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ESSAYS ON TURKEY'S BID FOR GLOBAL INTEGRATION

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Chapter 1

General Introduction

Turkey abandoned an inward-oriented development strategy, which it had been implementing for 50 years, and switched to outward-oriented development policies in 1980. The reform process started with structural steps such as the liberalization of the foreign trade regime and the financial sector and culminated in capital account liberalization in 1989. The following steps taken to further open up the economy were aimed at eventually integrating with the European Union (EU). A customs union was created between Turkey and the EU in 1996, which was seen as a step toward full EU membership at an unspecified future date. In fact, the European Council's Helsinki summit in 1999 marked a break-through in Turkey-EU relations by recognizing Turkey as an EU candidate state and the accession negotiations officially started in October 2005. Although the accession process has launched, it is not certain that the negotiations will lead to Turkey's eventual accession due to political as well as economic objections against Turkey's membership to the EU.

The essays making up this thesis combine two important milestones in Turkey's bid for global integration: Turkey's prospective accession to the EU and capital account liberalization. Chapters 2 and 3 deal with possible economic consequences of Turkish accession to the EU, focusing on transfers as the cause of EU's objection to admit Turkey and investigating whether the transfer may be a price worth paying for the European households, simultaneously in a static and a dynamic setting. Chapter 4 concerns the capital account liberalization experience of Turkey in order to account for the changes in the Turkish economy after its opening to capital flows and analyses whether Turkish agents are better off because of this opening up. The following paragraphs summarize the research issues addressed in each chapter of this thesis as well as our main findings.

EU grants structural and cohesion funds for specific objectives in order to narrow the development disparities among regions and member states. Turkey is poor relative to the EU standards -its purchasing power adjusted GDP per capita is 46 percent of the EU-27 average- and income disparities among the regions are great. Thus, Turkey will be a major recipient of these funds, if accession takes place. *Chapter 2*, titled, " May Free Capital Mobility be

Unfavorable for Admission to the EU?" examines some mechanisms, the general equilibrium of which may compensate the negative effect of transfers from incumbent members to Turkey. In this regard, two main issues are addressed: i) may a total factor productivity (TFP) increase in the candidate country compensate the cost of transfers and ii) may free capital mobility before accession decrease EU's incentive for admitting the candidate country. We answer these questions by setting forth a two-country model, in which one of the countries is the EU as a single EU country and the other is Turkey. After Turkish accession, the European household gives a transfer to the Turkish household whereas an upward TFP shift arises in Turkey due to the positive effect of accession on institutional development.

The analysis of the TFP increase stems from the likely improvement of Turkish institutions following the full adoption of the Copenhagen criteria. Sticking to a widespread literature ((Acemoglu and Johnson (2005),Dawson (1998), Klein and Luu (2003), North (1990))), we accept the hypothesis that better institutions stimulate better economic performance, which is proxied by a TFP increase in our model. Thereafter, we compare the utility of the European household before and after accession. First, we do this exercise when there is no capital in the production function. We next introduce capital into the model to see the implications of capital mobility. We first analytically find that a TFP increase in Turkey enhances the utility of the household in the EU, enabling the European household to compensate for the cost of transfer given to the Turkish household. On the other hand, we find that capital mobility has no effect on the level of transfer since the benefits of capital mobility would be reaped prior to accession, if capital markets were already integrated.

Chapter 3, with the essay "Worthy Transfers: A Dynamic Analysis of Turkeys Accession to the EU" deals with the same issue as Chapter 2 in a dynamic general equilibrium setting.[1] Our aim in this chapter is to overcome some shortcomings of Chapter 2 that result from the limitations of analytical derivations and the model's static set-up. This time, we assess numerically whether, in a European perspective, enlargement of the EU to include Turkey is welfare enhancing, and present a quantitative answer. Moreover, the model's dynamic set-up allows us to observe the effects of the TFP increase on the variables through time. We study the theoretical and quantitative implications of a TFP increase in Turkey for the EU in the aftermath of the enlargement, assuming first immobility of factors. We then extend the model to the case of perfect capital mobility, to verify whether mobile capital can affect the transmission mechanism of the model. The idea again is that adherence to the Copenhagen criteria leads to a generic improvement in the Turkish institutions, which in turn increases TFP in the model. After setting up the model and calibrating the structural parameters for Turkey and the EU, we run the simulation exercise assuming that half of the TFP gap between Turkey and the EU is filled where TFP increases monotonically along an S-shaped path. It turns out that the Europeans are better off, if the Turkish TFP increase bridges more than 23 percent of the initial TFP gap between Turkey and the EU. That figure becomes 47 percent when capital mobility is introduced. In fact, these quantitative results support the analytical findings of the previous chapter.

