Economic Consequences of Statehood for Puerto Rico: A General Equilibrium Analysis

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Abstract
It has been quite some time that Puerto Ricans have been debating the status issue. Put simply, it is the issue of appropriate political arrangement between the island and the mainland USA. There are basically three status options to consider, namely (a) statehood, (b) commonwealth, and (c) independence. The question of right political status is indeed a difficult and complicated question. It has many facets: political, economic, cultural, etc. It is therefore no wonder that, despite several referendums, no broad agreement on the status issue has yet emerged.

Among different dimensions of the status question, the one that is of foremost importance is economic. It is also possible to be more *objective* with regard to the economic aspect than with regard to other aspects. Hence, if agreement is possible with regard to any particular aspect of the status issue, it should be regarding the economic aspect. Agreement on the economic aspect may also lead to agreement on other aspects of the status debate. This provides the motivation for this paper. It hopes to contribute to a better understanding of the economic consequences of statehood for Puerto Rico. In this paper, we carry the study of economic consequences of statehood for the Puerto Rican economy one step forward. In order to do so, we construct a computable general equilibrium (CGE) model for the Puerto Rican economy and use this model to study the question. Our broad conclusion is that the results presented by CBO were bleaker than truly warranted.

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1. Introduction

It has been quite some time that Puerto Ricans have been debating the status issue. Put simply, it is the issue of appropriate political arrangement between the island and the mainland USA. There are basically three status options to consider, namely (a) statehood, (b) commonwealth, and (c) independence. The question of right political status is indeed a difficult and complicated question. It has many facets: political, economic, cultural, etc. It is therefore no wonder that, despite several referendums, no broad agreement on the status issue has yet emerged.

Among different dimensions of the status question, the one that is of foremost importance is economic. It is also possible to be more *objective* with regard to the economic aspect than with regard to other aspects. Hence, if agreement is possible with regard to any particular aspect of the status issue, it should be regarding the economic aspect. Agreement on the economic aspect may also lead to agreement on other aspects of the status debate. This provides the motivation for this paper. It hopes to contribute to a better understanding of the economic consequences of statehood for Puerto Rico.

It is not that the economic aspect of the status issue has not been investigated before. There exists a significant body of literature that addresses this aspect. In fact, several different methodologies have been used to investigate this question. Among these are (a) the regression approach, (b) the input-output approach, and (c) the macro-econometric modeling approach. The study done by the Congressional Budget Office (CBO 1990) stands out in importance among works of the third approach. Using a macro-econometric model, CBO predicted *severe negative* consequence of statehood for the Puerto Rican economy.

In this paper, we carry the study of economic consequences of statehood for the Puerto Rican economy one step forward. In order to do so, we construct a computable general equilibrium (CGE) model for the Puerto Rican economy and use this model to study the question. Our broad conclusion is that the results presented by CBO were bleaker than truly warranted. The reason for this lies to a great extent in some technical limitations of the model that CBO used. The CBO model was aggregate, it did not have a supply side, and it did not allow for price flexibility. These features seriously limited Puerto Rican economy's ability to adjust to the negative shocks associated with statehood (to be described shortly). This is what resulted in CBO's sharp negative results.

In contrast, the CGE model presented in this paper disaggregates the Puerto Rican economy into *ten* sectors. It allows for price flexibility and incorporates supply side responses. These features make the CGE model a more realistic description of the Puerto Rican economy. These features create the possibility of adjustment through inter-sectoral transfer of resources and corresponding movements in prices. Factor supplies can also now adjust. When CBO's assumptions regarding statehood shocks are run through the CGE model, we find that the Puerto Rican economy adjusts much better.

To our knowledge, the CGE model presented in this paper is the first complete functioning CGE model of the Puerto Rican economy. It is a general-purpose model, and hence can be used for a wide variety of policy simulations. In particular, it may be used to find out the impact of various countervailing measures that Puerto Rican government can take in order to counteract the impact of negative shocks to the Puerto Rican economy in the event of a change in political status. Some illustrative experiments of this nature indicate that through such countervailing measures it is possible for the Puerto Rican economy to overcome negative shocks and actually realize positive gains.

The paper is organized as follows. In section 2, we provide some perspective on the statehood debate. In section 3, we describe the structure of the Puerto Rican economy. Section-4 describes the structure of the Puerto Rican CGE model. In section-5 we present the replication of the CBO statehood experiment and discuss the results. Different sensitivity tests of the results are also presented in section-6. The statehood debate is reconsidered in section-7 in the light of the results. The results are also compared with

actual experience of the Puerto Rican economy since 1996 when a process of gradual elimination of Section-936 (to be explained shortly) was started. In section-8, we conclude.

2. The Statehood Debate

Historical Background

Puerto Rico came under the US possession in 1898 as a result of the Spanish war. Since then her economy underwent considerable transformation. The main characteristic of this transformation in the initial period of first three decades of the twentieth century was development of sugar industry under mainland US capital.[1] It was not until the forties that a somewhat broad-based process of industrialization began. The process evolved from the initial stage of 'state-*dominated* development' of the early forties to the 'state-*sponsored* development' strategy. The latter was embodied in 'Operation Bootstrap,' initiated in late forties. The main idea behind 'Operation Bootstrap' was to make Puerto Rico attractive to US mainland capital as a location for investment by providing incentives. Soon incentives provided by the Puerto Rican government were complemented by tax incentives provided by the US federal government, and with time it is the latter that became more important. After going through several variants, the federal tax break provided to US firms operating in Puerto Rico was canonized in the form of Section 936 of the US tax codes. Primarily in response to these tax incentives, large amount of mainland capital flowed into Puerto Rico during fifties and sixties. Also, Puerto Ricans became more eligible for various federal welfare programs, which resulted in a progressively increasing inflow of non-earned income to Puerto Rican residents from federal sources. As a result of these two processes, Puerto Rican economy experienced considerable growth during the fifties, sixties, and early seventies. Given the above, it is no wonder that the statehood debate, so far as its economic aspect is concerned, is framed largely in terms of these two processes, namely 936 capital flow and federal transfer.

[1] This mono-cultural feature of the economy came under severe test during the depression years of the thirties. Fir details on Puerto Rican economic history see the excellent work by Dietz (1986).

The connection between statehood and 936-tax credit is very clear. Statehood means repeal of the 936-tax credit. But statehood will also directly affect federal transfers. The latter, in turn, has two dimensions. On the one hand, statehood will further increase eligibility of Puerto Ricans for federal welfare payments. On the other hand, statehood will mean that Puerto Rican individuals and companies will come under federal income tax laws. The controversies regarding economic impact of statehood for Puerto Rico therefore exist at *two levels*. The *first* concerns the magnitude by which 936 capital inflow and federal transfer will change as a result of statehood. The *second* concerns the magnitude by which the Puerto Rican economy will suffer for a given change in 936 capital inflow and federal transfer (brought about by statehood).

