# Macroeconomic Effects of Interest Rate Liberalization: The Case of Turkey

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**Abstract:** This study proposes a financial computable general equilibrium (CGE) model, which represents the salient features of the Turkish economy. By including 15 production sectors and linking the real and financial sub-models through various channels of fund flows, interest rates, commercial bank intermediation, monetary and fiscal policies, we perform a counterfactual simulation using the financial CGE model to explore the potential macroeconomic effects of interest rate liberalization in the Turkish economy. Our results show that interest rate liberalization makes the government and the enterprises suffer a revenue loss, but households slightly and commercial banks notably revenue raise in both the short and long run. In addition, while the real GNP declines in the short run, it increases in the long run after the wage level has been adjusted fully and the employment effect has been eliminated.

**Keywords:** Interest Rate Liberalization, the Turkish Economy, Financial Computable General Equilibrium

## Introduction

It is a well known fact that 1980's witnessed liberalization movements all over the world. In line with this wave, the Turkish economy also launched and implemented the structural adjustment and liberalization program starting at the beginning of 1980 and achieved a notable improvement. The main purpose of this program was to increase the role of market mechanism in the allocation of resource by opening up the economy and reducing the state's role in the economic activities and transforming the distressed financial structure into a market-based system by aiming the commercialization of the banks, creation of more competition, liberalization of interest rate, central bank independence, development of monetary policy framework, liberalization of international trade and capital movement.

Prior to 1980 structural adjustment and liberalization program, direct control methods were used in macroeconomic management and resulted in relatively large fluctuations in the economy, the state-owned enterprises became loss-making and relied on subsidized bank loans to keep operating, and the state–owned bank credits were allocated to the state policies rather than market principles.

As a result of those economic policies, the Turkish economy had the following facts;

• Interest rates control by the state: In contrast with the case of assuming functioning markets, controlled interest rate becomes insensitive to market fluctuations and the allocation of credits become inefficient.

• An over-concentrated financial system: The state banks made loans according to the government policy rather than the market principles. Thus, while the state-owned sectors take a larger portion of the bank credits and investment resources, their output growth is slower than that of the non-state sectors.

• *Bank-enterprises debt problem:* Due to the difficult situation of the state-owned enterprises, the objective of the government became to keep the state-owned sector going. Otherwise, the disturbance on the economy and the increase in unemployment could pose a threat to social stability. Thus, of the state-owned banks is deeply affected by the condition of state-owned enterprises.

In this study, we focus on the first problem mentioned above and try to see what happens if interest rate is not controlled by the state rather it is determined by the market forces. Thus, the main purpose of this study is to explore the potential macroeconomic effects of interest rate liberalization in the Turkish economy.

A computable general equilibrium (CGE) model, which mirrors the salient features of the Turkish economy with a financial sector, is formulated. In the model, the economy initially adopts a fixed interest rate regime, and then the fixed interest rate regime is liberalized to observe the potential macroeconomic impacts and the effects of freeing interest rate on economic agents.

The plan of the paper is as follows: Section 2 provides literature review and data requirements of the model including parameter estimations. Model specifications are explained in detail in section 3. Finally, section 4 offers the simulation results.

### Literature Review and Data Requirements of the Model

More than two decades applied general equilibrium models, also known as computable general equilibrium (CGE) models, have been used to study the effects of taxes, tariffs and other policies. A number of CGE models have been previously used for the Turkish economy. Those are Dervis, De Melo, and Robinson (1982), Grais, De Melo, and Urata (1986), Lewis and Urata (1983, 1984), and Yeldan (1989, 1990). They worked on a wide range of policy concern over the impact of macro stabilization, trade policy and structural changes on various aspects of the Turkish economy such as poverty, income distribution and economic growth.

Besides the studies on poverty, income distribution and economic growth, financial CGE models were also formulated for the Turkish economy to investigate the financial policy issues. Lewis (1994) constructed a financial CGE model to demonstrate that financial liberalization through interest rate reform usually does not increase fixed investment much, since deposit rate increases are often matched by borrowing rate increases. Yeldan's (1997) model tries to investigate the effects of Turkish financial liberalization reforms on the real economy. Tunc (1998) analyzes the interactions between real and financial sectors of the Turkish economy.