[1] This essay is coauthored with Luca Pensieroso.

Instead of dealing with the EU accession of Turkey as Chapters 2 and 3 do, *Chapter 4*, entitled "Capital Account Liberalization: the Case of Turkey" considers the capital account liberalization experience of Turkey in 1989. Following Turkey's liberalization, capital inflows and trade deficits increased remarkably, domestic currency, the Turkish lira, entered into an appreciation trend, and booms and busts in Turkish economy became closely associated with capital flows. However, the trade deficits and the real exchange rate appreciations following Turkey's opening to capital flows were reversed by the trade surpluses and the real exchange rate depreciations first in 1994 and then in 2001.

We aim to quantitatively account for the above mentioned features of the Turkish economy in the aftermath of the capital account liberalization and investigate whether Turkish households have a welfare gain or loss due to the financial opening. In this regard, we set up a two-sector dynamic general equilibrium model where a capital poor country with a high population growth rate opens itself to capital flows. We find that the model can capture the main dynamics of trade balances in Turkey. At the year of opening to capital flows, Turkey starts to borrow both because it is capital poor and because it has a high population growth rate. Furthermore, two exogenous processes in the model, the interest rate premium and the remittance flows, determine the shape of the trade balances. We also scrutinize the effects of this capital account liberalization on the welfare of Turkish households. Our results show that Turkish households have a welfare gain because of the opening up. More specifically, they have to give up 26 percent of their lifecycle consumption in the open economy case in order to have the same level of welfare in the counterfactual case of the closed economy.

Overall, the results reached in all the chapters of this thesis suggest that capital mobility, which is an inevitable side-effect of global integration has significant repercussions on Turkish economy and thus on Turkish agents both directly and indirectly (via the welfare of the European households). In Chapter 4, we analyse the direct effects of opening the economy to capital flows on the Turkish economy and households. In Chapter 2, we see how capital mobility affects the welfare of European households and consequently how their incentives to admit Turkey to the EU may change. In Chapter 3, we observe that the required Turkish TFP increase to make the European household indifferent towards Turkey's accession is bigger when we relax the immobile capital assumption.

Chapter 2

May free capital mobility before accession be unfavorable for admission to the EU?

2.1 Introduction

The European Union (EU) has launched membership negotiations with Turkey. However, it is not certain that these negotiations will lead to Turkey's accession. If most of the objections to Turkey's membership are political in nature, the main economic objection is transfers. Once membership status is granted, Turkey, being a poor country relative to the EU standards, will be a major beneficiary of EU transfers.

EU grants Structural Funds and Cohesion Fund, both of which are instruments of the EU regional policy, in order to achieve real convergence -reduction of income and development gaps among regions and member countries- in the EU.[1] Turkey's purchasing power adjusted GDP per capita is only 46 percent of the EU-27 average and income disparities within the country are enormous.[2] Therefore, there is no doubt that Turkey will benefit from these funds, if it accedes to the Union.

Our purpose in this paper is to explore the mechanisms that compensate for the negative effect of transfers, and accordingly form an incentive for the incumbent members of the EU to admit a candidate country. More specifically, we address the following questions: i) may a total factor productivity (TFP) increase in the candidate country due to the positive effect of accession on institutional progress compensate for the cost of transfers and ii) may free capital mobility before accession decrease EU's incentive for admitting a candidate country.

[1] These funds constitute 35 percent of the 2007-2013 budget, being the second largest item after Common Agricultural Policy.

[2] Data is from Eurostat, `http://epp.eurostat.ec.europa.eu/portal/page/portal/statisticssearch\_database`.