Studies of economic aspect of statehood have addressed controversies of both these levels. Some have focused on the *first*, which is basically an issue of *economic concretization* of the statehood status option.[2] For example, there have been many studies focussing on the elasticity of 936 capital flow with respect to tax incentives. Obviously, this is a question of the first level of controversy. The *second* level of controversy has also received considerable attention. Many have argued that drop in 936 investment and capital stock will lead to serious dislocation in the Puerto Rican economy. On the other hand, others have argued that changes ensuing from statehood will not damage the Puerto Rican economy. In this view, statehood will rather prove good for the Puerto Rican economy, particularly in the long run.[3]

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[2] See Islam (1995b) for a detailed discussion of the economic concretization issue.

[3] Thus, many have argued that while 936 investment has at some stage played an important role in Puerto Rico's economic development, it is no longer doing so. Some of the facts that they point out to substantiate this view are as follows. *First*, the reverse side of foreign capital inflow is repatriation of investment income. By the end of the seventies, investment income repatriated from Puerto Rico to the mainland US has reached about one third of the GDP. This ratio has increased further in later years. *Second*, the GDP produced by the mainland firms in Puerto Rico represents not so much value added locally as value already created in the mainland and shifted to Puerto Rico through transfer pricing to take advantage of federal tax credit. An expression of this situation is that whereas 936 companies accounted for 35 percent of the GDP in 1982, in terms of employment their share was only about 15 percent. Thus 936 firms are acting more as vehicles for shifting profits than as source of generation of local income through significant employment expansion and value creation. This has also resulted in a segmented capital market with capital flows of 936 sectors responding primarily to various non market, administrative decisions regarding tax incentives. Various regulations regarding 936 capital and investment income flows have also perversely affected the entire capital and financial market of Puerto Rico. As a result large movements of capital are now associated with changes in administrative decisions rather than changes in real rates of return arising from real changes in the economy. *Third*, the availability of federal welfare transfers, coupled with imposition of the US minimum wage law (and also free migration between the island and the mainland) has created a very distorted labor

In this paper, we focus on this *second* level of controversy. There are several reasons for doing so. First, any 'concretization' is contingent on the particular point of time at which one is considering the issue. Laws are constantly changing, so are variables of both the Puerto Rican economy and the economy of the mainland US. Hence answering the first question requires many assumptions regarding the current conditions. Second, concretization also requires projections regarding future movements of the variables. Third, no matter what assumptions are made regarding current and future values, these will remain inherently controversial. Because of these reasons, the strategy in this paper is not to get mired in controversies of the first level. Instead, we propose to accept certain assumptions regarding the first level and move the analysis to the second level.

In order to do so, we turn to the CBO study. It is reasonable to assume that CBO is more competent that many other organizations or individuals to gauze the impact of statehood on federal transfers. We also want to accept CBO's assumption regarding statehood's impact on 936 capital inflow. This enables us to clearly deal with the controversy at the second level by abstracting from the first. We therefore start by taking a closer look at the CBO statehood simulation.

Understanding CBO's Statehood Simulation

Understanding CBO's statehood experiment is, however, not easy. It proceeds by initially constructing two baseline scenarios: one assumes high future growth and the other assumes comparatively low future growth. These are named as the *high-* and *low-growth* baseline scenarios, respectively. CBO assumes that, from economic point of view, the main impact of statehood will be felt in the form of reduction of 936 investments and increase in federal transfers. According to their assumptions, by the end of their sample period (i.e., year 2000), 936 investment will be lower by 62 and 73 percent compared with the low- and high growth baselines, respectively. This process of investment reduction will

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market in Puerto Rico. Labor participation rates are low, and the unemployment rate is permanently high. The pervasive influence of federal welfare payments on the Puerto Rican economy and labor market can be gauged from the fact that 53 percent of its population was covered by the Food Stamps program, and 64 percent by the Medicaid in 1987 (?). Given the above, one may argue that even if statehood leads to significant drop in 936 investment, this drop is not likely to have as much negative effect as has been generally thought.

lead to a reduction of the 936 capital stock by 37 to 47 percent compared with the 'high-' or 'low-growth' baseline scenarios, respectively. From a side calculation, CBO also determines that this will be associated with a decrease in 936 exports by 33 to 43 percent in the year 2000. With respect to federal transfers, CBO assumes that by the year 2000, there will be an increase by $1,345 million over the baseline. These provide CBO's answer to the controversies of the first level.

Turning to CBO's answer regarding controversies of the second level, we may first note that CBO considered the impact of changes in 936 investment and federal transfer on *growth rates*. However, the impact on growth rates also manifests itself in changes in the end-of-the-period *levels* of respective variables. Table-1 compiles CBO's answers with regard to the statehood controversies both of the first level and of the second level.

Table 1

Level Effects in the CBO Study[4]

Item	*High Growth Baseline*	*Low Growth Baseline*
Change in 936 Capital Stock (%)	-47	-37
Change in 936 Gross Investment (%)	-73	-62
Change in Federal Transfers	$1,345 mln	$1,345 mln
Change in 936 Exports (%)	-43	-33
Change in Unemployment Rate (%)	7	4
Change in no. of unemployed	100,000	50,000
Change in real GP (%)	-15	-10

It is clear from the numbers of the table that the effect of statehood, according to CBO's simulation, proves very negative. The real Gross Product falls by ten percent, and the unemployment rate increases by four percentage points relative to the low-growth baseline scenario.

The main contention of this paper is that these extremely negative numbers were result more of technical limitations of CBO's model than of Puerto Rican economy's inability to adjust to the new situation arising from statehood. We prove this by replicating

[4] The information presented in this table can be found in various places of the CBO report (1990).

CBO statehood experiment using the CGE model. The results we find prove to be much less severe. Puerto Rican economy displays better capability to adjust under the new conditions created by statehood. However, before presenting the exercise itself, it is necessary to describe the structure of the Puerto Rican economy and introduce the model.

3. Structure of the Puerto Rican Economy

The scheme presented in Figure-1 displays the anatomy of the Puerto Rican economy. It shows the interconnections and flows that exist in the Puerto Rican economy. In order to capture these interconnections in a CGE model, one needs to start with identification of the sectors and actors of the economy. The model has been calibrated on the basis of the most recent input-output tables available for Puerto Rico, and these are for 1987. This benchmark may seem old. However, for the purpose of the exercise in this paper, it is rather desirable to have this benchmark. The CBO model was estimated primarily on the basis of data for the 1980's. Hence, having 1987 as the benchmark allows the CGE model to be compatible with the CBO model in terms of underlying data.