There is a consensus among the CGE modelers that the data set that meets those requirements is the Social Accounting Matrix (SAM), which provides the most comprehensive and consistent data for creation of any CGE model. In other words, the most important part of the data required in CGE models is attained by constructing the SAM. Incorporation of the financial sector into the CGE model requires a financial SAM for the base year by using various financial data such as balance sheets of monetary institutions, sectoral capital stocks, and sectoral bank loan data. The financial SAM we used in this study is a slightly modified version of Tunc (1998).

Every agent's behavior embodied in the CGE model is reflected by the parameters, especially slope coefficients, and the specification of equations. We mostly used the parameter values estimated by Yeldan (1997).

## **Financial CGE Model for Turkey**

We assume that production sector produces according to constant returns to scale production function. We further assume that the labor market is neo-classical. Capital stock is sector-specific and fixed in the shortrun. Then, the production function can be written, in general form, as:

$$XD_{i}(L_{i}, K_{i}, V_{ii}) = \min\{(1/a_{0i}) \lor A_{i}(L_{i}, K_{i}), (V_{1i}/a_{1i}), (V_{ii}/a_{ii})\}$$
(1)

where  $(XD_i)$  is output of production sector i,  $(a_{0i})$  is the value-added requirement per unit of sectoral output, (VA<sub>i</sub> (L<sub>i</sub>,K<sub>i</sub>)) is value-added, (L<sub>i</sub>) is labor input by sector in number of persons, and (K<sub>i</sub>) is capital stock by sector., (V<sub>ji</sub>) is the physical quantity of intermediate input from sector j to sector i (i,j=1,2,3,...15), and  $(a_{ji})$ represents the fixed input-output coefficients.

Value added in each sector is produced using two primary factors of production, labor (L) and capital (K) according to constant returns to scale Cobb-Douglas production function:

$$VA_i = \alpha_i L_i^{\beta i} * K_i^{1-\beta i}$$
<sup>(2)</sup>

where  $(\alpha_I)$  is a constant, which represents the production function shift parameter of gross domestic output,  $(\beta_i)$  is production function share parameter of labor,  $(1-\beta_i)$  is production function share parameter of capital. In other words, sectoral domestic output  $(XD_i)$  is determined by Cobb-Douglas production function with labor and capital.

$$XD_i = \alpha_i * L_i^{\beta_i} * K_i^{1-\beta_i}$$
<sup>(3)</sup>

Given the Cobb-Douglas production function and the profit-maximization assumption about the enterprises, the share of each input in the value of output will be equal to the elasticity of output with respect to the input concerned. This relationship is used to obtain the values of  $\beta_i$  by substituting the cost (the value-added) of labor from the input-output table into the labor demand equations.

Labor demand (LD<sub>i</sub>) is derived from the first-order condition of the production function where the value of marginal product is equal to the price of labor.

$$LD_i = XD_i \left[ (\beta_i * PV_i) / (WL * wfdist) \right]$$
<sup>(4)</sup>

where  $(PV_i)$  is value added or net price, (WL) is average wage level, (wfdist) is variable labor market distortion parameter. The parameter of (wfdist) allows for labor market distortions and wages in different sectors to deviate from the average wage. Labor market closure rule applies to the labor supply specifications. We assume that labor wages are free to adjust to maintain full employment given a fixed total labor supply, which is a classical closure.

$$L = \Sigma L D_i \tag{5}$$

However, wages are rigid in the short-run and will only partially adjust, which is a Keynesian closure. The average nominal wage level relies on the change in real GNP and the price inflation, and employment varies negatively with the real wage level.

$$WL = WL_{t-1} * [\omega_0 + \omega_1 * (RGNP/RGNP_{t-1}) + \omega_2 * (1 + PINF)]$$
(6)

where  $(WL_{t-1})$  is average wage level of last period,  $(\omega_0)$  is constant term of wage equation,  $(\omega_1)$  and  $(\omega_2)$  are parameters of wage equation, (RGNP) is real gross national product, (RGNP<sub>t-1</sub>) is the real gross national product of last period, and (PINF) is inflation rate.