We set forth a two-country model, in which one of the countries is the EU as a single EU-country and the other is the candidate country. Each of the countries produces a heterogeneous good with its own technology. In the aftermath of the accession of the candidate country, the European household gives a lump-sum transfer to this country's household whereas the positive effect of accession on institutional development leads to an improvement in the TFP of the candidate country.

On the way to the EU membership, candidate countries have to comply with regulations defined by Copenhagen criteria, which require the development of political, economic and legal institutions. In this paper, we assume two things: first, sticking to Copenhagen Criteria will improve institutions of the candidate country; second, as elaborated extensively in the literature (Acemoglu and Johnson (2005), Dawson (1998), Klein and Luu (2003), North (1990)), improvement in institutions leads to economic growth, which is proxied by TFP increase in the model.

In this context, we compare the utility of the European household before and after accession. To this end, we search for the maximum level of transfer, where the household is indifferent between these two utility levels. First, we do this exercise when there is no capital in the production function. We next introduce capital into the model to see the implications of capital mobility on the maximum level of transfer. We compare the case, in which there is already a capital mobility before accession versus the case where capital is allowed to move freely only after accession.

We find that a TFP increase in the candidate country enhances the utility of the household in the EU, enabling the European household to compensate for the cost of transfer. We also find that allowing for free capital mobility before accession may be unfavorable for admission to the EU since European households would already profit from capital mobility through an increase in their utility before the enlargement.

Since our main goal in this paper is to analyze Turkey to derive policy implications on its bid to the EU membership, we will apply this standard general equilibrium model specifically to Turkey and call the candidate country as Turkey throughout the paper.

To the best of our knowledge, the effects of Turkey's EU accession have not been scrutinized from our perspective. Lejour and de Mooij (2005) and Flam (2004), Sulamaa and Widgrén (2007) and recently Philippidis and Karaca (2009) study the economic implications of the possible Turkish accession to the EU by using a general equilibrium analysis. Among them only Flam (2004) does not abstract transfers from his study and estimate the budgetary effects of accepting candidate countries including Turkey to the EU and finds that Turkey's accession would be costly for the incumbent members since some of the countries which are the net receipients of transfers might become net contributors.

The paper is structured as follows. In Section 2.2, we elaborate our assumption of Turkish TFP increase upon Turkey's EU accession from theoretical as well as empirical point of view. In Section 2.3, we describe a model with two countries that produce different goods using

only labor. In Section 2.4, we introduce capital into the model and discuss the role of capital mobility. In section 2.5, we draw some policy implications for Turkey. In Section 2.6, we introduce two variations into our model and analyze how our previous results are affected. Section 2.7 summarizes the basic findings and concludes.

2.2 EU Accession and TFP growth

There are formal requirements for every candidate country to join the EU. More specifically, these requirements include implementation of the Copenhagen Criteria and compliance with the EU law, i.e. *aquis*.[3] Turkey, similar to other candidate countries, must fulfil these criteria without objection in its quest for accession to the EU. While meeting these criteria on the way of its bid for the membership, Turkey will obviously go through various institutional changes. The idea of this paper is that this conditionality for the membership will lead to the probable improvement of Turkish institutions and, in turn, to the achievement of economic growth.

We have good reason to believe that better institutions foster economic growth since a widespread literature including Acemoglu and Johnson (2005), North (1990) among others has emphasized the important role of institutions such as structure of property rights and the rule of law on economic performance. According to Klenow and Rodrìguez-Clare (1997) and Hall and Jones (1999), on the other hand, of primary importance to income disparity across countries are the differences in TFP. Combining these two line of literatures leads us to conclude that a significant way in which quality of institutions stimulates economic growth is through its effect on TFP.

Moreover, a number of empirical studies document a positive and direct link between institutions and TFP growth. Employing economic freedom index as an indicator of institutional quality, Dawson (1998), Ayal and Karras (1998) and Klein and Luu (2003) find that economic freedom affects economic growth through its direct effect on TFP. Similarly, Moomaw and Yang (2006) find that economic freedom fosters TFP convergence for the sample of 12 OECD countries, 8 of which are EU members. Considering the positive economic freedom experience of the older EU accession countries, they propose that improvements in economic freedom of recent members will boost their productivity growth and convergence.