Identification of Sectors of the Puerto Rican Economy:

The Puerto Rican input-output tables are presented in terms of *ninety-six* two digit sectors. In order to construct the model, we aggregate these into the following ten sectors.

a) Primary
b) Non 936 manufacturing (N936)
c) 936 manufacturing (M936)
d) Machinery and equipment (ME)
e) Construction
f) Infrastructure
g) Trade
h) Services
i) Tourism
j) Public Administration (PubAd)

The details of the rationale and definition of these sectors and their correspondence to ninety-six sectors of the Puerto Rican input-output tables have been presented elsewhere.[5] Here we just want to draw attention to a few aspects of this classification. First, particular effort has been made to distinguish the 936 part of the Puerto Rican economy. This is done by identifying those two-digit level sectors of the Puerto Rican economy that have more than half of their output coming from 936 firms. All such sectors are manufacturing sectors. Two of these, namely "Machinery, except electrical (35)" and "Electrical and Electronic Machinery (36)" have been combined into the ME sector. This has been done because these sectors supply investment goods, and investment sectors have a special role in a CGE model. The rest of such sectors have been combined in the M936 sector. Thus ME and M936 are the two sectors that represent the 936 part of the Puerto Rican economy. The rest eight sectors form the non-936 part. Of these, "Construction" is another investment sector. Relative importance of various sectors in the Puerto Rican economy is discussed below.

Supply Side of the Sectors

Some information regarding supply side of the Puerto Rican economy is presented in Table-A1. The following aspects may draw our attention. *First* is relative importance of different sectors in the economy. There are generally two types of indicators that can be used for this purpose. One is share of different sectors in aggregate output or *value added*. The second is their share in total *employment*. Since large part of reported value added in 936 sectors is actually transferred to Puerto Rico from mainland as return to intangible investments and assets, shares in output or value added do not accurately reflect different sectors' relative importance in the economy. From this point of view, share in employment and/or labor compensation may be a more satisfactory indicator. Going by employment shares, we see that PubAd sector is the largest, accounting for 23.6 percent of the employed labor force. Next in importance come Service and Trade sectors, each of which accounts for about 20 percent of employment. Of the two 936 sectors, M936 accounts for 10.8 percent of the employed labor, and ME another 3.8. *Second,* looking at value added shares, we see that M936 and ME sectors account for 25.7 and 7.0 percent. These are 2.4

[5] For documentation of the model see Islam (1995a).

and 1.8 times higher than their respective shares in total employment. This indicates that value added shares can be misleading as indicator of importance of 936 sectors in the Puerto Rican economy. Together, 936 sectors account for 15 percent of the economy, as measured by employment, rather than 36 percent, as measured by value added.

Third, some sectors are more intermediate input intensive than other sectors. In the light of the discussion above, we can again focus on input use per unit of *employment* instead of per-unit of output or value added. The relative numbers are provided in Table-A1. We can see that the most intermediate input intensive sector is N936, using an average of $112 thousand worth of intermediate input per worker. The analogous figures for M936 and ME sectors are $81 and $83 thousand, respectively. Thus N936 sector use about 1.4 times more intermediate input per worker than 936 manufacturing sectors. Among non-manufacturing sectors, Construction proves to be the most intermediate input intensive, with a value of $39 thousand per worker. This is followed by Infrastructure ($27 thousand) and Services ($21 thousand). Tourism ($15 thousand) and Trade ($10 thousand) come next. The least intermediate input intensive (per employed worker) sectors are Primary and PubAd sectors.

Fourth, part of the intermediate input is derived from import. Figures on Table-A1 show that sectors vary widely in terms of their *import dependence* for intermediate input too. We find that overall, 39.5 percent of the intermediate input was imported. However, for the manufacturing sectors this share was, as expected, higher, ranging around 50 percent.[6] The share of import in total intermediate input required by M936 and ME is 51.7 and 49.7 respectively. For N936 this share is 49.3, which is only slightly lower.

Demand Side of the Sectors:

Some information regarding demand side of the sectors is provided in Table-A1. Additional information can be seen in Table-A2. The following features may draw our attention. *First,* the sectors vary enormously with regard to export as avenue for disposal of their output. Export accounts for 82 and 81.3 percent of the output of M936 and ME sectors, respectively. This shows that 936 firms operate in Puerto Rico primarily to send

[6] Also note that this share for Tourism sector was even higher, 55.5 percent.

their output back to the mainland. This behavior contrasts with that of the non 936 manufacturing sector. Only 17.2 percent of N936 output goes for export. The role of export is also minimal for many other non-936 sectors. For example, Trade, Services, and Primary sectors export only 1.3, 3.8 and 6.8 percent of their respective gross output. As expected, there is no export from non-tradable sectors such as Construction and PubAd. *Second*, the situation regarding export can be compared with that regarding import. Table-A1 also shows import as percentage of total domestic demand, *Q* (which is domestic output marketed domestically plus imports). Again we find that imports are more important for the 936 sectors, accounting for 72.0 and 63.6 percent of *Q* for M936 and ME, respectively. The analogous figure for N936 is 51.5 percent. This reflects higher import-intensity of intermediate inputs used in 936 sectors. (Note that imports here are inclusive of intermediate inputs.) Imports are also important for the Primary sector (52.7 percent). However, for rest of the sectors import is either nominal or non-existent (as it is expected to be for non-tradable sectors). *Third,* besides exports, other categories of demand are personal consumption (C), investment (I), and consumption by the government (G). Relative importance of these categories of demand for output of different sectors can be seen in Table-A2. Significant difference between the 936 and non-936 manufacturing sectors emerge in this regard as well. As we can see, while 57.3 percent of the gross output of the N936 sector goes for personal consumption, only 22.7 and 4.7 percent of the N936 and ME sectors' output is used for this purpose.

The Actors of the Puerto Rican Economy:

In order to follow the income-expenditure relationships, the model classifies the actors in the Puerto Rican economy into the following categories:

a) Puerto Rican Households (PRH)
b) Puerto Rican Corporations/Business (PRC)
c) Puerto Rican Government (PRG)
d) US (mainland) Corporations/Business (USC)
e) US Federal Government (FED)
f) Non-resident Puerto Ricans (NR).

The following aspects of this classification may be of note. *First* is the importance of non-island actors in the list. This is because reallocation of value added and income in Puerto Rico goes very deep and involves many non-island actors. Without bringing them explicitly into the picture, it is not possible to capture the general equilibrium connections of the economy. *Second,* the distinction between Puerto Rican Corporations (PRC) and mainland US Corporations (USC) is in terms of physical location, not ownership. Thus, a subsidiary of a parent mainland US corporation located in Puerto Rico falls under the category of PRC, while the parent company is identified as USC. All businesses that are under Puerto Rican ownership and located in Puerto Rico are obviously classified as PRC.

Redistribution in the Baseline Data

Tables A3 to A5 give the details of transactions among various actors of the Puerto Rican economy for the benchmark year. These tables are constructed from the viewpoint of the local actors of the Puerto Rican economy, namely Puerto Rican households (PRH), Puerto Rican Corporations/Business (PRC), and the Puerto Rican Government (PRG). These also reveal the process of redistribution of value added among various actors of the Puerto Rican economy. In the following we note some aspects of this process of redistribution.

First, we observe that transfer of value added by the 936 firms from the mainland to the island greatly inflates the contribution of capital to the measured value added of Puerto Rico. As a result, labor and capital are found to be almost equal contributors to the value added in Puerto Rico. Of the total value added of $22,657 million (at factor cost), labor accounts for $10,695 million (i.e., 47.2 percent), and capital for $11,962 million (52.8) percent. We can compare these to that of the mainland USA, where contributions of labor and capital to the value added are about 70 and 30 percent respectively.

