmarking diverted about 18% of oil export revenues to other semi-autonomous agencies. However, since then the ratio has declined, particularly since 2001, and now stands at about 3 percent of oil export revenues. This has provided a feeding frenzy for the government which has caved in to higher wage demands, worsening an already rigid budget, and which could prove detrimental when oil prices drop. In recent months, higher public spending, combined with the government decision to allow early withdrawals of the country's social security funds (IESS) has caused an up-tick in domestic prices and changes in relative prices.

Ecuador has one of South America's largest markets for liquefied petroleum gas (LPG), used extensively for residential heating and cooking. Domestic production, though, only meets one-quarter of LPG demand and because of the country's limited refinery capacity, Ecuador must import refined oil products, which the government subsidizes to the public (Table II.1.1). The share of fuel imports over total imports has edged upward (Figure II.1.3).

Figure II.1.3



The government covers the difference between the fixed domestic fuel prices and the international price it pays for imports.

Hence each dollar increase in price translates more directly into a dollar less for the government. For different fuel categories, the degree of subsidization varies, with gas being the most heavily subsidized, as a result there is smuggling of propane tanks across the border to Peru and Colombia, in effect the Ecuadorian government is also subsidizing users in these countries.

Increases in oil prices do not affect operating revenues for PetroEcuador, as all oil export revenues pass through the general budget. Instead, from the government revenues, PetroEcuador receives a cost rebate of $4.20/barrel produced – however estimates are that this is still below its cost recovery level which is estimated at $6.30. PetroEcuador also receives revenue to cover the cost of the imported oil. Overall, given the gains in revenues minus the cost in subsidy, it has been estimated that Ecuador earns a net $30 million for each dollar increase in the price of oil for a year.

Higher oil export revenues of nearly 7 percent of GDP in 2005 (due to higher oil prices) helped to keep the primary surplus high. In turn, this has lead to a steady decline in public debt, which fell from 90 percent of GDP in 2000 to 43 percent in 2005. However, the rising cost of domestic fuel subsidies has eroded total revenues. Moreover, between 2003 and 2005, the non-oil deficit deteriorated by about 5 percent due to the expansion of recurrent spending. High oil prices, however, have also boosted confidence in the government ability to pay its debt. As such, Ecuador was able to return to international bond markets in December 2005. The new placement helps to retire the more expensive Global 2012 debt.

The public and private sector performance in the oil sector differs markedly. Although Petroecuador has some of the most productive oil fields, lack of public investment has led to a steady decline in production, even in the face of higher oil prices. Between 2000 and 2005, public oil production declined from 230 million barrels per day (mbd) to under 200 mbd in 2005, which is considerably lower than its peak production of 311 mbd just a decade ago. The low public investment is because most of Petroecuador's budget is imputed on a cost per barrel basis, however this amount barely covers its operating costs, leaving little space for investment. Ministry of Finance refuses to raise the amount of the imputed cost unless Petroecuador undergoes a financial audit. Private investment in the oil sector has risen sharply over the past few years, namely in preparation for the 2003 opening of the new oil pipeline (OCP), which removed a significant bottleneck in the system. Of the roughly $1-1.2 billion in annual oil investments over the past four years, 90 percent was made by the private sector. As a result, although production in 2003 was roughly split between the private and public sector, by 2005, the private sector was producing nearly 75 percent more than Petroecuador.

b. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

Rising oil prices have impacted positively the Ecuadorean terms of trade and, due to the adoption of full dollarization, the country has remained insulated from nominal exchange rate shocks. As a result, higher oil prices have helped boost the current account balance. After dollarization, the real exchange rate rapidly appreciated significantly. Since 2003, though, the weaker dollar helped the real exchange rate to depreciate. As discussed above, the direct impact of oil prices on the economy has been insulated until recently when the increase in public spending — *i.e.* an increase in wages and salaries financed by the higher oil revenues— put pressure on the price of

non-tradables, leading to an appreciation of the exchange rate. Without the "sterilizing" effect of saving oil revenues to the stabilization fund (FEIREP) outside of Ecuador and using it to pay off debt, the appreciation of the exchange rate is affecting Ecuador's competitiveness in the international market.

Regarding the evolution of the current account, the higher oil prices have led to a sharp improvement in the oil trade balance, thus helping disguise the steady deterioration of the non-oil trade balance, due in part to rapid import growth. Not surprisingly, the share of oil exports in total exports has risen substantially from 37 percent in 2001 to 55 percent in 2005 (see Figure II.1.4). Note that this ratio would be even higher if not for the declining production levels at PetroEcuador.

Figure II.1.4
Export Performance of the Oil and Non-oil Sector

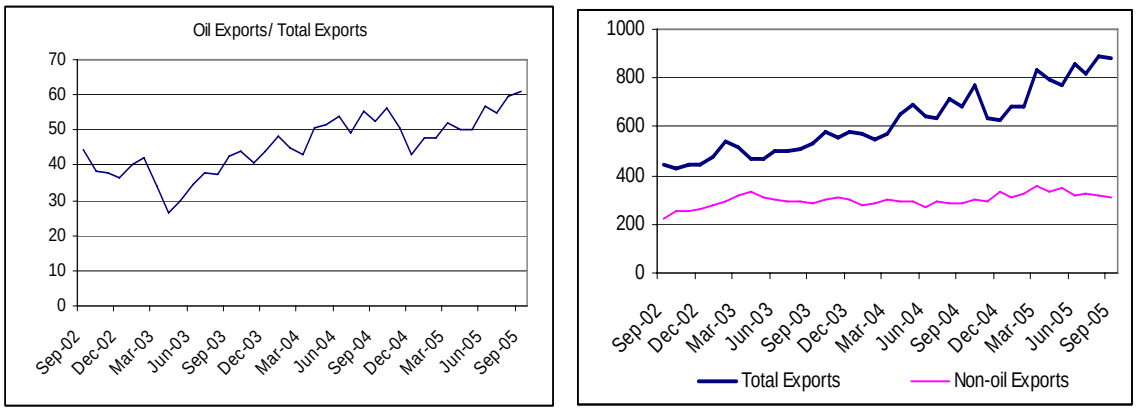


Table II.1.2
Ecuador Trade Balances
(In US$ millions)

	2000	2001	2002	2003	2004	2005
Trade Balance	1458	-303	-971	98	444	957
Non Petroleum Trade Balance	-728	-1953	-2793	-1902	-3064	-3850
Petroleum Trade Balance	2186	1650	1821	2001	3513	4805
Remittances	1317	1415	1432	1540	1604	1798
Percent of GDP						
Trade Balance	9.2	-1.4	-3.9	0.3	1.3	2.6
Non Petroleum Trade Balance	-4.6	-9.2	-11.2	-6.6	-9.3	-10.6
Petroleum Trade Balance	13.7	7.8	7.3	7.0	10.7	13.3
Remittances	8.3	6.7	5.8	5.4	4.9	5.0

Source: BCE

II.1.3 Key policy recommendations

On the fiscal side, the 2005 restructuring of the oil fund and the reform of the Fiscal Responsibility Law weakened the overall framework for fiscal discipline. This has left Ecuador

more vulnerable in the event of a decline in oil prices, thus becoming important to build a thicker fiscal cushion. To accomplish that, Ecuador needs to widen the tax base, reduce revenue earmarking, lower fuel subsidies (which are highly distortionary and poorly targeted), contain the wage bill and advance the civil service reform, and to continue maintaining high primary surpluses in order to bring the public debt down to 20 percent of GDP within the next five years provided both oil prices and economic growth remain robust.

To increase private investment in the oil sector, Ecuador needs to eliminate legal uncertainty and depoliticize the determination of oil derivative prices. To improve the climate for private sector investment in downstream activities, recommendations are to liberalize the domestic fuel market by deregulating prices and to rein in Petroecuador's monopoly in wholesale distribution and storage.

The most efficient and expeditious way to increase the oil sector's productivity would be to increase investment in the Petroecuador fields. This can be done be either raising Petroecuador's investment budget or by opening up the fields to private companies—however, either solution will require revising and transforming the oil sector's institutional framework. One recommendation to improve the institutional framework and reduce the conflictive nature of the state to decide on short-term expenditure priorities versus long-term oil investment results would be to create a non-operating specialized agency to administer this natural resource. This agency – similar in vein to the Norwegian Petroleum Directorate and National Hydrocarbons Agency in Brazil and Colombia—would be staffed with technical professionals and have a high degree of autonomy, much like a Central Bank to help ensure a long-term view and management of the sector.

II.2. VENEZUELA[27]

II.2.1 The Impact of Higher Oil Prices on Domestic Prices

In the case of Venezuela, the Government's strategy has been to completely isolate domestic prices from international fluctuations. The domestic hydrocarbon price has been frozen since 1997, and the difference with the market price represents the government's subsidy. This subsidy is not justified either on efficiency or equity grounds, and it has been kept even during periods of severe political and economical crisis (1998, 2001). The gasoline price averages US$ 0.2 per gallon in Venezuela, compared to the estimated free market price of around US$ 0.9 per gallon. Venezuelan fuel prices are one-tenth the regional average of US$2.2 per gallon and well below prices of other Latin American petroleum producers such as Mexico (US$2.3 per gallon) and Ecuador (US$1.12 per gallon). Given the current boom in international prices, it is most unlikely that the government will raise domestic oil prices. Consequently pass through is zero as the government will in all probability be able, in the medium term, to keep fully subsidizing domestic prices.