If we look at empirical evidence on the convergence of TFP among new and old members of the EU, we find mixed results. Kutan and Yigit (2007) test the validity of their theoretical framework, which relies on the analytical hypothesis that integration leads to sharing of knowledge and technology. They find that 5 recent members to the EU-15 experience stronger TFP

[3]Copenhagen criteria set down the requirements for the stability of institutions guaranteeing democracy, the rule of law, human rights and the existence of a functioning market economy that member countries must meet before accession. Compliance with the acquis means harmonization of Turkey's rules and institutions with those of the EU and is verified in 35 chapters including intellectual property and company law, institutions, education and culture, environment etc.

growth than France, which is taken as the benchmark country. They conclude that integration stimulates productivity (TFP) and growth. Comparing the labour productivity performance of original members of the EU with those of Western European countries that either acceded the Union in 1995 or still not acceded, Parente and Prescott (2006) conclude that EU membership fosters labour productivity growth. They also report that countries that joined the EU in 1973 experienced significant labor productivity catch-up process upon their accession.

Conversely, basing their analysis on a production frontier approach, Salinas-Jimenez, Alvarez-Ayuso, and Delgado-Rodrìguez (2006) find that TFP contribution to labour productivity is negative for the new members of the EU-15 during the period 1980-1997. Similarly, in their study of productivity convergence in EU-15 during period 1980-2001, Delgado-Rodrìguez and Alvarez-Ayuso (2008) find that labour productivity growth has been mainly driven by capital deepening whereas contribution of TFP to the labour productivity improvement in the Union is almost negative, reflecting the poor TFP performance of the recent members to the EU-15. Fare, Grosskopf, and Margaritis (2006) find evidence of labour productivity convergence for three different groups of countries instead of convergence among all EU members and argue that contribution of TFP to labour productivity growth is different, though mostly negative, for each country.

Although the link between institutional development and TFP presents a sound theoretical background, empirical evidence on TFP increase in accession countries and therefore a convergence among old and new members of the EU is rather vague. In our model institutional changes that will take place after accession are embedded in the exogenous Turkish TFP increase.

2.3 The Model without Capital

This section allows us to see the effect of the candidate member's accession on the utility of the incumbent members' representative household and to compare the negative effect of transfer payment with the positive effect of a TFP increase that occurs in the candidate member country, when there is no capital in the production function.

2.3.1 The Benchmark Model

We consider two countries, one of which is the EU as a single EU-country and Turkey as the candidate member country. Variables associated with Turkey will be denoted by *. Each country produces one good by the following production functions:

$$Y = ANl, \tag{2.1}$$

$$Y^* = A^*N^*l^*. \tag{2.2}$$

where $A > 0$ is the TFP and N is the number of households. Since time endowment is normalized to unity l is the number of hours devoted to working and 1-l is leisure. Price of the good that is produced in the EU is chosen as the numÃ©raire. We terefore denote as p the price of one unit of Y^*, expressed in terms of Y. Since there is free trade between these two countries, the households in each country can consume both of the goods without incurring any costs. The European household has the utility function of the form:

$$U = \ln c^E + \beta \ln c^T + \gamma \ln(1 - l), \tag{2.3}$$

where c^E denotes the consumption of the good produced in the EU, c^T denotes the consumption of the good produced in Turkey, $\beta > 0$ is the preference term for the Turkish good, and γ is the preference term for leisure. The European household maximizes (2.3) subject to:

$$wl = c^E + p\, c^T$$

where w is the wage in the EU.

The first order conditions yield:

$$\begin{aligned} c^E &= \frac{w}{1+\beta+\gamma}, \\ c^T &= \frac{\beta w}{p(1+\beta+\gamma)}, \\ 1-l &= \frac{\gamma}{1+\beta+\gamma}. \end{aligned}$$

The Turkish household maximizes her utility within the resource constraint

$$U^* = \ln c^{*E} + \beta \ln c^{*T} + \gamma \ln(1 - l^*), \tag{2.4}$$

subject to

$$w^* l^* = c^{*E} + p\, c^{*T}.$$

The variables c^{*E} and c^{*T} stand for the consumption by the Turkish household of the good produced in the EU and in Turkey, respectively. The variable w^* is the wage in Turkey.