Second, from Table-A4 we can see that the investment income repatriated to the mainland parent firms amounts to $7253.3 million, which is 60.6 percent of the total capital income of Puerto Rico for the benchmark year. This causes a large gap between the GP[7] and GDP of Puerto Rico. For the benchmark year, this gap stands at 28 percent of

[7] GP stands for Gross Product, and is similar in definition to GNP (Gross National Product) of an independent country.

GDP and 38 percent of GP. In other words, *transferred profit* of the 936 firms distorts the measurement of the GDP of the island by about 28 percent.

Third, the total amount of capital income in the 936 sectors is $6,049 million, meaning that the repatriated investment income exceeds the total 936 capital income by a factor of 1.2. This is related with the way in which various rules pertaining to repatriation of profit operate. The 936 firms are required to deposit their profits in the local banking system before these profits become eligible for repatriation under commonwealth tax credits. Also, terms of these credits undergo frequent changes. Accordingly, 936-firms decide the most opportune timing for repatriation of the (accumulated) profits in the light of these rules and regulations. This causes the amount of the profit *repatriated* in a particular year not to match exactly to the profit *generated* in that year.

Fourth, looking at the formation of household disposable income (Table-A3), we find that a large part if it is derived from federal transfers. Transfers received from the Federal government amount to $3,661.9 million, which is 25 percent of the household disposable income gross of federal transfer and 34 percent of the same net of the latter. Household income also gets a considerable boost from transfers received from the Puerto Rican government, to the tune of $788.6 million, constituting another 5 percent of total disposable household income and about 8 percent of the same net of federal and Puerto Rican government transfers.

Fifth, a considerable part of the Puerto Rican government's income is also derived from federal transfers. For the benchmark year the figure is $1040.8 million, which constitutes about 19.8 and 24.7 percent of the total PRG income gross and net of federal transfer respectively. To the extent the transfer of PRG to PRH is contingent on the former's getting federal subsidy, this increases the dependence of PRH income on federal subsidies.

External Transactions and Balance of Payments

The figures on trade flows in Table-A6 show that for the benchmark year Puerto Rico has a surplus in merchandise trade with export exceeding import by $2,604 million. This surplus however gets completely wiped out by the huge negative balance on current investment income, leaving Puerto Rico with a deficit of $4,621 million. However, federal

transfers move in to considerably redress the situation. Private transfers also help, the extent of which depends on the way the statistics are interpreted. So that all in all, Puerto Rico ends up with a current account surplus of $1,316.

This is matched by corresponding capital flow. The total amount of capital flowing in is $2,813 million. There are two components to it. In the official Puerto Rican Income-Expenditure accounts (NCPR), one is named as Net Inflow of External Capital (NIEC), and it amounts to $1,697 million. This seems to refer to indirect or portfolio category of investment. The other is named as Errors and Omissions-Balance of Payments (EO-BoP), which stands at $1,116 million, after the adjustment discussed earlier. The amount of capital flowing out is $4,129 million. This results in a capital account deficit of $1,316 million, matching the current account surplus.

Saving-Investment Balance

Next we see how the above external flows square with the aggregate balance of saving and investment. Information on the saving-investment balance is provided in Table-A7. A few comments may be in order. *First,* after necessary adjustments, Puerto Rican household sector posts a modest amount of positive saving. *Second,* the Puerto Rican government accounts display a surplus, which is another interesting, albeit unusual, feature of the Puerto Rican economy. *Third,* total amount of domestic saving thus amounts to $4,617 million. This is further augmented by an external capital inflow of $2,813 million as noted earlier. *Fourth,* a significant amount of saving is sent out in the form of investment overseas. For the benchmark year, this amounts to $4,129, which is about 56 percent of the total available saving and 89 percent of the domestic saving. *Fifth,* the rest of the saving is invested domestically, 93 percent of which goes for fixed investment, with the rest 7 percent for inventory buildup.

The aggregate income expenditure balance, together with the aggregate and sectoral balance between supply and demand finds reflection in the consistent social accounting matrix presented in Table-A9. The input-output table in terms of the ten sectors of the model can be seen in Table-A8.

4. Structure of the Puerto Rican CGE Model

The details of the model are provided in the Appendix. The model is structurally similar to CGE models that have been developed and used earlier by de Melo, Dervis, Devarajan, Lewis, Robinson, Rodrik, and others.[8] A few features of the model that we may draw attention to are following. *First*, since the US dollar is also the currency of Puerto Rico, and since mainland US accounts for lion's share of Puerto Rican export and import, the foreign exchange regime for Puerto Rico can be considered to be one of fixed (*pro rata*) nominal exchange rate. *Second*, two types of capital have been distinguished. One is capital that is mobile and hence can move around sectors responding to differences in sectoral rates of return to capital. This type of capital is referred to simply as "capital." The other type of capital is sector specific and cannot be used in other sectors. We call this kind of capital as Sector Specific Input (SSI). An example of SSI is *land* that is used in the Primary sector. However, the more important example of SSI for the Puerto Rican economy is "intangibles" that are used in 936 manufacturing sectors. These intangibles take the form of patents, licenses, labels, etc. They embody the value created through research in the mainland and transferred to Puerto Rico to be realized. These intangibles are specific to M936 and ME sectors and cannot move to other sectors of the Puerto Rican economy. Sector specific capital inputs earn their sector specific rates of return. *Third*, labor is assumed to be mobile across sectors subject to sectoral wage differentials that exist in the Puerto Rican economy. *Fourth*, the model allows for imperfect substitution between export and domestic disposal on the one hand and between import and domestic demand on the other. *Fifth*, the model allows for labor mobility between the mainland US and Puerto Rico. This is a feature that distinguishes the Puerto Rican economy from many developing economies for which across-border labor mobility is severely limited. Puerto Ricans are however free to move between the mainland and their island as they wish. *Sixth*, we also allow capital to be mobile across border, i.e., between the island and the mainland. All in all, in the base variant of the model, there are 258 equations and an equal number of variables.

[8] See for example Dervis, de Melo, and S. Robinson (1982), Devarajan and de Melo (1987), Devarajan and Lewis (1991), Devarajan and Rodrik (1989a), and Devarajan and Rodrik (1989b).

5. Replication of the CBO Statehood Experiment

Designing the CBO Simulation Experiment

In view of our earlier discussion of the CBO simulation, we design the replication of the CBO experiment in the following way.

a) Reduce 936 capital stock by 37 percent.

b) Reduce 936 exports by 37 percent.

c) Reduce investment flow going into the 936 sectors by 62 percent.

d) Impute the reduction in 936 investment entirely to external capital inflow.

e) Increase the volume of federal transfer by 41 percent.

The CGE model traces through the entire economy the impact of these changes and produces a new equilibrium. The new Social Accounting Matrix (SAM) shown in Table-A10 represents this new equilibrium. Comparing the new equilibrium values of different variables with their values in the base solution, we can gauze the impact of the above changes on the economy.