GNP deflator is used for general price index (PLEV) for the economy. Then, PLEV is equal to nominal gross national product or value added in market prices (GNPVA) divided by real gross national product (RGNP).

(7)

$$PLEV = GNPVA / RGNP$$

The price inflation rate (PINF) is computed as general price index this year divided by general price index last year minus 1. Given that money is used as the numeraire, price changes are obviously absolute changes (not relative changes as in the real CGE models), and we can examine the price inflation directly from the price level changes. If price level change is negative (positive), we can subtract (add) it from (to) the last year price inflation rate to find this year price inflation rate

Household demand for goods ( $C_i$ ) is a linear expenditure system and equal to the total value of household consumption ( $CON_{hh}$ ) times households consumption expenditure share ( $cles_{i,hh}$ ) divided by composite (domestic and imported) good price ( $PQ_i$ );

$$C_i = \left( \sum cles_{i,hh} * CON_{hh} \right) / PQ_i \tag{8}$$

The total value of household consumption (CON<sub>hh</sub>) is determined by household nominal income (YH<sub>hh</sub>) modified by household income tax (htax<sub>hh</sub>) and household savings rate (SAV<sub>hh</sub>);

$$CON_{hh} = YH_{hh} * (1 - htax_{hh}) * (1 - SAV_{hh})$$

$$\tag{9}$$

Government demand for final goods is defined through multiplying a set of fixed shares, government expenditure share (gles<sub>i</sub>), with aggregate real government spending (gexp).

$$G_i = (gles_i * gexp * PLEV) / PQ_i$$
<sup>(10)</sup>

Households income comes from labor earnings (LY<sub>hh</sub>), the foreign remittance (RMT) and government transfer ( $GT_{hh,g}$ ), price subsidies ( $SUB_{hh,g}$ ). In addition, households keep financial assets, and receive interest on enterprise bond ( $IEB_{h,ep}$ ), and bank deposits ( $IBD_{hh,b}$ ).

$$Y_{hh} = LY_{hh} + RMT * ER + SUB_{hh,g} + IEB_{h,ep} + IBD_{hh,b} + GT_{hh,g}$$
(11)

Households pay part of their total income  $(Y_{hh})$  as income tax at the rate of  $(t_{hh})$  to the government.

$$T_{hh} = t_{hh} * Y_{hh} \tag{12}$$

The leftover will be the household's net income. That net income is divided between consumption and saving.

The total amount of household savings depends on the total income as well as the savings rate  $(s_{hh})$ , which has positive relation with the average real rate of return of investment.

$$s_{hh} = k_{hh} \left( irc_{hh} - infr \right) \tag{13}$$

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where  $(k_{hh})$  is a parameter that measures the responsiveness of the household savings rate to a change in the average real rate of return,  $(irc_{hh})$  is a composite interest rate determined as a weighted average rate of return of financial assets-treasury bonds, enterprise bonds and time deposits, and (infr) is price inflation. After netting the price inflation out, we reach the real rate of investment return ( $irc_{hh} - infr$ ). Households now decide how much they will save or consume by considering the rates of return of various investment opportunities.

The total amount of savings in the current period is obtained by multiplying the savings rate with the total net income. Then it is allocated among different savings options: money demand for transactions and other purposes ( $MD_{hh}$ ), financial assets; enterprise bonds ( $EB_{hh}$ ), time deposits ( $TD_{hh}$ ), and housing investment, computed as a fixed share (house<sub>hh</sub>) of the savings.

$$S_{hh} = s_{hh} Y_{hh} = MD_{hh} + EB_{hh} + TD_{hh} + house_{hh}$$
(14)

The household demand for money is a transaction-based interest-elastic money demand function.

$$MD_{hh} = \lambda_{hh} * Y_{hh} * (1 + ir - infr)^{-\eta}$$
(15)

where  $(\lambda_{hh})$  is money transaction demand factor, (ir) is interest rate, and  $(\eta)$  is interest elasticity of money demand.