II.2.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

Fiscal policy in Venezuela has traditionally been dominated by the oil sector. Historically, oil revenues have represented the major single source of revenue for the Central Government (approximately 60% in recent years). The oil price boom has had a significant impact on the fiscal accounts, generating enormous windfall revenues accruing to the Government.[28] The increase in oil activity tends to drive forward the remaining economic activities which, in turn, strengthen the positive effects of the high international hydrocarbon prices on the fiscal accounts. This has enabled the Government to increase substantially its spending, mostly in populist social programs. Moreover, the fiscal space generated is enabling the development of expansive fiscal policies and the reduction of the fiscal pressure over the rest of the economy. Again, for political considerations, the Government is reducing the VAT rate

Fiscal revenues and the price of oil are closely linked in Venezuela, and the evolution of the price of oil will play an important role in any fiscal adjustment. Should international oil prices fall, it would make the needed fiscal adjustment more difficult because, historically, when the price of oil has gone down expenditures have shown more downward stickiness than revenues. However, the impact on revenues may not be immediate. On the average, for the last two decades, both expenditures and revenues have reacted with a lag of about one year to changes in

[27] The country report on Venezuela was prepared by Carlos Mollinedo.

[28] The annual oil income received by the Government during the period 1990 to 2003 has been on average US$8 billion. Maximum annual amounts, of approximately US$12 billion, were obtained during the year 1997 and 2000 2001. Minimum annual amounts, oscillating between US$5 and US$7 billion, were obtained the years 1994, 1998, 1999 and 2003.

the price of oil. According to the 2004 Venezuela CEM[29], on average, revenues have reacted not only to current changes in the price of oil but indeed more intensively to changes experienced the year before. The estimates indicate that a 10 percent increase in the price of oil would boost contemporaneous revenues by 0.2 percentage points of GDP. Assuming fiscal revenues are 20 percent of GDP; this would imply a 5 percent increase in total government revenues. Over the following year the aggregate impact, if nothing else had changed, would increase fiscal revenues from 0.2 percent of GDP to 0.8-0.9 percent of GDP.

Institutional Arrangements for the Management of Oil Revenue and Costs. Venezuela has several stabilization mechanisms (including stabilization funds) that are not working properly. The boost in the world price of oil is substantially increasing financial resources of stabilization funds as well as the government's voracity to capture these resources to further increase public spending. The stabilization policy has recently significantly deteriorated in Venezuela as the Government is trying, successfully to have discretionary access to financial stabilization funds. As an illustration, the FEM (*Fondo de Estabilizacion Macroeconomica*) rules have been changed in this direction:

Originally, the government could only withdraw resources from the Macroeconomic Stabilization Fund (FEM) with Congressional approval and if oil revenues were lower than the reference value, or if the resources of the fund exceed 80 percent of the previous five years' average. In this case, resource withdrawal had to be used to buy back federal debt or to be invested in capital expenditures by the Regional Governments. In addition, the end-of-year Fund balance could not be less than one-third of that of the preceding year.

However, significant modifications in FEM regulations were introduced since 1999. This included changes to the reference values and Presidential discretion for withdrawal of funds. The new reference values were substantially reduced and extended for the period 1999-2004. As a result of these changes, FEM assets have dropped considerably, despite very high oil prices. Fund reserves fund fell from US$6.2 billion in December 2001 to US$0.7 billion in April 2005.

Current Policy Stance on Subsidies to Domestic Fuel Prices. Petroleum products are heavily subsidized, creating energy demand distortions and inefficient allocation of fiscal revenues. Given the substantial fiscal space generated by high international prices, it is very unlikely that the Government will change its oil domestic price policy. The price signal sent by subsidized fuel gives a strong, biased price signal encouraging excessive use of a contaminating resource. As well, the subsidy disproportionately favors the non-poor over the poor, as about 70 percent of gasoline is used for individual automobiles, while the remaining 30 percent is used for public transportation.

Assessing the costs and sustainability of current oil framework in Venezuela. A full elimination of the fuel subsidy would improve the public sector fiscal position by 2-3 percent of GDP. The current policy is sustainable as long as international prices remain elevated. Venezuelan history shows that a harmful change in the international environment will need to be accompanied with

[29] Venezuela Country Economic Memorandum "The Foundations of Growth for All", June 2005. The World Bank,

adjustment policies. This is even worse in light of the fact that stabilization mechanisms have been seriously weakened.

b. Effects of Rising Oil Prices on Monetary Policy

In recent years, the Central Bank has been using the exchange rate as the main anchor of monetary policy. In February 2003, the Government introduced a fixed exchange rate regime in conjunction with foreign exchange and price controls. The goal was to reduce capital outflows, control inflation and stabilize the currency. This policy strategy has had some pervasive effects:

- A parallel market for foreign exchange has emerged,
- The exchange rate became rapidly overvaluated, despite annual devaluations,
- Price distortions resulted in shortages of basic commodities and essential imports,
- The interest rates dropped sharply and became significantly negative in real terms due to increased liquidity in the system.

Nevertheless, the stabilization strategy of the government helped reduce inflation from a high of 39 percent in February 2003 to 16 percent by September 2005 and, given the high international oil prices, they allowed to increase net international reserves by US$16.4 billion in the same period. In this context, the ability of the Central Bank to conduct an adequate monetary policy has been continuously undermined by Government's pressures to use oil windfalls for financing fiscal spending.

Recent modifications of Central Bank Law weakened the position of the Central Bank (BCV) in the exchange market and to control liquidity and inflation. This Law mandated the Central bank to transfer part of the international reserves to a development fund managed by the Government. In addition, the Law grants the Government direct and periodic access to international reserves, exceeding an "adequate level". Finally, it eliminated the requirement that PDVSA (state oil company and main source of foreign exchange), deposit the full amount of its US dollar revenues in the BCV.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

Venezuela is a large net hydrocarbon exporter and has the largest petroleum reserves in Latin America. Petroleum accounts for about 20 percent of economic activity, 80 percent of exports and 45 percent of fiscal revenues. Non-oil exports are concentrated in few commodities and have shown little dynamism. The upward trend of international oil prices has had a positive effect on exports, which have skyrocketed in recent years. The export boom and the FX controls improved current account balance despite the large fiscal expansion and exchange rate overvaluation.[30]

[30] In 2004 the current account balance reached 13 percent of GDP.

Venezuela has a very strong current account balance despite record high imports. Exports reached US$ 24,605 billion (40 percent of GDP) while imports reached US$ 10,868 billion (55 percent of GDP), for an external account surplus of US$ 10,482 million; conversely capital and financial accounts registered a US$ 4,410 million deficit indicating capital flight, despite prevailing exchange controls.

Due to political uncertainty, private investment in the oil sector has dropped dramatically from about US$605 million in 1998 to an estimated US$147 million in the first ten months of 2005. The compulsory renegotiation of contracts with major oil companies and serious concerns about the rule of law have deteriorated the investment climate.

Finally, high international oil prices are enabling the Government to maintain the fixed exchange rate regime characterized by sporadic small devaluations (about one per year) annual. This exchange rate policy is resulting in a sizeable misalignment of the real exchange rate; its sustainability relies on the oil price boom.

II.2.3 Key policy recommendations

Venezuela needs to address the problem of highly vulnerable fiscal accounts. The current level of public spending is sustainable if and only if high international oil prices are maintained. The country should be generating a sustained higher primary surplus to better cope with a future decline in international prices. The Macroeconomic Stabilization Fund (FEM) has been depleted and no new deposits have been made to honor savings commitments.

Venezuela should be generating a sustained higher primary surplus to better cope with a fall in international oil prices. The macroeconomic stabilization fund (FEM) has been depleted and no new deposits have been made to honor savings commitments. Extra-budgetary public expenditure has increased significantly. Several funds to manage a large share of oil revenues have been established outside the national budget. Any major slide in the prices would generate serious fiscal imbalances.

Finally, Venezuela should address the issue of PDVSA's production sustainability. According to OPEC, Venezuela oil production reached 2.6 million barrels per day (mbd) in January 2006, which is less than the OPEC quota assigned to Venezuela (3.1 mbd). Although PDVSA is currently outsourcing most new exploration, drilling and exploitation to foreign companies, there are concerns about its own investment capacity to increase or even maintain the current level of production.

III. Net Oil Importers in the LCR Region

III.1. DOMINICAN REPUBLIC[31]

The Dominican Republic is struggling to emerge from a macroeconomic crisis that began with a banking sector crisis and intervention by the Central Bank in early 2003, followed by a severe loss in confidence in the economy and the peso. The flight to US dollars led to a 100 percent depreciation of the peso, and inflation skyrocketed from historically single-digit levels to over 50 percent in 2004.