Highlights of Aggregate Results

We begin by looking at the main aspects of the aggregate results. These are summarized in Table-2. It also reproduces the corresponding CBO results for ready comparison.

Table-2

Comparison of CGE and CBO Aggregate Results

Item	*CBO*	*CGE*
Decrease in Real GP (%)	10.0	3.4
Increase in unemployment rate (%)	4.0	1.3
Increase in the number of people unemployed	50,000	11,000

It is clear from figures of this table that replication of the CBO statehood xperiment using the CGE model produces significantly different results. In general, the consequences of changes stipulated by the CBO do not prove to be as detrimental for the Puerto Rican

economy as was predicted by CBO on the basis of its aggregate macroeconomic model. The decrease in GP proves to be less than half of that predicted by the CBO. Similarly, the increase in the number of people unemployed proves to be in the vicinity of 11,000 rather than of 50,000. This implies that the reduction in the rate of employment that could be expected was about 1.3 percent rather than 4 percent. Clearly, these are much smaller numbers.

Sectoral Results

The important thing is to be able to explain why CGE model yields different results than those by CBO model. In trying to understand CGE results, we may begin by looking at sectoral outcomes. Tables 3 and 4 provide some summary information on the sectoral changes. We may first look at the new equilibrium values of capital in different sectors. Notice that capital stock of the two 936 sectors has undergone a reduction by 37 percent. This is exactly what was stipulated, and this shows that CBO reductions have indeed gone into effect. However, notice that capital stocks of the remaining sectors have increased. For most of the sectors, the increase is modest ranging from one percent to three percent. The construction sector experiences a more substantial increase of about nine percent. (We have deliberately kept capital stock of the government sector fixed, and hence it does not change.) Where is this increase in capital stock of non-936 sectors coming from? As we shall see, this owes to capital flowing from the mainland to non-936 sectors of Puerto Rico because of a rise in the rate of return to capital in these sectors once the CBO reductions go into effect.

However, before further following that lead, we may look at the sectoral results regarding labor employed. These can also be seen Table-3. We note that labor employed in the 936 sectors has decreased by about twenty percent. This is far less than the 37 percent decrease in capital stock. It is clearly a response to substitution possibility between labor and capital. We can see the reflection in results regarding output. Gross output of the 936 sectors falls by about 33 percent, which is less than 37 percent. Going back to labor figures, we also see that labor employed in all non-936 sectors has increased. The increase

range from less than one to a little over four percent for most of the sectors, except for Construction, which again witnesses a large increase of about eleven percent.[9]

The above pattern of movement of sectoral quantities can be pursued further on the basis of information provided in Tables 3 and 4. However, we may now also have a look at movement of sectoral prices. There are many price variables to consider, for example, *PX*, *PV*, *PQ*, *PD*, etc. But, the basic pattern is the same, and it can be most prominently seen from movements of the price of value added, *PV*. We see that *PV* of 936 sectors increases (by about six percent), while it decreases for all the non-936 sectors (by about eleven percent.) Thus one chain of events leading to the overall results has been the following. Sharp decline in capital of 936 sectors led to decline of output of these sectors. Some substitution of labor for capital allowed these sectors to avoid a proportionate decline in output. However, considerable amount of labor was nevertheless released from these sectors, and this released labor sought employment in non-936 sectors. This led to increase in output of these sectors but at the same time depressed their prices. This, however, is just one of the several processes that led to the ultimate outcome. In order to get the full picture, we need to consider several other chains of events.

Another important chain of events can be deciphered by looking at the external trade situation. In the basic variant of the model, the world prices of non-936 sectors are treated fixed. This is because compared to the US mainland's economy, the volume of Puerto Rican exports is relatively small. However, 936 sectors are allowed to have a downward sloping demand curve. This is also necessary to impose the CBO requirement of reducing 936 exports by 37 percent. We cannot control the quantity unless we let the price to be flexible. We can see the consequences by looking at the sectoral export figures. First of all we notice that exports of 936 sectors decrease by 37 percent as required by CBO. Looking at the export prices for these sectors, we see that this decrease has some effect on their export prices though by not too much. The export prices of the non-936 sectors do not change as stipulated. But we have seen above that domestic prices of non-936 sectors feel downward pressure. This makes export more attractive for the producers

[9] Labor employed by the Government sector was kept fixed by design, and hence it does not change. The reason for very large increases in capital and labor employed by the Construction sector possibly lies in very large value of the productivity shift parameter that was obtained for this sector upon calibration. More on this later.

of these sectors. Thus we see significant expansion of export by non-936 tradable sectors. The impact of this pattern of world-versus-domestic price movements can also be seen in the results regarding import. Since world prices are higher than domestic prices, import decreases. Import decreases for M936 too but not to the same extent as its *D*, i.e., the domestically consumed part of its output. The behavior of ME differs from that of M936 because ME is more sensitive to changes in investment demand than M936. This chain of events therefore show us the salutary effect that international trade has on the Puerto Rican economy as it tries to adjust to the shocks imposed by CBO experiment. Again, we see that 936 and non-936 sectors behave differently. Even within these two types, individual sectors responds differently both quantitatively and qualitatively.

Finally, we may look at some aspects of the demand side of sectoral results. This is most clearly revealed by figures regarding consumption demand (*CD*). We see a clear response to changes in relative sectoral prices. Taking advantage of lower prices of non-936 sectors, consumers have increased consumption of the output of these sectors and have cut back their consumption of the output of 936 sectors. A similar pattern of adjustment can be seen with respect to other variables of the demand side. Once again sectoral differences come out sharply.

However, not all changes can be understood at the level of the sectoral results. For example, on the supply side we do not yet have answer to such questions as follows:

(a) How was total supply of capital stock for non-936 sectors determined?
(b) How was total labor supply determined?

On the demand side, we have not yet answered such questions as:

(a) How was total consumption demand determined?
(b) How was the total investment demand determined?

In order to answer these questions, we need to look at the details of the aggregate results.

Details of the Aggregate Results:

Some details of the aggregate results are presented in Table-4. At the outset, we may take note of movement of the price index variable, *PINDEX*, which is a deflator relative to the baseline. Note that the baseline value of *PINDEX* is unity. In our perusal of sectoral results above, we saw that most of the sectoral prices declined. It is therefore expected that *PINDEX* will also fall, and we actually see a decrease in *PINDEX* by about six percent.[10] What this means is that movements of variables will be much muted in real terms than they are in nominal terms.

We may first look at changes in the aggregate values of capital and labor. Looking at *CAP936* and *SSI936* we once again see the 37 percent reduction in 936 capital stock. On the other hand *KST936GN* shows that aggregate capital stock of the non-936 sectors (excluding PubAd) has increased by a modest 1.43 percent as a result of mainland capital flowing into these sectors in response to higher rate of return. Earlier, we saw how this increased capital was distributed across these sectors.