The function gives the current period stock of money demanded by household,  $(MD_{hh})$ . Money demand consists of currency and demand deposits. Currency deposits  $(CD_{hh})$  and demand deposits  $(DD_{hh})$  take up fixed proportions of the total money demand.

$$CD_{hh} = cs_{hh} * MD_{hh}$$

$$DD_{hh} = (1 - cs_{hh}) * MD_{hh}$$

$$(16)$$

$$(17)$$

where  $(cs_{hh})$  is proportion of money held as currency by households.

By subtracting the last period's stocks of currency and demand deposits from the current stocks, we get the changes in currency and demand deposits.

$$\Delta CD_{hh} = CD_{hh} - CD_{hh, t-1}$$

$$\Delta DD_{hh} = DD_{hh} - DD_{hh, t-1}$$
(18)
(19)

If we sum both up, we get the change in money demand  $(\Delta MD_{hh})$  that is part of the household savings.

$$\Delta M D_{hh} = \Delta C D_{hh} + \Delta D D_{hh} \tag{20}$$

Income of enterprises mainly comes from participation in the production of goods and services  $(XD_i*PX_i)$ . In addition, enterprises own deposits and treasury bonds so that they get interest on enterprise deposits  $(IBD_{ep,b})$ , interest on treasury bonds  $(ITB_{ep,g})$ . Enterprises get the transfer from government  $(GT_{ep,g})$  as well.

On the other hand, enterprises spend on the provision of goods and services ( $epe_{gs}$ ) and fixed investment ( $epe_{fi}$ ). Moreover, since enterprises borrow funds from other economic institutions through bank loans and issuing of enterprise bonds, they have to pay interest to households ( $IEB_{h,ep}$ ) and commercial banks ( $IBL_{b,ep}$ ). Thus, the income equation of enterprises will become as follows;

$$Y_{ep} = (XD_i * PX_i) + IBD_{ep,b} + ITB_{ep,g} + GT_{ep,g} + SUB_{ep,g} - (epe_{gs} + epe_{fi}) * PL - IEB_{h,ep} - IBL_{b,ep}$$
(21)

Enterprises pay income tax (T<sub>ep</sub>) to the government with the proportion of their income.

$$T_{ep} = t_{ep} * (Y_{ep} - \delta K_{ep}) \tag{22}$$

where  $(t_{ep})$  enterprise income tax rate, ( $\delta$ ) is capital depreciation rate, and  $(K_{ep})$  is capital stock of enterprises.

Deducting the income tax of enterprises from enterprises income, the remaining part will be the enterprise savings  $(S_{ep})$ .

$$S_{ep} = s_{ep}^* (1 - t_{ep}) * Y_{ep}$$
(23)

where  $(s_{ep})$  is enterprise savings rate.

Enterprise savings generally support part of the expenditures. If the sources together cannot cover all the expenditures, enterprises have to borrow from other economic institutions. In other words, if there is

negative savings, which means the total expenditure is greater than the total sources, this gap constitutes the credit requirement of enterprises. A positive credit requirement indicates that enterprises need to borrow through borrowing banks loans, and issuing enterprise bonds.

The government enters the model through its revenue, expenditure and deficit activities. The government revenue (GR) is comprised of mainly a variety of taxes: tariffs (TF), household income taxes ( $T_{hh}$ ), enterprise income taxes ( $T_{ep}$ ), indirect taxes ( $T_{ind}$ ), and interest payments of government deposits in central bank (IGD<sub>g,cb</sub>).

$$GR = TF + T_{hh} + T_{ep} + T_{ind} + IGD_{g,cb}$$
<sup>(24)</sup>

Among the government expenditures, the two largest items are the spending on the provision of public goods and services  $(ge_{gs})$  and fixed investment  $(ge_{fi})$ . Both are fixed in real values. Moreover, the governments spends on interest of foreign borrowing  $(IFB_{row,g})$ , interest of treasury bonds to enterprises  $(ITB_{ep,g})$ , transfers to enterprises  $(GT_{ep,g})$ , and households  $(GT_{hh,g})$ , subsidies to the money loosing enterprises  $(SUB_{ep,g})$  and price subsidies on consumption goods to households  $(SUB_{hh,g})$ .