An IMF Stand-By Arrangement is being successfully implemented (the second review was completed in October 2005), providing a framework for macroeconomic recovery through fiscal controls, tighter monetary policy, and increased oversight of banks. The economy returned to positive growth rates in 2004 and 2005, and the peso regained 85 percent of its lost nominal value and 100 percent of its value in real terms. Nevertheless, climbing oil prices continue to take a toll on the fiscal and current account balances (the Dominican Republic is an oil importer), and is influencing monetary policy. Because of simultaneous movements in macroeconomic balances and important changes in fiscal, trade and monetary policy concurrent with rising oil prices in world markets, it is not possible to disentangle the role of oil price shocks. Nevertheless, the following analysis examines specific transmission routes in order to estimate specific effects where possible and understand the indirect impact of exogenous oil price changes.

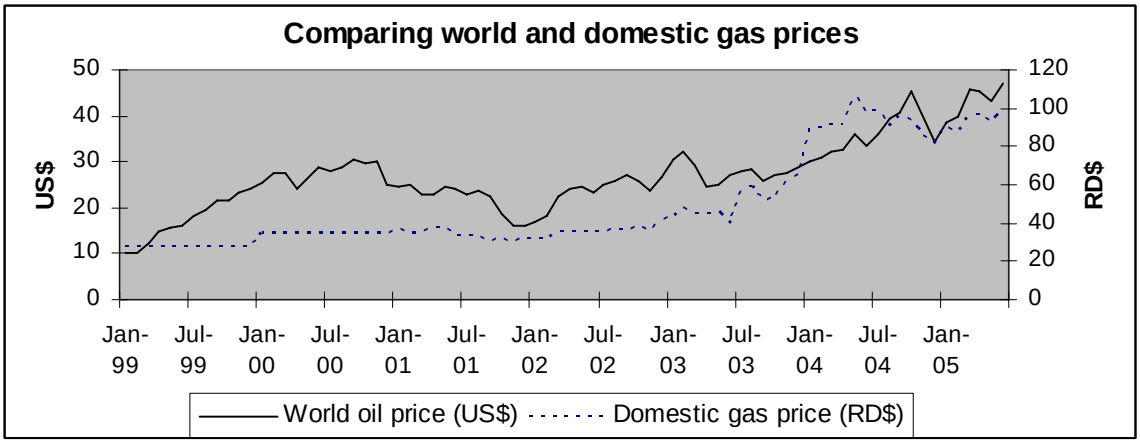
III.1.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

Beginning in December 2000, the government of the Dominican Republic no longer intervened in setting domestic gasoline prices, implying total pass-through of world price fluctuations to the domestic market. The graph below illustrates that the world and domestic gasoline prices track closely between January 2001 and July 2003, at which point domestic prices in pesos escalate more quickly than the US dollar price of crude, reflecting the peso depreciation. This trend is reversed in the second half of 2004, when the peso regained much of its lost value (see Figure III.1.1).

Figure III.1.1
World and Domestic Gasoline Prices

[31] The country report on Dominican Republic was prepared by Elizabert Ruppert Bulmer.



b. Estimating the pass-through from domestic gasoline prices to overall inflation

The marked rise in domestic gas prices affected the consumer price index, and we test this impact econometrically by regressing current monthly inflation on lagged inflation, monthly domestic gas inflation and lagged domestic gas inflation. Using monthly information for the period 1999-2005, we run the following inflation regression:

$$\pi_t = 0.0043 + 0.4158\ \pi_{t-1} + 0.0868\ gp_t + 0.0709\ gp_{t-1} + \varepsilon_t$$
$$(2.05) \quad (4.48) \quad (4.45) \quad (3.32)$$
$$R^2 = 0.5216, \ N = 73$$

To avoid autocorrelation, we use first differences. Our results indicate that fuel price increases raise consumer inflation by 9 percent, and lagged fuel price increases also have a positive impact on inflation (equivalent to 7 percent).

III.1.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

As mentioned above, gas prices are not controlled by the Government, so that prices at the pump reflect import costs without intervention or subsidy from the Government. However, the Government subsidizes LPG, and higher prices contributed to subsidy outlays equivalent to 0.8% of GDP in 2004, and a projected 0.5% of GDP in 2005. There are two other transmission routes by which the Government's budget is directly affected by world oil prices: taxes on domestic gas consumption and the electricity sector subsidy. With respect to taxes on gasoline sales, although nominal tax revenues have risen in recent years and represent an important revenue stream for the Government, revenues as a share of GDP fell from 2 percent in 2002 to 1.4 percent in 2004.

The electricity sector in the Dominican Republic is plagued by costly, poor-quality electricity services and serious systemic inefficiencies including on the institutional side. The Government supports the electricity distribution companies through transfers to cover any losses, which are large because of poor institutional oversight and misaligned incentives; electricity service quality is weak, line losses are high, and non-payment is increasingly common, notably by large

commercial consumers. The result has translated into higher outlays by the Government, raised even further by climbing oil prices. In 2004, for example, transfers to the electricity sector amounted to 2.3 percent of GDP, or US$422 million, but the costs are projected to reach US$580 million for 2005 and US$800 million in 2006 (although not all of these extra costs are due to oil price increases).

The Government is currently implementing a major sectoral reform program, part of which includes tariff adjustments to reflect market movements in generation costs (i.e., the tariff calculation formula depends inter alia on the import cost of fuel, which is determined by world oil prices and the exchange rate). But the tariff formula was not applied when the peso appreciated in end-2004 and the beginning of 2005, which would have meant reducing tariffs; the Government instead kept tariffs fixed and channeled surpluses to the Stabilization Fund. However, all the reserves in this Fund have now been depleted, and last week tariffs were raised to pass on the higher costs to consumers. If oil prices remain high and the peso continues to depreciate, the Government will continue to face pressure to raise tariffs or incur the higher costs directly.

The Government's fiscal stance —guided under the IMF Stand-By Arrangement— has shifted to accommodate many simultaneous pressures, including but not limited to escalating electricity subsidies. Trade tax reductions are being accommodated by increases in the value-added tax, but will require serious fiscal discipline to contain spending, especially if the electricity crisis and its attendant mounting costs persist.

b. Effects of Rising Oil Prices on Monetary Policy

The Central Bank's stated monetary policy is to maintain low, stable inflation over the medium term without resorting to formal inflation targeting. In practice, however, the Central Bank has targeted the nominal exchange rate, which is of course closely linked to inflation, given the openness of the Dominican economy. The peso depreciation of 2003 and the first half of 2004 drove annualized inflation from 6 percent in January 2003 to a peak of 54 percent in October 2004. Similarly, the return of confidence in the peso has reduced inflationary expectations, and annual inflation is projected to return to single digits this year.

The Central Bank financed its bail-out of failed banks by issuing certificates of short maturity priced through auctions. The interest rates on these certificates hit very high levels, exceeding 50 percent in mid-2004, but declined steadily as confidence was restored, and averaged 27 percent in November 2004 and 15 percent in April 2005. Similar trends were observed in commercial lending rates, which peaked around 35 percent in May 2004 but declined steadily to 20 percent by September 2005. In October 2005, the peso depreciated from 30 RD$/US$ to 33 RD$/US$, following which the monetary authorities quickly raised interest rates by 2-3 percentage points.

Regression analysis to test monetary policy responses to rising oil prices is conducted using monthly information for the period 1999-2005 (with robust t-statistics reported in parenthesis below the coefficient estimates):

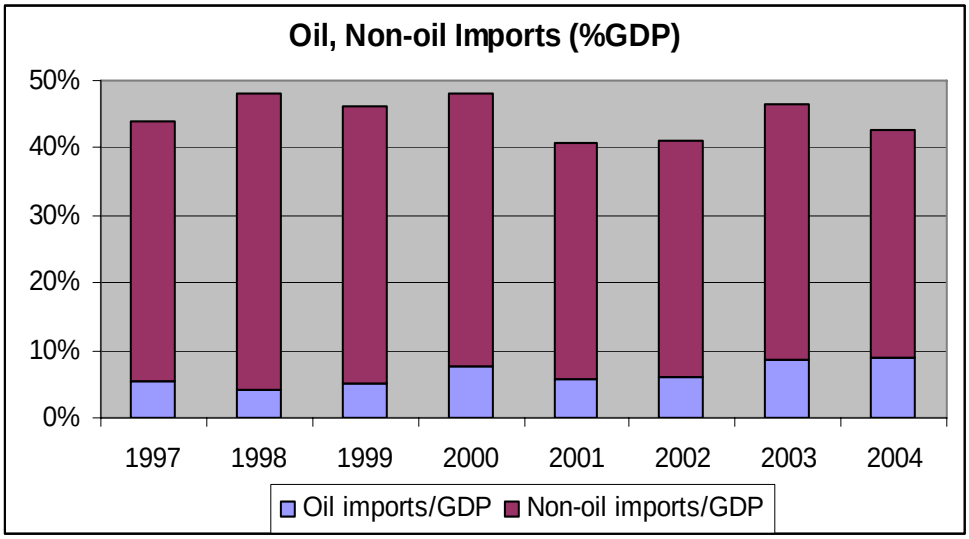
$$r_t = -0.1945 + 1.8961\, gp_t + 4.7931\, gp_{t-1} + \varepsilon_t$$
$$\quad (-1.21) \qquad (1.16) \qquad (2.88)$$
$$R^2 = 0.1121,\ N = 73$$