The variable *LAB936* shows that total labor employed by the 936 sectors has decreased by 19.4 percent. On the other hand, we see that total labor employed by non-936 sectrors has *increased* by about 1.9 percent. Since, labor is mobile across all sectors, including both 936 and non-936, the drastic fall in 936 capital stock cannot but affect its overall position. New inflow of mainland capital into 936 sectors cannot offset the 936 reduction, and therefore as whole Puerto Rican labor has less capital to work with than before. This finds reflection in lower marginal productivity and hence lower real wage. *ARWAGE* shows that average real wage in the Puerto Rico falls by about five percent. This also explains why the total labor employed in the Puerto Rican economy fails to increase despite possibility of labor migration between the island and the mainland.

These movements find reflection in total income of capital and labor. We see that for the economy as a whole labor income (*LABINC*) falls by 12.4 percent and capital

[10] In a usual small economy case, *PINDEX* variable has two other interpretations. In such an economy world prices of *all* tradables are usually assumed to be given. Hence PINDEX can also serve as a ratio of world to domestic price levels. Alternatively, it can also serve as a ratio of prices of tradables to prices of non-tradables. In our base variant of the model, we have allowed the 936 sectors to have downward sloping demand curve for their exports. Hence, the above interpretations may hold exactly. However, to the extent that even a 37 percent reduction in 936 exports did not move the world export prices by that much, these two interpretations can also apply, at least as a close approximation.

income (*CAPINC*) by 18.2 percent. The decrease is sharper for 936 sectors. Both labor and capital income in these sectors together decrease by about 29 percent.

Why is then the we saw the overall decline of real GP to be only about four percent? There are several other processes that we need to consider to understand this outcome. The simplest of these is increase in federal transfer. Recall that according to CBO, statehood would imply a net increase in federal transfer by about $1.4 billion, which is about 41 percent of the baseline value. This increase is reflected in the aggregate variable *FEDTRANS*. These increased federal transfer cushion Puerto Rican personal and Puerto Rican Commonwealth government income from sharp fall. In fact, on the whole, in real terms, aggregate personal consumption increases by about 3.9 percent. The Puerto Rican government income in nominal terms falls, but in real terms government consumption remains almost unchanged.

The second process to consider is repatriation of investment income by 936 companies. As we mentioned before, the baseline data shows that 936 firms were repatriating 1.2 times of their capital income in that year. This means that as capital income of 936-firms falls as a result of CBO shocks, the amount of their repatriated investment income falls even more, resulting in a rather increase of corporate saving. The variable *FSAV* denotes the investment flow from the mainland to Puerto Rico. Note that this is different from flow of capital stock that we considered earlier. Unlike capital stock, investment flow does not have *supply*-augmenting effect during the period considered by the model. The effect of investment flows remains limited to augmentation of investment *demand*. We see that *FSAV* undergoes a reduction by about 25 percent. This is a reflection of the CBO shock of 62 percent decline in 936 investment. However, because of the increase in corporate saving, the overall domestic saving does not decline, at least in nominal terms. Investment in inventory change is modeled as proportional to gross output. Much of inventory investment in the base year was accounted by the 936 sectors. Since gross output of 936 sectors falls, investment in inventory build up rather declines. This frees up more resources for fixed investment, and thus we see about ten percent increase in investment demand for most of the sectors. This also protects aggregate demand from severe fall.

It is possible to argue here that the more-than-proportionate rate of transfer of investment income by the 936 firms is a phenomenon that is specific for a particular year and is not sustainable in the long run. Hence, results based on this transient feature may not be very robust. This is a valid argument. As this model is improved in future, it will be desirable to ground the model as much as possible on *average* relationship that are expected to prevail over sustained period of time rather than on relationship that hold in a *particular* (base) year. Having said that, we can ask the question, would our result change dramatically if this "more than proportionate" rate of repatriation was removed? Our answer is no. The reason for this is that the base year of 1987 was also characterized by another "more than proportionate feature." That relates to the investment flowing out of Puerto Rico as a proportion of total domestic saving. That relationship remains embedded in the baseline data although in this version of the model we have tried to express it in a different way. This is another relationship that is not sustainable in the very long run. Thus if average relationships are substituted for the base-year specific relationships for both these flows, they roughly cancel each other out, and the overall results still remain in the vicinity of what has been presented above.

Apart from the issue above, CGE results depends considerably on the parameter values assumed. In assigning values to the parameter, the general policy was to be data-dependent as much as possible. Unfortunately econometric analyses of various aspects of the Puerto Rican economy are still limited. Thus there are not too many parameter estimates that are available in the Puerto Rican economic literature. Thus in many cases we had to rely on assumed parameter values

6. Conclusions

The overall conclusion therefore is that CBO's earlier results regarding economic consequences of statehood for Puerto Rico are somewhat misleading. The main reason that CBO got exaggerated negative effects of stipulated reduction in 936 capital stock and investment (accompanied by some increase in federal transfer) lies in technical limitations of the model that it used for this purpose. CBO's macro model did not allow for sectoral disaggregation and price flexibility. But, in reality different sectors of the economy differ with regard to their labor, capital, and intermediate input requirements and substitution possibilities, their export and import intensity, their contribution to meeting demands of consumption, investment, and government purchase. They differ with respect to the ownership pattern, which then determines the ultimate destination of the value created in the sector. They differ with respect to the wages to be paid and the price of the capital goods required for investment in them. Because of all these differences, it is only natural that different sectors will respond differently to a particular policy change. A particular sector’s optimal response will depend on its unique circumstances, and to the extent these circumstances differ, the responses of various sectors will not be the same. Also, the response will be not only in terms of quantities, but also in the form of adjustment of prices. The macro model of the CBO did not allow for responses both in prices and quantities and differences in them across the sectors. The CGE model is more equipped to do that. The results show that when sectoral differences are allowed and both prices and quantities are allowed to change, the Puerto Rican economy adjusts much better to the adverse shocks that CBO thought statehood would entail. Finally, there is also the issue of countervailing measures that the Puerto Rico could undertake in response to the CBO shocks. Preliminary results from experiments incorporating such countervailing measures show that Puerto Rico can go a long way in overcoming the negative consequences and turn many things into positive. But that is a subject for future work.