$$GE = (ge_{gs} + ge_{fi})^* PL + IFB_{row,g}^* EXR + ITB_{ep,g} + GT_{ep,g} + GT_{hh,g} + SUB_{ep,g} + SUB_{hh,g}$$
(25)

where (PL) is price level, (EXR) is exchange rate, and  $(\cos_g)$  is government share of current capital outflow.

When the government's total expenditure exceeds its revenue the government has to find extra fund (government borrowing) to finance its deficit. The government fiscal deficit (GFD) equals its expenditure minus its income.

$$GFD = (ge_{gs} + ge_{fi}) * PL + IPFB_{row,g} * ER + ITB_{ep,g} + GT_{ep,g} + GT_{hh,g} + SUB_{fcg} + SUB_{ep,g} + SUB_{hh,g} + -TF-T_{hh} - T_{ep} - T_{ind} - IGD_{g,cb}$$
(26)

When the government faces a deficit, there are three ways to finance it. *First*, the government can borrow from the central bank.

$$\Delta CBC_{s,ch} = \mu_2 * GFD + \Delta GD \tag{27}$$

where  $(\Delta CBC_{g,cb})$  is the change in central bank credits to government,  $(\mu_2)$  is the share of deficit financed by central bank credit, and  $(\Delta GD)$  is change in government deposits. This method is the easiest way to finance government deficit. Yet, this method increases the money stock and jeopardizes the money control function of the central bank.

Second, government can issue the treasury bond.

$$\Delta TSTB = \mu_l * GFD \tag{28}$$

where ( $\Delta$ TSTB) is the change in supply of treasury bonds, ( $\mu_1$ ) is the share of deficit financed by treasury bonds.

*Third*, the government can borrow from the foreigners. This method might increase the national debt to the foreigners and affects negatively the balance of payments.

Since we impose the government deficit, we will explicitly incorporate the decision of financing deficit into model using two-policy parameters  $\mu_1$  and  $\mu_2$  that represents the share of government deficit financed by treasury bonds and by central bank loans respectively. The remaining part, equal to  $(1 - \mu_1 - \mu_2)$ , will be financed by foreigners.

Incorporating the banking sector into the model is one of the most important characteristics of financial CGE models. The banking sector of the model represents the functions of the central bank and the commercial banks. The central bank is the authority of monetary policy. The commercial banks are the financial intermediaries. They channel the savings of households and enterprises in the form of bank deposits to borrowers as loan.

Since the commercial banks lend out bank loans and put reserves into the central bank, the income equation of commercial banks is little bit different from other sectors. The commercial banks receive interest on bank loans from enterprises ( $IBL_{b,ep}$ ), interest on treasury bonds from government sector ( $ITB_{b,g}$ ), and interest on bank reserves from the central bank ( $IBR_{b,cb}$ ). If it is the case, they can get foreign trade earn a profit on trade ( $b\pi_{fic}$ ). Then, the income equation of commercial banks becomes;

$$Y_b = (IBL_{b,ep}) + ITB_{b,g} + IBR_{b,cb} + b\pi_{fic}$$
<sup>(29)</sup>

On the expenditure side, the commercial banks pay interest on bank deposits to household ( $IBD_{hh,b}$ ) and enterprises ( $IBD_{ep,b}$ ). Since commercial banks borrow from the central bank, they pay interest on central bank loans ( $ICB_{eb,b}$ ).

$$E_b = IBD_{hh,b} + IBD_{ep,b} + ICB_{cb,b}$$
(30)

The equation below shows the financial intermediation function of the commercial banks. The savings of households and enterprises in the form of bank deposits are channeled to borrowers as loans.

$$\Delta BL = \Delta DDh + \Delta DDep + \Delta TDhh + \Delta TDep - \Delta BR$$
(31)

This equation simply says that the changes in total bank loans ( $\Delta BL$ ) is equal to the changes in total demand deposits of households ( $\Delta DD_{hh}$ ) and enterprises ( $\Delta DD_{ep}$ ) plus the changes in total time deposits of households and enterprises ( $\Delta TD_{hh}$ ) + ( $\Delta TD_{ep}$ ) minus the changes in total bank reserves ( $\Delta BR$ ).