The evidence shows that there is a statistically significant link between interest rate changes and lagged domestic gas price increases, suggesting that the monetary authorities have been responsive to controlling inflationary pressures that stem predominantly from exchange rate movements but also from world oil price increases. However, their effectiveness in setting interest rate policy is complicated by their need to finance Central Bank debt through market-priced zero coupon certificates.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

As mentioned above, the Dominican peso experienced large fluctuations in value over the course of the last 2 years, quite independently of oil price pressures on the current account but rather stemming from the banking crisis and subsequent macroeconomic crisis and eventual return of confidence. Whereas the weakened peso spurred export growth in 2004, imports were compressed to a large extent, as total imports declined by nearly 4 percentage points of GDP. At the same time, however, oil imports increased as a share of GDP, reflecting higher international prices (see Figure III.1.2). The current account surplus increased as a result of lower overall imports and higher exports, concurrent with an upward trend in remittances.

Figure III.1.2



III.2. EL SALVADOR[32]

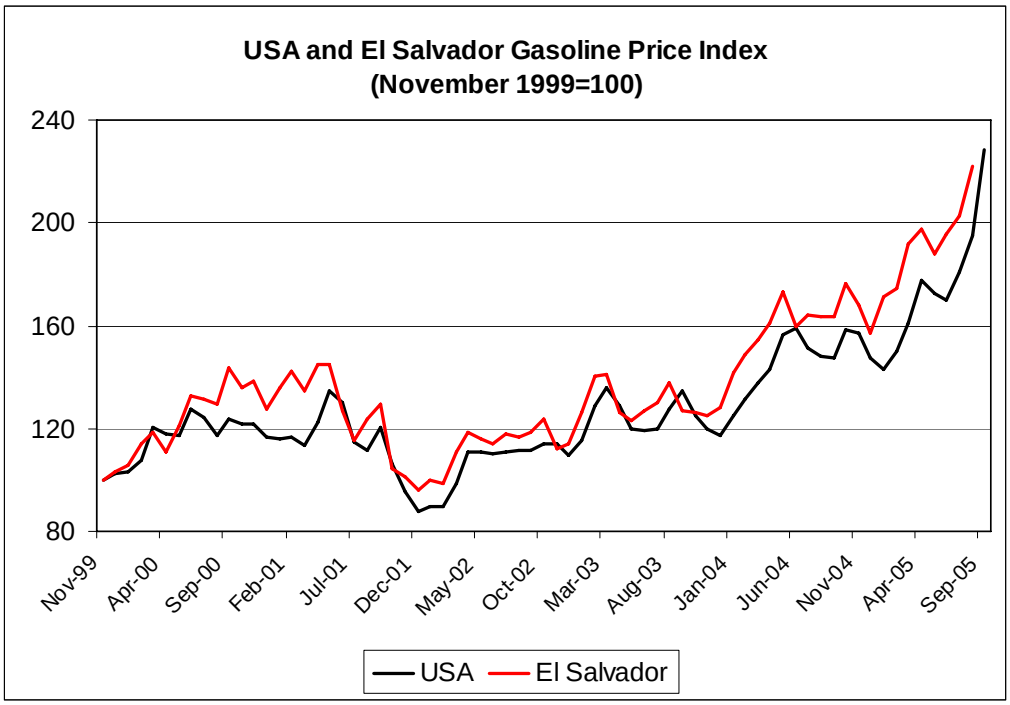
Despite being a net oil importer, economic activity in El Salvador has picked up from 1.6% in the first quarter of 2005, to 2.5% in the second quarter - the highest quarterly rate recorded by El Salvador since 1999. The recovery is led by increasing agricultural output (led by significant growth in production of cotton, fisheries, poultry, grains, sugar and milk) as well as the return to positive growth in the construction sector. As further explained below, so far the recent increase in oil prices has had a small impact in El Salvador's economy.

III.2.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

Figure III.2.1 show the gasoline price indices in USA and El Salvador for the period 1999-2005 and we observe that the rise in oil prices has been passed through to Salvadorean consumers. Specifically, gasoline prices in El Salvador have moved in the same direction that those in the United States since end 1999.[33] The simple correlation is very high (0.96), indicating that the rise in oil prices has been transferred to Salvadoran consumers almost as it has happened in the United States (the *"free market"* benchmark used in this exercise).

Figure III.2.1



[32] The country report on El Salvador was prepared by Ana Lucia Armijos.
[33] There is no official index for all gasoline prices in El Salvador. Therefore, the monthly price series for regular gasoline were used in this section (excluding VAT taxes), as they represent the greatest share of gasoline consumption in the country.

b. Estimating the pass-through from domestic gasoline prices to overall inflation

Using monthly information for the period 2000-2005, we estimated an inflation equation in order to compute the pass-through from domestic gasoline prices to overall CPI inflation. We run a regression of the current monthly inflation rate on current fuel prices changes and the last two months inflation rates. To avoid autocorrelation problems, first degree differences were used.

$$\pi_t = 0.0001 - 0.7223\ \pi_{t-1} - 0.2977\ \pi_{t-2} + 0.0304\ gp_t + \varepsilon_t$$
$$(0.21) \quad (-7.19) \quad (-3.02) \quad (4.77)$$
$$R^2 = 0.5824, \ N = 69$$

The evidence shows that a one percent increase in fuel prices result in a 0.03 percent increase in overall CPI inflation There are no indicators for core inflation readily available in El Salvador, so the second regression was not estimated. However, given the small impact of fuel prices in overall inflation, I would not expect a significant relation on the core inflation rate, which excludes volatile items like fuel, food, etc.

III.2.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

The fiscal impact of higher oil prices in El Salvador has been moderate, amounting to 0.3 percent of GDP of extra public spending so far in 2005. As we can observe in Table III.2.1, the additional spending is mainly related to three government subsidies:

- The Transport subsidy, established in mid-2005 to avoid sharp increases in transportation costs, has amounted to US$ 6 million in additional spending as of September 2005. If such trend continues throughout the end of this year, this subsidy would approximately total 0.09 percent of GDP in additional spending.
- The Electricity subsidy (FINET) was budgeted to reach US$ 5 million during 2005. However, transfers related to FINET already totaled US$ 17.5 million between January and September 2005.
- The liquid gas subsidy (FEFE) reached US$ 32 million in the first nine months of 2005, although it was also budgeted at US$ 5 million for the entire year.

The total deviation from the original budget equals $46 million for the first nine months of the year, equivalent to almost 0.3% of GDP in extra spending. If the same trend continues during the rest of the year 2005, extra public spending related to higher oil prices could reach 0.5% of GDP.

Table III.2.1
El Salvador: Current Transfers related to Public Subsidies
(US$ millions)

	2005 Budget	Jan-Sept. 2005	Difference
F I N E T (Electricity)	5.0	17.5	12.5
F E F E (Liquid Gas)	5.0	32.4	27.4
Transport Subsidy	0.0	5.9	5.9
Total	**10.0**	**55.8**	**45.8**

Source: DGT, Ministry of Finance

b. Effects of Rising Oil Prices on Monetary Policy

In January 2001, El Salvador adopted full dollarization as the monetary regime so there is no room for domestic monetary policy in the country. Since then, it has been required by law that all prices be quoted in US dollars and both government and financial sector transactions have been conducted in that currency. The effects of dollarization —reduced inflationary pressures and convergence of interest rates towards those in the United States— have already been felt, and should continue into the future. This will help to offset a loss of policy flexibility and the potential loss of export competitiveness. Interest rates are expected to rise in 2005-2006, following possible interest rates increases in the United States as a result of a tighter monetary policy.

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

El Salvador has coped well with rising oil prices and the external position remains strong: higher export commodity prices and strong investment flows have allowed the economy to recover in 2005 in spite of higher oil prices. The value of crude oil imports increased by 8% in 2004 and by 35% in the first eight months of 2005, but the strong pick up in remittances (21% in 2004 and 12% in the first eight months of 2005) and traditional exports (42% in the first eight months of 2005) have more than offset the oil shock. Reflecting these trends, the current account deficit declined to 3.9% of GDP in 2004 from a peak of 5.1% of GDP in 2003 and is expected to close at around 3.7% of GDP in 2005. Going forward, the external balance remains sustainable (average of near 4% of GDP for 2006-09) with oil prices expected to decline gradually from their current peaks, while remittance flows are expected to continue to grow. These two effects offset the anticipated decrease in world commodity prices, which are expected to affect Salvadoran coffee and sugar exports.