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Table-A1

Sectors of the Puerto Rican Economy: Supply Side

Sectors	*Gross output (X)*	*Share in X (%)*	*Value Added (VA)*	*Share in VA (%)*	*Total employ-ment (L) (000)*	*Share in L (%)*	*Imported int input as % of total int. input*	*Export as % of gross output X*	*Import as % of total dom. Demand Q*	*Int. input per worker ($000)*
Prim	703	1.4	437	1.7	36	4.2	35.3	6.8	52.7	7.39
N936	4398	8.7	914	3.5	31	3.6	49.3	17.2	51.5	112.39
M936	14278	28.3	6766	25.7	93	10.8	51.7	82.0	72.0	80.77
ME	4574	9.1	1830	7.0	33	3.8	49.7	81.3	63.6	83.15
Cons	2083	4.1	425	1.6	43	5.0	39.0			38.56
Infra	3493	6.9	2037	7.7	54	6.3	27.5	16.0	14.1	26.96
Trade	5503	10.9	3802	14.5	165	19.1	18.2	1.3		10.31
Serv	9457	18.7	5905	22.5	168	19.5	17.1	3.8	14.9	21.14
Tour	1586	3.1	1045	4.0	36	4.2	55.5	16.2	4.3	15.03
PubAd	4400	8.7	3124	11.9	204	23.6	17.4			6.35

Total	50475	100.0	26285	100.0	863	100.0	39.5	34.6	30.5	

Table-A2

Sectors of the Puerto Rican Economy: Demand Side

Sectors	*Personal Consumption (C) mln $*	*Investment (I) mln $*	*Govt consumption (G) mln $*	*Exports (E) mln $*	*Total int. demand, mln $*	*Imports (M) mln $*	*Total dom. absorption (Q) mln $*	*Domestic supply for dom market (D) mln $*	*Consumption as share of gross output (C/X)*	*Investment as share of gross output (I/X)*	*Government demand as share of gross ourput (G/X)*
Prim	301	33	0	48	1051	730	1385	655	0.428	0.047	0.000
N936	2522	139	0	755	4852	3870	7513	3643	0.573	0.032	0.000
M936	3240	362	0	11701	5600	6625	9202	2577	0.227	0.025	0.000
ME	217	580	0	3718	1557	1498	2354	856	0.047	0.127	0.000
Cons	0	1648	0	0	435	0	2083	2083	0.000	0.791	0.000
Infra	1227	46	0	551	2153	484	3426	2942	0.351	0.013	0.000
Trade	3180	436	0	69	1818	0	5434	5434	0.578	0.079	0.000
Serv	5081	57	0	360	5548	1589	10686	9097	0.537	0.006	0.000
Tour	440	0	0	257	948	59	1388	1329	0.277	0.000	0.000
PubAd	181	0	3991	0	228	0	5285	5285	0.041	0.000	0.907

Total	16389	3301	3991	17459	24190	14855	48756	33901	0.325	0.065	0.079

Table-A3

Income-Expenditure Flows of the Puerto Rican Households (PRH)

Item	Adjusted
Labor Income	10,695.0
Transactions between PRH and PRC	
Income from unincorporated enterprises	1,067.6
Rental income of persons	849.4
Net interest	310.6
Business transfers	196.0
Dividend paid to residents	46.4
PRHBPRC	*2,470.0*
Transactions between PRH and PRG	
Personal taxes and fees	-1,043.5
SS payments (employers' contribution)	-599.6
SS payments (employees' contribution)	-181.2
Transfers received	788.6
Interest paid	-432.8
Interest received	97.4
PRHBPRG	*-1,371.1*

Transactions between PRH and the FED	
Passport fees paid to the Fed	-1.4
SS payments (employers' contribution)	-540.1
SS payments (employees' contribution)	-543.3
Transfers received from Fed	3,661.9
Transfers received from the US State govts.	15.3
PRHBFED	*2,592.4*
Transactions between PRH and USC	
Dividends received as stock holders	1.9
Dividends received as life insurance policy holders	18.5
PRHBUSC	*20.4*
Transactions between PRH and PNR	
Transfers from Non-residents	2472.4
Remittances sent abroad	-74.4
PRHBPNR	*2,398.0*
Total household income	16,804.0
Personal consumption	16,398.0
Household saving	415.0

Table-A4

Income-Expenditure Flows of the Puerto Rican Business (PRC)

Item	Adjusted
Capital Income	
Profits/Rents/Interests	11,962.0
Business transfers	196.0
Subsidies	-314.0
Sub-total	11,844.0
Transactions between PRC and PRH	
Income from unincorporated enterprises	-1067.6
Rental income of persons	-849.4
Net interest	-310.6
Business transfers	-196.0
Dividends paid to the residents	-46.4
PRCBPRH	*-2470.0*
Transactions between PRC and PRG	
Subsidies received from PR govt.	245.1
Corporate tax paid	-731.7
Income tax on dividend withheld at source	-12.4

Profit of public corporations	-285.4
Value of depreciation of PubAd sector returned to PRG	*-885.0*
PRCBPRG	*-1,669.0*
Transactions between PRC and FED	
Subsidies received	69.8
PRCBFED	*69.8*
Transactions between PRC and USC	
Repatriated profit on direct investments	-7253.3
Dividends received by corporations	8.3
PRCBUSC	*7,245.0*
Transactions between PRC and PNR	
Income tax withheld at source on dividends	12.4
Dividends paid to non-residents	-6.8
PRCBPNR	*5.6*
Retained income by PRC	536.0
Depreciation	2,683.0
Gross saving by PRC	3,219.0

Table-A5

Income-Expenditure Flows of the Puerto Rican Government (PRG)

Item	Adjusted
Direct Income of the PRG	
Indirect business tax	1948.0
Transactions between PRG and PRH	
Personal taxes and fees	1043.5
SS payments (employers' contribution)	599.6
SS payments (employees' contribution)	181.2
Transfers paid	-788.6
Interest paid	-97.4
Interest received	432.8
PRGBPRH	
Transactions between PRG and PRC	
Subsidies paid	-245.1
Corporate tax received	731.7
Payment of income tax on dividend withheld at source	12.4
Profit of public corporations	285.4
Depreciation of capital of the PubAd sector returned	885.0

PRGBPRC	1,669.0
Transactions between PRG and USC	
No transactions	0
PRGBUSC	*0*
Transactions between PRG and FED	
Toll gate tax returned to PRG	120.4
Indirect tax handed over to Fed	-13.6
Transfers received	1040.8
Transfers paid	-181.1
PRGBFED	*966.5*
Transactions between PRG and PNR	
Interest received	41.8
Interest paid	-187.6
Transfers paid	-4.3
Transfers received	0.7
Personal taxes received	53.0
PRGBPNR	*-96.4*
Total PRG income	5,859.0
Government expenditures	4,876.0
PR Government saving	983.0

Table- A6

External Transactions of Puerto Rico

Item	Adjusted
Current Account	
Trade Flows	
Export	17,460
Import	14,856
Balance	2,604
Factor Income Flows	
Capital	
PRHBUSC	20
PRCBUSC	-7,245
PRGBUSC	0
Balance	-7,225
Labor	
PRHBPNR	2,398
PRCBPNR	6

PRGBPNR	-96
Balance	2,308
Unilateral Transfers	
PRHBFED	2,592
PRCBFED	70
PRGBFED	967
Balance	3,629
Current Account Balance	13,16
Capital Account	
External Capital Inflow	2,813
NIEC	1,697
EO-BoP	1,116
Capital Outflow	4,129
Capital Account Balance	-1,316

Table-A7

Aggregate Balance and Balance of Payments

Item	Adjusted	Adjusted
PRH		
Household Disposable Income	16,804	16,804
Household Consumption	16,389	16,389
Household Saving	415	415
PRC		
Undistributed Profits	536	536
Depreciation	2863	2683
Gross Business Saving	3,219	3,219
PRG		
Total PRG Income	5,859	5,859
Govt. Consumption	4,876	4,876
Government Saving	983	983
Total Domestic Saving	4,617	4,617