The commercial banks have to reserve a certain portion of their deposits in the central bank account. The equation below indicates that the total reserves of commercial banks (BR) deposited in the central bank account is equal to the total stock of demand deposits  $(DD_{hh} + DD_{ep})$  and total stock of time deposits  $(TD_{hh} + TD_{ep})$  with the ratio of reserve to commercial banks (rrb).

$$BR = rrb \left( DD_{hh} + DD_{ep} + TD_{hh} + TD_{ep} \right) \tag{32}$$

To see authority of monetary policy function of the central bank clearly, we should introduce money base equations. Change in money base ( $\Delta MB$ ) is used to measure the money supply and defined as the household currency demand ( $\Delta CD_{hh}$ ) and enterprise currency demand ( $\Delta CD_{ep}$ ) plus the total bank reserves ( $\Delta BR$ ).

$$\Delta MB = \Delta CD_{hh} + \Delta CD_{ep} + \Delta BR \tag{33}$$

It is obvious that if the money multiplier is constant, money supply will be affected by the change in the money base in the same direction. That means the central bank credits to the government is an injection of money into the economy, and this injection will expand money base.

# Simulation Results<sup>1</sup>

In the simulation result table below, we show nominal and real changes in the macroeconomic and financial variables as a result of freeing the interest rate. Since the central bank credit to enterprises and commercial banks stays at the original level as in the baseline situation, the simulation results show the pure effects of interest rate liberalization. Thus, there is no shift in monetary policy and what we see is a pure effect of interest rate liberalization.

As it is seen from the simulation results, the price level drops by 1.33% in the short run and 1.95% in the long run. Notice that a drop in the price level does not mean there is no inflation. The price level of the base run is normalized to one, and the inflation rate is 60.3% initially. To see the price inflation level, we should examine the item "price inflation rate" in the macro and financial variable tables. This fall in the price level at the same time means that the inflation rate has gone down by about two-percentage point, from 60.3% to 58.97% in the short run and to 58.35% in the long run. For the other nominal variables shown in the tables, the change in the price level is a point of reference to compare with to get some ideas about the change in real values. Throughout all discussions we will check the changes in the real values of variables when they are necessary. In this case, as an example, the price level decreases by 1.33% in the short run and thus for any nominal variable its value decreases by less than 1.33% in the short run, there is actually an increase in the real value.

A drop in the price level proposes that the real wage level has risen, and thus, employment in the short run has fallen by 0.9% or unemployment increased by 171 thousands (by assumption only the short run has employment effect). A result of the drop in employment is that the real GNP decreases by about 0.3% in the short run. However, the story changes in the long run after the wage level has been adjusted fully and the employment effect has been eliminated. As seen in the table 1, in the long run, the real GNP increases slightly by 0.2%. From this simulation result, it can be concluded that interest rate liberalization, in fact, has slightly

<sup>&</sup>lt;sup>1</sup> Simulation results were obtained by using Generalized Algebraic Modeling System (GAMS) program.

improved, even if it is very small, the efficiency of the economy. Given that the capital stock is fixed, the increase in real GNP or production efficiency has to come from the reallocation of labor among sectors.