III.3. GUYANA[34]

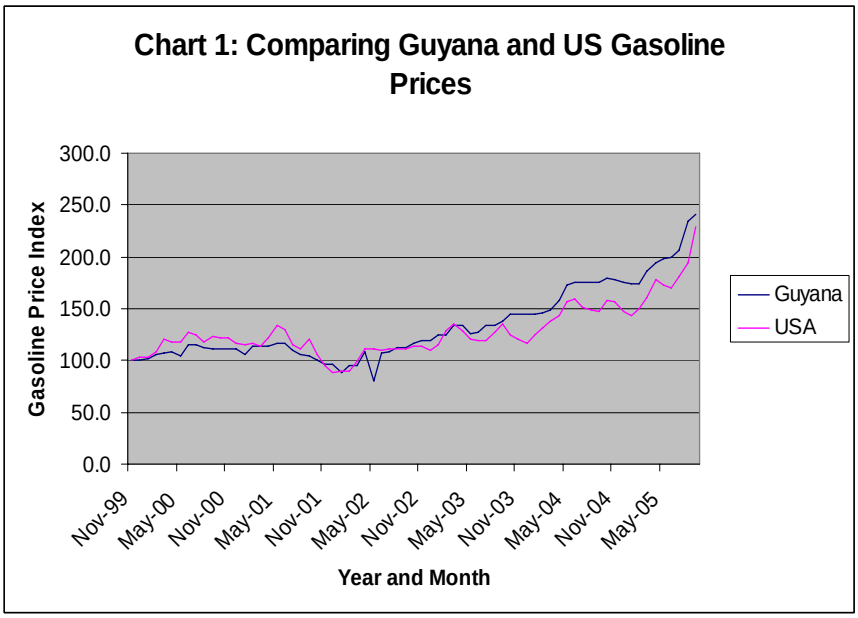
Guyana is an energy intensive and highly oil-dependent country. Oil imports have risen very rapidly in recent years from 17 percent of GDP in 2002 to an estimated 26 percent in 2005. This reflects the increase in world prices, as well as the energy intensity of its industry (e.g., bauxite, sugar and timber), high transportation costs, and low fuel efficiency, particularly in the production of electricity. The high increase in prices is affecting growth, inflation, the fiscal balance and external financing gaps.

III.3.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

According to Bullen (2005), Guyana had the third lowest gasoline price in Latin America in the year 2000 (about 60% of the region's average). Yet, its gasoline price had increased to 105% of the Latin America's average by August 2005. This was the result of Guyana's liberalization of the oil products market; the major international oil companies now compete with the publicly owned GUYOIL that once had a monopoly and now retains about 60% of the market. As Figure III.3.1 illustrates, the trend of gasoline prices in Guyana generally accompanied the prices of that product in the US.

Figure III.3.1



b. Estimating the pass-through from domestic gasoline prices to overall inflation

To assess the degree of pass through from gasoline prices to inflation, an equation was estimated, using the consumer price index for Georgetown as dependent variable and the gasoline price index for Georgetown as an explanatory variable. To avoid autocorrelation problems, first differences for the consumer price index and the gasoline price index were used. To enhance the explanatory power of the regression, the lagged CPI for Georgetown was also included as a regressor. Notwithstanding the modest

[34] The country report on Guyana was prepared by Clara Ana Coutinho de Sousa.

explanatory power of the estimated equation, results indicate inflation increases by 5% in response to a 1% fuel price increase.

$$\pi_t = 0.6626 - 0.0019\ P_{t-1} + 0.0523\ gp_t + \varepsilon_t$$
$$(0.49) \quad (-0.15) \quad (5.11)$$
$$R^2 = 0.2752,\ N = 73$$

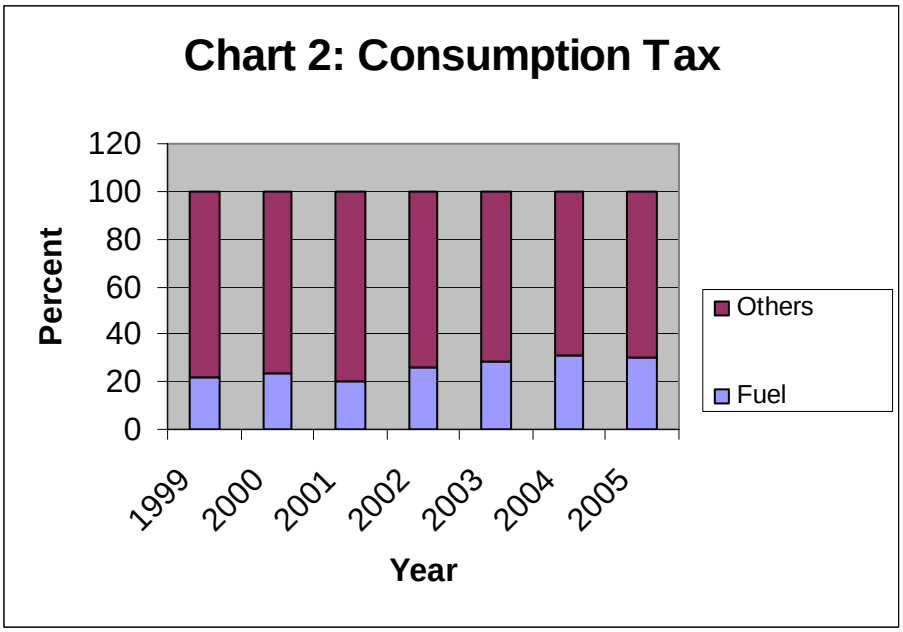
The degree of the pass through from fuel prices to inflation may be influenced by two main factors. The first is the ad-valorem consumption tax for fuel, which has been changed as a means to partially shelter the consumer from high oil prices. The consumption tax on fuel has recently been lowered from 50 to 20 percent. The second factor is that some companies have reduced profit margins and postponed expenditures to lessen the impact of oil prices on the consumer. GUYOIL, for example, which as mentioned earlier retains 60% of the oil market, lowered its profit margin by about 7.5 percent to soften the impact of the high international oil prices on the consumer at the pump. Similarly, public transportation fares and electricity tariffs were adjusted only partially and with lags for the higher oil prices. Guyana Power and Light (GPL), supplier of almost all the electricity consumed in Guyana, which is mainly fuel generated, has its tariffs regulated. The tariff increase in response to the hype in oil prices has fallen short of the required level and the company's balances are deteriorating.

III.3.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

Guyana's fiscal position has been affected as a result of the hype of oil prices through two main routes. The first and on the positive side is the fuel tax and the second, which more than offset this positive impact, was the deterioration of the balances of public enterprises. Guyana's fuel tax revenue as a percentage of GDP almost doubled from 1999 to 2005, from about 2 to 4 percent on account of a higher import bill, but the net balances of public enterprises deteriorated from 0.4 percent of GDP in 2001 to -4.4 percent in 2004. Projections suggest that the balances will deteriorate further to -5.4 percent in 2005. As Figure III.3.2 illustrates, fuel related taxes now account for about 30% of consumption taxes while in 1999 the share was little over 20 percent.

Figure III.3.2



b. Effects of Rising Oil Prices on Monetary Policy

Guyana targets a monetary aggregate and uses both a reserve requirement ratio and open market operations to regulate liquidity and in that way, control inflation. Treasury bill auctions are conducted regularly by the Central Bank and commercial banks can refinance themselves at the Bank rate, which provides the main signal for the policy stance. To assess the reaction of the Central Bank to the rise in oil prices, an equation was estimated linking the interest rate and the oil price changes. To overcome autocorrelation problems, first differences were again used. Results indicate with statistical significance that the lagged fuel price index yields a positive but very modest increase in the Bank rate.

$$r_t = -0.4463 + 0.0015\ gp_t + \varepsilon_t$$
$$\quad (-3.21) \qquad (2.53)$$
$$R^2 = 0.0858,\ \ N = 70$$

c. Effects of Rising Oil Prices on the Exchange Rate and the Current Account

Guyana is highly oil dependent. The imports of fuel and lubricants as a share of GDP grew in Guyana from about 13 to over 26 percent from 1999 to 2005 given the rigidity of demand to changes in prices, justified by the high energy-intensity of industries such as mining, sugar and timber, in the absence of non-fuel alternative sources of energy.

From 2002 to 2004, the impact of the high oil price increase on the external current account deficit was offset by solid export and remittances performance[35], allowing it to narrow from 16 percent of GDP in 2002 to 9 percent in 2004. Indeed, exports recovered from about 68 percent of GDP in 2002 to 75 percent of GDP in 2004, offsetting the increase in imports to yield a reduction in the trade balance deficit to 7.3 percent of GDP in 2004, from 9.3 percent of GDP in 2002. Also, worker's remittances (credit) increased from about 21 million US dollars in 1999 (about 3 percent of GDP) to about 100 million US dollars in 2004 (13 percent of GDP). Net remittances, which were estimated at -3.1 million dollars in 1999, rose to nearly 50 million US dollars in 2004 (over 6 percent of GDP).