The first order conditions of this problem are given by

$$\begin{aligned} c^{*E} &= \frac{pw^*}{1+\beta+\gamma}, \\ c^{*T} &= \frac{\beta w^*}{1+\beta+\gamma}, \\ 1-l^* &= \frac{\gamma}{1+\beta+\gamma}. \end{aligned}$$

The firm in the EU maximizes profits subject to equation (2.1). Marginal productivity of labor is thus equal to its factor price, which writes as

$$w = A.$$

Symetrically, for Turkey we have:

$$w^* = A^*.$$

Equilibrium requires the clearance of goods' markets. Total production in the EU is consumed at home and in the other country:

$$Y \quad = \quad Nc^E + N^*c^{*E}. \tag{2.5}$$

Solving equation (2.5) for price yields

$$p = \frac{\beta n A}{A^*}.$$

where n is ratio of the EU population to Turkey's population (i.e. $n = \frac{N}{N^*}$). We observe that an increase in A^* will lead to a decrease in the price of the Turkish good whereas an increase in β and A will lead to an increase in it.

Now we can express equation (2.3) as follows:

$$U = \ln A + \beta \left(\ln A^* N^* - \ln N\right) + (1 + \beta + \gamma) \ln (1 + \beta + \gamma). \tag{2.6}$$

As equation (2.6) demonstrates clearly, both TFP levels affect the utility of the European household positively. This is a result of free trade between countries.

2.3.2 After Accession

After Turkey's accession, the European household gives a lump-sump transfer to the Turkish household while a positive TFP shift occurs in Turkey. The new TFP parameter of Turkey becomes $\hat{A}^*$, which writes as

$$\hat{A}^* = \mu A^*$$

where $\mu > 1$ refers to the TFP shift in Turkey due to its accession to the EU. The representative European household maximizes her utility, which is equation (2.3) subject to the new budget constraint:

$$wl - \theta = c^E + p\ c^T$$

where θ represents the lump-sum transfer given by the European household to the representative Turkish household.

The first order conditions for this maximization problem yield:

$$\begin{aligned} c^E &= \frac{A-\theta}{1+\beta+\gamma}, \\ c^T &= \frac{\beta(A-\theta)}{p\,(1+\beta+\gamma)}, \\ 1-l &= \frac{\gamma(A-\theta)}{A(1+\beta+\gamma)}. \end{aligned}$$

The representative Turkish household maximizes equation (2.4) subject to her new budget constraint:

$$p\,w^*l^* + n\,\theta = c^{*E} + p\,c^{*T}.$$

The first order conditions of this problem are given by

$$\begin{aligned} c^{*E} &= \frac{p\hat{A}^* + n\theta}{1+\beta+\gamma}, \\ c^{*T} &= \frac{\beta(p\hat{A}^* + n\theta)}{p\,(1+\beta+\gamma)}, \\ l^* &= \frac{\gamma(p\hat{A}^* + n\theta)}{p\,(1+\beta+\gamma)\hat{A}^*}. \end{aligned}$$

When goods market clear according to equation (2.5), p reads as

$$p = \frac{n(\beta A + \gamma\theta)}{\hat{A}^*}.$$

Utility of the European household after accession reads

$$\begin{aligned} \hat{U} = {} & (1+\beta+\gamma)\ln(A-\theta) + \beta\ln(\beta\hat{A}^*) - \beta\ln(\beta A+\gamma\theta) \\ & - \beta\ln n - \gamma\ln A + \gamma\ln\gamma - (1+\beta+\gamma)\ln(1+\beta+\gamma) \end{aligned} \tag{2.7}$$

The European household will be willing to give a lump-sum transfer to the candidate member country Turkey, if her utility level before Turkey's accession is equal or higher than her utility level before accession. We represent this problem for the maximum level of transfer when the European household is indifferent between two utility levels, which writes as

$$\hat{U}_E = U_E \tag{2.8}$$

where $\hat{U}_E$ is the utility of the European household after accession. The proposition below summarizes the results that are drawn by solving equation (2.8).

Proposition 1. *There exists a unique positive θ_x, which is the solution to problem (2.8) if and only if $\mu > 1$. The higher μ, the higher the level of transfer that the European household is willing to give.*

Proof: See Appendix 2.7.1.