In both the short and the long run, the nominal interest rate goes up even though the general price level falls, and the combined effect of the two gives rise to a jump in the real rate of interest by more than threepercentage point from 2.4% to 5.63% in the short run and to 5.45% in the long run. It should be remembered that freeing the interest rate allows the loanable funds market to reach the equilibrium and rationing of credit funds is no longer needed. Indeed, the leap in the real rate of interest is one of the mechanisms working towards equilibrating the financial and loans markets. The nominal total income of households falls by 0.95% in the short run and 1.03% in the long run. Yet, by taking the change in the general price level into account, the real income has actually risen in both the short and long run. Total nominal households income as a percentage of the GNP rises slightly from 85.6% to 86.25% in the short run and to 86.3% in the long run. Theoretically speaking, the saving behavior of households is expected to change due to the rise in the real interest rate. In line with the theory, our simulation results show that the nominal gross saving of households goes up even though the price level has fallen, and the result is an increase in the real savings around 4.7%, as indicated by the increase of savings as a percentage of the GNP, from 19.3% to 20.2% in both the short run and the long run. Furthermore, households compress their real consumption and lower their demand deposits. Money holdings decreased by 3.3% and 4.6% in the short run and long run respectively while time deposits increased by 9.1% and 9.74% in the short run and long run respectively. Thus, the households build up their time deposits directly as well as converting their money holdings into the interest earning deposits.

Regarding the fiscal condition, government revenue drops in both the short and the long run. The nominal revenue decreases by 2.3% in the short run and 2.03% in the long run. Since the percentage of government revenue fall is larger than the price level change in both the short and the long run, government revenue decreases with not only nominal terms but also real terms. This real revenue decrease is also reflected in the decrease of government revenue measured as a percentage of the GNP from 21.1% to 20.95% in the short run and to 21.03% in the long- run. On the other hand, government expenses decrease by 0.4% in the short run and 0.2% in the long. Those expenses decreases are less than the price level change in both the short and the long run. Combining effect is that budget deficit or government borrowing requirement increases by 7.42% in the short run and 7.17% in the long run.

The results show interesting outcome for enterprises. While the liberalization leads to more fixed investment, it hurts enterprises by lowering their net income for 2.19% in short run and 2.04% in the long run. That means real net income decreases in both the short and long run. The reduction in net income is largely due to the increased interest payments on the stock of enterprise loans. On the other hand, real fixed and total investment rises in the short and long run. In order to support a higher level of fixed investment, enterprises have to increase their borrowing in the current period — enterprise bonds issued goes up by 2.3% in the short run and 2.5% in the long run, and domestic bank loans goes up by 2.5% in the short run and 2.9% in the long run.

The most fascinating results were obtained in the banking system comparing to households and enterprises. The increased credit demand of enterprises causes 2.5% increase in short run and 2.9% in the long run in the amount of bank loans to enterprises made in the current period. Besides, the increasing real interest rate coupled with the impact on household saving behavior causes the amount of demand deposits made in the current period to decline by 2.6% in the short run and 2.2% in the long run. On the other hand, in line with theory, increasing real interest rate causes the amount of time deposits to go up by 6.02% in the short run and 6.87% in the long run. Furthermore, a higher nominal interest rate means that interest payments received and paid by banks rush forward drastically. Thus, the total income of commercial banks rises substantially by 25.4% in the short run and 2.3.7% in the long run. On the other hand, the total bank expenses jump by 13.5% in the short run and 9.5% in the long run.

To summarize, the following remarks can be concluded:

- 1. The simulation results show that while the government and the enterprises suffer a revenue loss, households slightly and commercial banks substantially gain from freeing the interest rate. This differential impact on the incomes of economic agents depends to a large extent on the initial distribution of financial assets and liabilities.
- 2. When interest rate is liberalized, we observe the income transfers from borrowers to lenders, and thus lenders tend to gain but borrowers to lose. Since main borrowers are enterprises and government, their net incomes decrease in he short and long run.
- 3. However, real net income of enterprises is getting better from the short run to the long run. While price level decrease from the short run to the long run is 0.62%, the decrease in net total income of enterprises is just 0.15%. Speaking with real terms enterprises are getting better from the short run to the long run even if their real net income is decreasing in both the short and long run. This situation would be explained by the increasing productivity of enterprises in the long run after interest rate liberalization takes place.