External Savings	2,813	2,813
Net Inflow of External Capital	1,697	1,697
EO-BoP	1,116	1,116
Total Available Saving	7,430	7,430
Investment in the Island	3,301	3,301
Change in Inventories	245	245
Fixed Investment	3,056	3,056
Investment overseas	4,129	4,129
Total Investment	7,430	7,430

Table-A9

Social Accounting Matrix of Puerto Rico

	Act	*Com*	*Lab*	*Cap*	*PRH*	*PRC*	*PRG*	*Kac*	*PNR*	*USC*	*Fed*	*Row*	*Tot*
Act		33,901										17,459	51,360
Com	24,190				16,389		4,876	3,301					48,756
Lab	10,695												10,695
Cap	14,527												14,527
PRH			10,695			2,470		-415	2,398	20	2,592		17,760
PRC				14,527					6		70		14,603
PRG	1,948				1,371	1,669					967		5,955
Kac						3,219	983					2,813	7,015
PNR							96					2,308	2,404
USC						7,245							7,245
Fed												3,629	3,629
Row		14,855						4,129		7,225			26,209
Tot	51,360	48,756	10,695	14,527	17,760	14,603	5,955	7,015	2,404	7,245	3,629	26,209	

Table-3

Sectoral Results of the CBO Replication Experiment: Supply Side
(Percent change, except for *E/D* and *Rho*)

Sector	*X*	*LD*	*KD*	*PD*	*D*	*E*	*E/D*	*Rho*	*PX*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Prim	2.4	4.0	3.1	-7.8	2.0	8.8		0.8	-7.2
N936	1.7	2.1	1.2	-7.1	-0.1	9.9		1.3	-5.9
M936	-33.3	-19.6	-37.0	3.4	-18.6	-37.0		1.3	1.0
ME	-32.5	-18.9	-37.0	-1.2	-15.3	-37.0		1.3	-0.2
Cons	10.6	11.0	9.2	-6.4	10.7				-6.4
Infra	1.6	1.9	1.3	-11.7	-0.2	10.3		0.8	-9.8
Trade	1.2	1.3	1.1	-10.8	1.1	5.9		0.4	-10.6
Serv	1.8	2.1	1.7	-10.7	1.2	17.2		1.3	-10.3
Tour	0.4	0.6	0.3	-11.9	-1.4	9.0		0.8	-9.9
Pubad				-6.5					-6.5

Table-4

Sectoral Results of the CBO Replication Experiment: Demand Side
(Percent change, except for M/D)

Sector *(1)*	*PQ* *(2)*	*M* *(3)*	*M/D* *(4)*	*CD* *(5)*	*II* *(6)*	*ICD* *(7)*	*FID* *(8)*	*DK* *(9)*	*Pint* *(10)*	*PK* *(11)*	*PV* *(12)*	*Pssi* *(14)*
Prim	-3.8	-4.4		0.7	-2.4	0.4	10.3		-1.7	-5.3	-10.7	-8.6
N936	-3.5	-9.3		0.4	-8.0	1.0	10.3		-4.4	-5.2	-11.7	
M936	0.9	-15.0		-4.0	-23.9	-29.2	10.3	-60.1	-3.3	-5.0	6.2	12.3
ME	-0.5	-16.7		-2.7	-21.4	-28.9	-5.1	-59.9	-4.0	-5.3	5.7	13.1
Cons	-6.4				-6.5		15.2		-5.1	-4.6	-11.8	
Infra	-10.1	-9.6		7.8	-7.2		10.3		-7.1	-5.8	-11.8	
Trade	-10.8			8.6	-14.0		10.3		-8.4	-5.9	-12.0	
Serv	-9.2	-12.7		6.7	-8.2		10.3		-7.8	-5.7	-12.0	
Tour	-11.4	-10.9		9.3	-7.1				-6.2	-5.8	-12.0	
Pubad	-6.5			3.6	-2.4				-6.8	-6.1	-6.4	

Table-A5

Aggregate Results of the CBO Replication Experiment

Variable	*Base*	*Expmnt*	*Change (%)*
Exchange Rate	1.000	1.000	
Price Index	1.000	0.936	-6.397
Capital Employed	93.408	93.181	-0.242
Capital Employed, 936 sectors	2.775	1.748	-37.000
Capital Employed, Non 936 sectors	90.632	91.433	0.883
Labor Employed	0.863	0.852	-1.248
Labor Employed, 936 sectors	0.126	0.109	-13.576
Labor Employed, Non 936 sectors	0.737	0.751	1.853
Capital Income	14.527	11.890	-18.151
Capital Income, 936 sectors	6.193	4.388	-29.151
Labor Income	10.695	9.371	-12.378
Labor Income, 936 sectors	1.926	1.365	-29.127
Indirect Tax	1.948	1.659	-14.859
PRH Balance with PRC	2.470	2.022	-18.151
PRH Balance with PRG	-1.371	-1.186	-13.461
PRH Balance with Fed	2.592	3.655	41.000
PRH Balance with USC			
PRH Balance with PNR			
PRC Balance with PRG	-1.669	-1.366	-18.151
PRC Balance with USC	-7.245	-5.133	-29.151
PRC Balance with Fed	0.070	0.099	41.000
PRC Balance with PNR			
PRG Balance with Fed	0.967	1.363	41.000
PRG Balance with USC			
PRG Balance with PNR			
Federal Transfer	3.629	5.117	41.000
Net Investment Income	-7.225	-5.113	-29.231
Non Resident Transfer	2.308	2.308	
Household Income	16.804	16.279	-3.123
Consumption, Real	16.389	17.023	3.868
Consumption, Nominal	16.389	15.877	-3.123
Household Saving	0.415	0.402	-3.123
PR Govt. Revenue	5.859	5.479	-6.494
PR Govt. Consumption, Real	4.876	4.875	-0.020
PR Govt. Consumption, Nominal			
PR Govt. Saving	0.983	0.919	-6.494
PR Corporate Saving	3.219	3.474	7.926

Table-A5 (continued)

Aggregate Results of the CBO Replication Experiment

Variable	*Base*	*Expmnt*	*Change (%)*
Domestic Saving	4.617	4.795	-3.863
External Saving	2.813	2.118	-24.723
Domestic Investment	3.301	3.372	2.151
Investment Abroad	4.129	4.289	3.863
Inventory Investment	0.245	0.198	-19.284
Fixed Investment	3.056	3.182	4.119
Fixed Investment, 936 sectors			
Fixed Investment, Non 936 sectors	1.935		
Average Nominal Wage	12.393	10.996	-11.270
Average Real Wage	12.393	11.745	-5.225
Average Nominal Rental Rate	0.130		
Average Real Rental Rate	0.130		
Exports, Nominal	17.459	12.070	-30.869
Imports, Nominal	14.855	12.966	-12.718
Real GDP	27.170	24.482	-9.894
Real GP	22.343	21.582	-3.408