The reduced external current account deficit, coupled with inflows of FDI and concessional external resources, allowed official international reserves to remain at adequate levels and real exchange rates remained mainly unchanged in the period. In 2005, the current account is expected to widen significantly to over 26 percent of GDP, reflecting the high import bill and the higher imports associated with the ambitious investment plan in response to the floods and the restructuring of the sugar sector. Again, in 2005 FDI is project to maintain its upward trend and grant inflows to remain robust, and the Central Bank's reserves are projected to remain at above three months of imports.

[35] Workers remittances (credit) increased from about 21 million US dollars in 1999 (about 3 percent of GDP) to about 100 million US dollars in 2004 (13 percent of GDP). Net remittances, which were estimated at -3.1 million dollars in 1999, rose to nearly 50 million US dollars in 2004 (over 6 percent of GDP).

Table III.3.1
Balance of Payments, Selected Indicators, 1999-2000
(as percentage of GDP)

	1999	2000	2001	2002	2003	2004	2005
Current account	**-8.1**	**-14.1**	**-15.4**	**-13.3**	**-8.8**	**-4.6**	**-19.6**
(excluding official transfers)	-11.2	-16.2	-18.8	-15.2	-11.8	-9.4	-26
Merchandise trade (net)	**-3.5**	**-11.3**	**-13.1**	**-9.3**	**-7.9**	**-7.3**	**-23.5**
Exports (f.o.b.)	75.5	71	68.8	68.2	68.7	75	73.8
Imports (c.i.f.)	79	82.2	81.9	77.5	76.6	82.2	97.3
Fuel and lubricants	12.7	17	18.4	17.3	19.7	21.5	26.1
Services (net)	**-4.5**	**-3.4**	**-2.9**	**-3.2**	**-2**	**-2.6**	**-2.6**
Income (net)	**-8.8**	**-8.2**	**-8.9**	**-8.1**	**-7.7**	**-5.4**	**-6.4**
Current transfers (net)	**8.7**	**8.7**	**9.6**	**7.3**	**8.8**	**10.7**	**12.9**
o/w general government	3.1	2.1	3.4	1.8	3	4.8	6.5
o/w other sectors	5.6	6.6	6.2	5.5	5.8	5.9	6.4
				1996=100			
Export unit value index (1996=100)	85.3	79.7	80.3	80.9	86.2	96.3	102.8
Export volume index (1996=100)	107.1	110.2	106.2	106.5	103.6	106.4	96
Import unit value index (1996=100)	84.6	98.2	92.7	95.3	106.4	126.4	146.1
Fuel	88.3	138.6	119.4	122.5	141.8	185.3	249.1
Import volume index	109.2	100.2	106	99.3	90.3	85.9	87.3
Fuel	111.5	97.1	122.5	114.3	115.5	101.4	91
Terms of Trade	100.8	81.2	86.7	84.9	81	76.2	70.4

Source: IMF

Table III.3.2
Guyana: Non-Financial Public Sector
(as percentage of GDP)

	1999	2000	2001	2002	2003	2004	2005
Revenue	33.9	33.8	33.4	32.4	35	37.5	35.6
Tax revenue			29.6	30.2	29.1	31	29.9
Non-tax revenue			2	2.2	2.3	2.2	1.6
Public enterprises			1.8	0.1	3.6	4.4	4.2
Expenditure	39.4	46	48.6	46.4	48	48.5	54.2
Current expenditure 2/	27.3	32.2	34.6	33.7	33.8	32.2	36
Other goods and services	5.2	6.3	6.9	7.1	7.8	8.3	10.2
Current balance	6.6	1.6	-1.4	-1.3	1.2	5.3	-0.4
Capital expenditure (excluding Skeldon)	12.1	13.8	14	12.6	14.2	16.3	18.2
Overall balance	-5.5	-12.2	-15.4	-13.9	-13	-11	-18.6
Grants 3/	4.4	7.7	8.4	8.2	4.6	6.5	9.7
Overall balance after grants			-7	-5.8	-8.6	-4.5	-16.2

Source: IMF

Table III.3.3
Changes in Gasoline Tax Rate

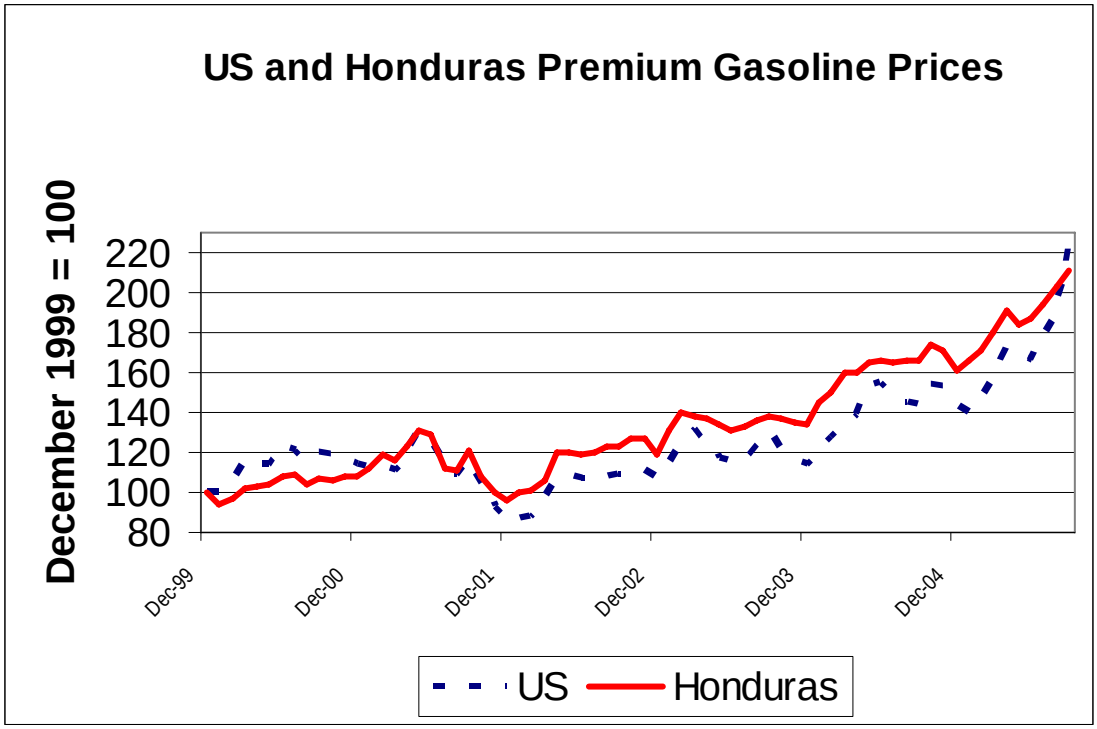
	Tax Rate
Mar-00	40
Jun-00	35
Apr-01	25
May-01	25
Aug-01	35
Nov-01	50
Jan-03	35
Jun-03	50
May-04	40
Dec-04	50
Mar-05	40
Aug-05	35
Sep-05	20

Source: GoG

III.4. HONDURAS[36]

Honduras has a regulated market for downstream petroleum products (which includes regular and premium unleaded gasoline, diesel, kerosene, and liquefied petroleum gas). This market is regulated by a pricing system that is based on maximal mark-up margins that can be charged at each stage of the commercialization process: imports, storage, distribution, transport, and retail. The industry is fully privatized. The majority of importers are foreign companies, but there is virtually no competition among them, since prices are set in line with the maximal margins established by law. Even so, a visual inspection of Figure III.4.1 suggests that international gasoline prices are passed through fairly quickly to domestic gasoline prices.

Figure III.4.1



Source: Government Data

III.4.1 The Impact of Higher Oil Prices on Domestic Prices

a. Estimating the pass-through of world oil price changes to domestic gasoline prices

In 2003, as the oil prices increased permanently above US$28/bbl, the monthly price variations became much larger than before and the government accelerated the application of the pricing formula, adjusting prices on a weekly, instead of monthly, basis. This meant that international oil price fluctuations were passed on to consumers in a more timely fashion. This system remained in place until the beginning of September 2005, when a price hike of nearly US$0.85 per gallon in gasoline led to a strike by taxi drivers that paralyzed the capital city. In response, Congress

[36] The country report on Honduras was prepared by Dante Mossi and Rodrigo Jarque.

decided to impose a price ceiling of all petroleum products at the pre-Hurricane Katrina levels until December 2005. To pay for the cost of sustaining this price freeze, the government applied expenditure cuts elsewhere in the budget. The total fiscal cost of the price freeze is estimated to be around US$20.0 million or 0.25% of GDP.

b. Estimating the pass-through from domestic gasoline prices to overall inflation

To estimate the pass-through from domestic gasoline prices to overall and core inflation, we run inflation regressions for monthly variations in gasoline prices and consumer prices. The regression results for CPI inflation are reported in Tables III.4.1 and III.4.2, whereas the regressions for core inflation are reported in Tables III.4.3 and III.4.4.