- 4. The simulation results of interest rate liberalization indicate that the fixed interest rate system before liberalization is putting a squeeze on especially the banking sector by protecting the benefits of and maintain the status quo in other institutions.
- 5. When the long run is compared to the short run, we see an increase, even if very small, in the long run real GNP while we have a decrease in the short run.
- 6. Another important observation is the increase in the government-borrowing requirement as a percentage of the GNP in both the short and the long run. This result is similar to the context of enterprise. Since government is also borrower, increasing real interest rate is increasing government borrowing.
- 7. The long run results suggest that some adverse effects associated with freeing the interest rate are reversed when a full adjustment is reached. Government and enterprises enjoy with low interest rate under fixed interest rate regime, while freeing the interest rate make household slightly and banking sector substantially better.

INTEREST RATE LIBERALIZATION MACRO AND FINANCIAL VARIABLES					
	Base	Value	% ▲	Value	% ▲
Price Level	1.0000	0.9867	-1.33%	0.9805	-1.95%
Price Inflation Rate (%)	60.30%	58.97%	-2.21%	58.35%	-3.23%
Nominal Interest Rate (%)	62.70%	64.60%	5.58%	63.80%	3.99%
Real Interest Rate (%)	2.40%	5.63%	135%	5.45%	127%
Employment (thousand)	18,539	18,368	-0.9%	18,539	0.0%
Wage Level (million TL/year)	5,768	5,701	-1.16%	5,680	-1.53%
Real GNP	395,042	393,840	-0.3%	395,848	0.2%
Nominal GNP	395,042	388,602	-1.63%	388,129	-1.75%
Government	•				
Revenues	83,317	81,396	-2.3%	81,629	-2.03%
Revenues as % of GNP	21.1 %	20.95%	-0.71%	21.03%	-0.33%
Expenditures	103,867	103,470	-0.4%	103,652	-0.2%
Expenditures as % of GNP	26.3 %	26.6%	1.14%	26.7%	1.52%
Deficit	20,550	22,074	7.42%	22,023	7.17%
Deficit as % of GNP	5.2 %	5.68%	9.2%	5.67%	9.04%
Households		•			
Total Nominal Income	338,379	335,173	-0.95%	334,893	-1.03%
Total Nom. Inc. as % of GNP	85.6 %	86.25%	0.76%	86.3%	0.82%
Total Real Income	338,379	339,691	0.39%	341,553	0.94%
Total Savings	76,173	78,565	3.3%	78,451	3.1%
Savings as % of GNP	19.3 %	20.2%	4.7%	20.2%	4.7%
Nominal Consumption	262,206	257,608	-1.75%	256,442	-2.2%
Nom. Cons. as % of GNP	66.4%	66.3%	-0.15%	66.1%	-0.45%
Real Consumption	262,206	261,080	-0.43%	261,542	-0.25%
Demand Deposit	5,261	5,086	-3.3%	5,017	-4.6%
Time Deposit	29,640	32,345	9.1%	32,527	9.74%
Enterprises		, ,		,	•
Net Total Income	229,194	224,153	-2.19%	224,521	-2.04%
Working Capital	1,363	1,323	-2.93%	1,329	-2.49%
Total Investment	68,564	69,389	1.2%	69,658	1.6%
Real Fixed Investment	65,888	66,553	1.0%	66,994	1.68%
Demand for Credit	38,766	39734	2.5%	39,860	2.8%
<ul> <li>Enterprise Bond Issued</li> </ul>	6,273	6,419	2.3%	6,431	2.5%
Bank Loans Borrowed	32,493	33.315	2.5%	33,429	2.9%
Commercial Banks	,		_10 /1		
Total Income	44.308	55.560	25.4%	54.821	23.7%
Total Expenses	39.179	44.485	13.5%	42,917	9.5%
Bank Loans to Enterprises	32.493	33.315	2.5%	33.429	2.9%
Total Bank Loans	76.261	77.176	1.2%	77.325	1.4%
Total Deposits	93.928	97.066	3.3%	97821	4.1%
Demand Deposits	29.295	28.536	-2.6%	28,647	-2.2%
Time Deposits	64 633	68 530	6.02%	69.074	6.87%

## **Simulation Results**

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