Using monthly data for the 1999-2005 period, our main results are:

- Changes in domestic gasoline or diesel prices have a significant influence on changes in the domestic price (CPI) level (see regressions in Table III.4.1 and III.4.2. Furthermore, the effect of fuel prices on the CPI occurs fairly immediately. Only the coefficients associated with the concurrent independent variables are significant, while the coefficients on the Lagged independent variables are not significant.

- A one percent increase in the price of gasoline causes an increase of 0.60 percent in the price level, and one percent increase in the price of diesel causes a similar 0.47% in the price level.

- Changes in fuel prices do not seem to have a significant effect on core inflation (see regressions in Tables III.4.3 and III.4.4). This suggests that the Honduran authorities have been fairly successful, by and large, in preventing the transmission of inflationary pressures from oil prices to other prices.

III.4.2 Domestic Policy Responses to Higher Oil Prices

a. Effects of Rising Oil Prices on the Fiscal Stance

The government levies three different taxes on oil products: a tariff (15% of the CIF import price), a tax earmarked for road maintenance and social programs, and a specific excise tax of 15%. The taxes applied to oil products have had the effects of changing prices at the pump more than proportionally to the international price variation. In early 2003, a sustained increase in oil prices led to higher tax revenue than had been forecasted in its budget, so the government consolidated all fuel taxes into one specific tax applied to the volume of product in an effort to stabilize revenues from oil taxes.

Table III.4.1 Equation 2a (with First Differences) Dependent Variable: d(IPC)	1	2	3
Constant	0.821	0.870	0.867
	(6.91)	(7.41)	(7.47)
Lag d(IPC)	0.021	-0.042	-0.043
	(0.16)	(-0.33)	(-0.34)
Diesel	0.087		
	(2.61)		
Lag Diesel	0.031		
	(0.87)		
Regular Gasoline		0.086	
		(3.36)	
Lag Regular Gasoline		0.037	
		(1.29)	
Super Gasoline			0.090
			(3.68)
Lag Super Gasoline			0.038
			(1.40)
Observations	68	68	68
R-sq	0.1278	0.1806	0.2061
Adjusted R-sq	0.0869	0.1422	0.1688

"t" statistic in parenthesis

Table III.4.2 Equation 2a (with % Changes) Dependent Variable: % Change (IPC)	1	2	3
Constant	0.610	0.650	0.648
	(6.38)	(6.97)	(7.00)
Lag % change IPC	0.089	0.012	0.011
	(0.70)	(0.09)	(0.08)
Diesel	0.018		
	(2.01)		
Lag Diesel	0.002		
	(0.17)		
Regular Gasoline		0.026	
		(3.07)	
Lag Regular Gasoline		0.008	
		(0.90)	
Super Gasoline			0.027
			(3.29)
Lag Super Gasoline			0.009
			(0.99)
Observations	68	68	68
R-sq	0.0727	0.1485	0.1661
Adjusted R-sq	0.0293	0.1086	0.1270

"t" statistic in parenthesis

Table III.4.3 Equation 2b (with First Differences) Dependent Variable: d(Core Inflation)	1	2	3
Constant	0.688	0.692	0.689
	(6.71)	(6.91)	(6.89)
Lag d(Core)	-0.032	-0.069	-0.067
	(-0.26)	(-0.55)	(-0.54)
Diesel	0.033		
	(0.85)		
Lag Diesel	-0.004		
	(-0.09)		
Regular Gasoline		0.032	
		(1.09)	
Lag Regular Gasoline		0.035	
		(1.15)	
Super Gasoline			0.035
			(1.22)
Lag Super Gasoline			0.035
			(1.21)
Observations	68	68	68
R-sq	0.0122	0.0424	0.0483
Adjusted R-sq	-0.0340	-0.0025	0.0037

"t" statistic in parenthesis

Table III.4.4 Equation 2b (with % Changes) Dependent Variable: % Change (Core Inflation)	1	2	3
Constant	0.610	0.610	0.606
	(5.93)	(6.08)	(6.05)
Lag % change Core	0.064	0.031	0.032
	(0.51)	(0.24)	(0.25)
Diesel	0.009		
	(0.71)		
Lag Diesel	-0.005		
	(-0.40)		
Regular Gasoline		0.012	
		(0.96)	
Lag Regular Gasoline		0.011	
		(0.87)	
Super Gasoline			0.015
			(1.13)
Lag Super Gasoline			0.012
			(0.92)
Observations	68	68	68
R-sq	0.0130	0.0310	0.038
Adjusted R-sq	-0.0332	-0.0143	-0.0071

"t" statistic in parenthesis

The Honduran government only has in place one overt subsidy for oil products, which is targeted to urban transport in Tegucigalpa. This subsidy is capped in the budget to a fixed amount (currently at US$6.3 million) to be distributed during the course of a year to the owners of the transport fleet operating in Tegucigalpa. The Honduran government also provides a hidden subsidy in the form of tax exemptions for fuel oil, used for electric generation, and to a smaller extent on the consumption of diesel (see Table III.4.5).

Table III.4.5
Estimated Fiscal Revenues from Oil Taxes

Product	Consumption (million of gallons)	Exonerated product (million of gallons)	Taxable Consumption (million of gallons)	Road Tax (US$/gallon)	Tax Revenue (US$ million)
Premium Gasoline	113.1	5.7	107.4	1.1589	124.5
Regular Gasoline	7.8	0.4	7.4	1.1516	8.5
Diesel	265.0	28.6	236.4	0.6106	144.3
Kerosene	11.5	0.0	11.5	0.2950	3.4
Avjet	8.7	0.0	8.7	0.0300	0.3
Fuel Oil	303.9	300.0	3.9	0.4267	1.7
LPG	29.8	1.0	28.8	0.2100	6.0
TOTAL	739.8	335.6	404.2		288.8

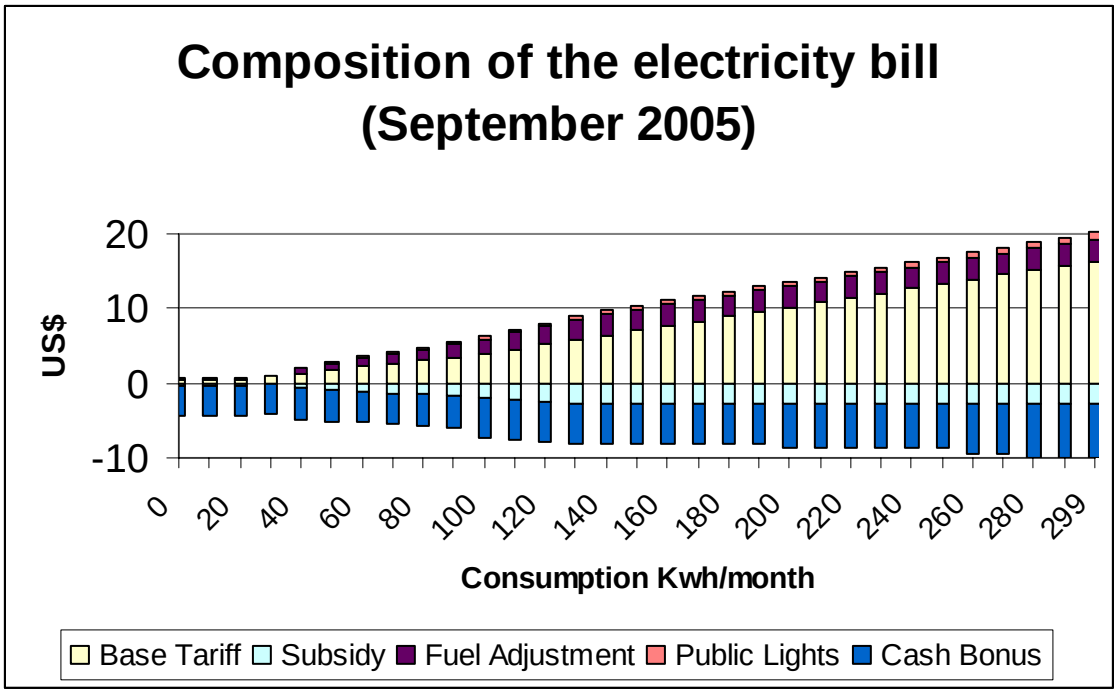
Source: Secretary of Finance of Honduras

The Electricity Market. In the market for electricity, thermal generation (mostly private generators using fuel oil) accounts for approximately 70 percent of the total market and hydroelectric generation (mostly government owned) accounts for the remaining 30 percent. Honduras has a state owned electricity utility (ENEE) that is the sole vendor of almost 100% of the electricity sold. Private generators provide energy under Power Purchase Agreements (PPAs) with ENEE. These PPAs have escalation clauses. Adjustments in fuel prices are mandated to be passed on to consumers through a fuel adjustment factor that is based on a weighted average of the production costs from the variable-cost thermal PPAs and fixed-price hydroelectric plants. Currently, the fuel adjustment factor is 53.9% of the base tariff, defined in 2002. This factor does not cover ENEE's costs under the thermal PPAs, which has resulted in considerable financial stress for the utility. To worsen matters, ENEE has nearly 23% in technical and non-technical losses (see Figure III.4.2).

Electricity Subsidization policy. To mitigate the impact of increasing oil prices on poor electricity consumers, the government introduced a cash transfer in August 2005, to be delivered to consumers of electricity with less than 300 kwh/month. This cash transfer comes on top of an existing electricity tariff subsidy, which had been capped in agreement with the IMF under the PRGF arrangement. The estimated cost of the tariff subsidy is US$14.2 million a year and of the cash transfer is US$40.1 million a year or 0.50% of GDP ($4 for consumers with consumption in the range 01-100 Kwh/month, up to $7.10 for consumers in the range 281-300 Kwh/month).

The incidence of oil and electricity subsidization. The evidence suggests that the freeze on oil prices, and subsidies in electricity tariffs have benefited the middle class rather than the poor, as can be observed from data of the 2004 Household Survey. The analysis reveals that the poorest spend very little on electricity or vehicle fuel, with consumption concentrated among the wealthiest households (see Table III.4.6).

Figure III.4.2



Source: ENEE

Table III.4.6
Expense on Electricity, Public Transport and Fuel by Deciles
(US$ per month)

Deciles	Electricity	Public transport	Lighting fuel	Cooking fuel	LPG for cooking	Kerosene for cooking	Petrol for vehicles
Poorest	0.11	0.35	8.01	1.59	0.02	0.01	0.00
2	0.41	0.60	9.25	1.47	0.02	0.09	0.00
3	1.05	0.98	10.11	1.58	0.14	0.22	0.00
4	1.64	1.23	9.93	1.34	0.32	0.38	0.15
5	3.22	1.68	9.72	1.16	0.98	0.68	0.11
6	5.19	2.23	9.00	0.65	1.76	0.83	0.57
7	6.15	2.72	8.02	0.72	2.29	0.84	0.69
8	8.96	3.68	7.74	1.68	3.34	0.78	1.65
9	13.17	3.86	7.44	0.66	4.40	0.62	3.85
Richest	26.54	5.22	5.28	0.71	3.95	0.21	14.16
All households	7.99	2.52	8.26	1.11	1.98	0.49	2.73

Source: ENCOVI 2004

b. Effects of Rising Oil Prices on Monetary Policy

Using the monthly information on gasoline prices and short-term interest rates, we want to assess whether rising oil prices have had an effect on monetary policy. In Tables III.4.7 through III.4.10 we report the results.

Table III.4.7
Equation 3 (with First Differences on Fuel prices)
Dependent Variable: ST interest Rate

	1	2	3
Constant	12.332	12.322	12.138
	(64.96)	(65.70)	(65.55)
Diesel	-0.072		
	(-0.59)		
Lag Diesel	-0.085		
	(-0.70)		
Regular Gasoline		-0.062	
		(-0.64)	
Lag Regular Gasoline		-0.067	
		(-0.69)	
Super Gasoline			-0.054
			(-0.58)
Lag Super Gasoline			-0.061
			(-0.65)
Observations	67	67	67
R-sq	0.0163	0.0148	0.0129
Adjusted R-sq	-0.0144	-0.0160	-0.0179

"t" statistic in parenthesis

Table III.4.9
Equation 3 (with First Differences on Fuel prices)
Dependent Variable: ST interest Rate

	1	2	3	4
Constant	12.374	12.365	12.221	11.988
	(62.45)	(62.71)	(62.26)	(61.67)
Diesel	-0.101	-0.072997	-0.072	-0.104
	(-0.83)	(-0.61)	(-0.60)	(-0.88)
Lag Diesel	-0.101	-0.102	-0.020	-0.071
	(-0.83)	(-0.84)	(-0.16)	(-0.60)
Lag 3 Diesel	-0.198209			
	(-1.63)			
Lag 4 Diesel		-0.248		
		(-2.04)		
Lag 6 Diesel			-0.161	
			(-1.21)	
Lag 12 Diesel				0.020
				(0.14)
Observations	65	64	62	56
R-sq	0.0569	0.0769	0.0355	0.0280
Adjusted R-sq	0.0105	0.0308	-0.0144	-0.0281

"t" statistic in parenthesis

Table III.4.8
Equation 3 (with % Change in Fuel prices)
Dependent Variable: ST interest Rate

	1	2	3
Constant	12.320	12.303	12.296
	(64.65)	(65.39)	(65.18)
Diesel	-0.016		
	(-0.41)		
Lag Diesel	-0.026		
	(-0.67)		
Regular Gasoline		-0.015	
		(-0.38)	
Lag Regular Gasoline		-0.022	
		(-0.56)	
Super Gasoline			-0.012
			(-0.29)
Lag Super Gasoline			-0.019
			(-0.49)
Observations	67	67	67
R-sq	0.0117	0.0075	0.0055
Adjusted R-sq	-0.0197	-0.0235	-0.0256

"t" statistic in parenthesis

Table III.4.10
Equation 3 (with First Differences on Fuel prices)
Dependent Variable: ST interest Rate

	1	2	3	4
Constant	12.348	12.297	12.222	11.961
	(63.56)	(64.24)	(62.86)	(62.15)
Regular	-0.080	-0.061515	-0.085	-0.056
	(-0.85)	(-0.65)	(-0.90)	(-0.60)
Lag Regular	-0.093	-0.064	-0.060	-0.053
	(-0.92)	(-0.65)	(-0.61)	(-0.55)
Lag 3 Regular	-0.148			
	(-1.49)			
Lag 4 Regular		-0.134		
		(-1.37)		
Lag 6 Regular			-0.089	
			(-0.89)	
Lag 12 Regular				0.026
				(0.24)
Observations	65	64	62	56
R-sq	0.0505	0.0474	0.0316	0.0138
Adjusted R-sq	0.0038	-0.0002	-0.0185	-0.0431

"t" statistic in parenthesis

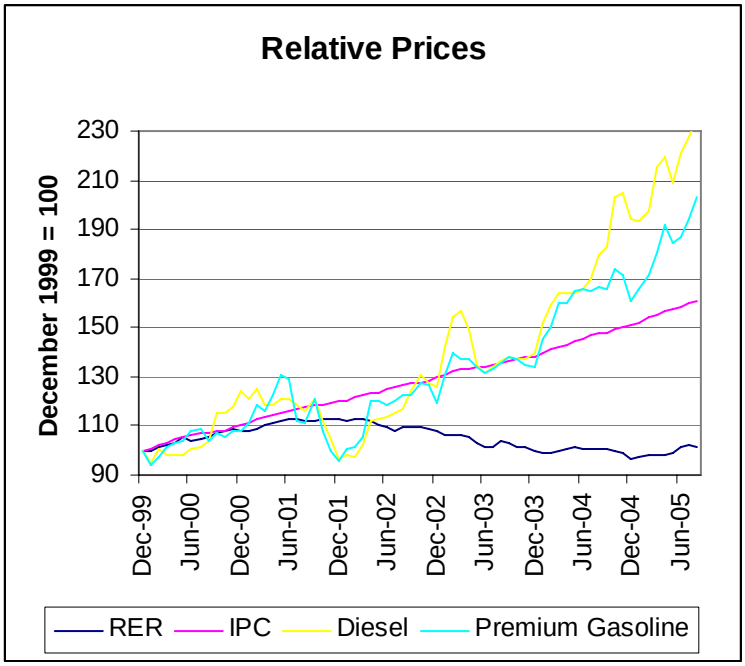
In general, we find that changes in fuel prices do not have a significant influence on domestic interest rates. That is, domestic monetary policy appears to have been largely isolated from the effects of rising oil prices.

c. Effects of Rising Oil Prices on the Balance of Payments

The import of oil products increased to $570.4 millions during January-August 2005, which represents an increase of 38.9 percent over the same period last yea. Of this total increase in oil imports, 19 percent is due to increases in volume led by the expansion of the economy (and including the generation of electricity with exonerated fuel oil), and 81 percent is attributable to the increase in oil prices. In spite of this significant increase in imports, the balance of payments was not significantly affected. This is because it was accompanied by equally significant increases in exports and remittance inflows. Remittances increased by 47.1 percent in the first semester of 2005, to $699.1 millions, while exports grew by 21.5 percent in that same period, to $364.2 millions.

The exchange rate regime consists of a crawling peg mechanism that is implemented via daily auctions of US dollars, with a base price determined by the Central Bank, taking into consideration the inflation in partner economies. This system functions with a 7 percent band around the reference price. As observed from Figure III.4.3, there does not seem to have been any significant change in the trend behavior of the real exchange rate in response to the increase in oil prices after 2003. The Central Bank has not been under pressure to adjust the exchange rate, given that the increases in oil imports were more or less compensated by increases in remittances and exports. At the same time, the government had adopted a neutral fiscal policy, where the additional expenses incurred under the various subsidy schemes were financed with cuts in other public expenditures. As a result, the country's international reserves have continued to grow over the last year and inflation has remained more or less stable at last year's rate of 9.0 percent.

Figure III.4.3



Source: Central Bank of Honduras, and IMF International Financial Statistics