Proposition 1 states that there is no positive level of transfer as a solution to equation (2.8), when there is no TFP increase in Turkey, namely when μ=1. In other words, the European household will be worse off upon Turkish accession unless she is compensated by a TFP increase in Turkey. In fact, the representative European household consumes less European good and has less leisure after she gives away transfer. Thus, only a utility gain due to an increase in the consumption of the Turkish good through a decline in its price can offset this utility loss. Obviously, an increase in μ will lower the price of the Turkish good, and therefore will correct for the utility loss of the European household.

2.3.3 Exogenous Labor Supply

To see how the labor supply decision of the households affects our results, we consider a model with exogenous labor supply and simply set γ, the preference term for leisure, to zero. Thereafter, we compare the change in the utility of the European household after accession, when labor supply is endogenous versus when it is exogenous.

Change in the utility of the European household when labor supply is endeogenous is the following:

$$\hat{U} - U = \ln\left(\frac{A-\theta}{A}\right) + \beta \ln\left(\frac{\beta\mu(A-\theta)}{\beta A + \theta\gamma}\right) + \gamma \ln\left(\frac{A-\theta}{A}\right). \tag{2.9}$$

Change in the utility of the European household when labor supply is exogenous (γ=0) is given by the following equation:

$$\hat{U_o} - U_o = \ln\left(\frac{A-\theta}{A}\right) + \beta \ln\left(\frac{\mu(A-\theta)}{A}\right). \tag{2.10}$$

First expression in equations (2.9) and (2.10) represents the utility loss of the European household that results from consuming the European good less. This utility loss is exactly the same in both cases. Second expression in equations (2.9) and (2.10) demonstrates the European household's utility change resulting from the change in Turkish good consumption. The difference between these two expressions is $\ln(\beta A) - \ln(\beta A + \gamma\theta)$. Since γ is higher than zero, utility loss is higher when labor supply is endogenous.

Third expression in equation (2.9) shows the utility change of the European household resulting from the change in her leisure. We observe that the European household has less

leisure after accession. In addition to a utility loss due to the decrease in Turkish good consumption, the household has a utility loss due to having less leisure and thus total utility loss will be higher. In turn, when labor supply is endogenous TFP increase in Turkey must be higher to compensate for the higher utility loss of the European household.

2.3.4 Exogoneous Migration

It is important to note that this model assumes labor immobility between countries. However, possible migration flows from Turkey to the EU in the aftermath of accession would have significant economic consequences both on the EU and Turkey. This subsection deals with the effect of an exogenous migration flow from Turkey to the EU on the representative European household without modifying the model. Equation (2.6) is useful in this sense.

Suppose that m Turkish households decide to migrate to the EU, increasing the total number of European households to $N + m$ and reducing the number of Turkish households to $N - m$. Here, we assume that Turkish migrants earn the same income as European households. Hence, utility of the European household becomes

$$\begin{aligned}\hat{U} = &\ln A + \beta \ln A^* + \beta \ln(N^* - m) - \beta \ln (N + m) \\ &+ (1 + \beta + \gamma) \ln (1 + \beta + \gamma). \end{aligned} \tag{2.11}$$

This equation reveals that migration leads to a decrease in European household's utility since $\ln(N^* - m) - \ln (N + m) > \ln N^* - \ln N$. The intuition underlying this result is that labor mobility causes the price of the Turkish good to rise. As price equation demonstrates clearly, a fall in the number of Turkish households increases the price whereas an increase in the number of European households reduces it. Therefore, migration flows from Turkey to the EU has a negative effect on the utility of Europeans because of the price effect.

2.4 The Model with Capital

In the previous section, we have considered the implications of a TFP increase in Turkey on the level of transfer, when there is no capital in the model. In this section, we introduce capital into the production function. Moreover,we will discuss Two accesssion alternatives. In the first alternative, the representative European household pays a lump-sum transfer whereas a TFP shift occurs in Turkey after accession. In the second alternative, in addition to these changes accession also leads to free capital mobility between the countries.

2.4.1 The Benchmark Model

In this section, we introduce capital so that production is made through a Cobb-Douglas constant returns to scale technology:

$$Y = AK^{\alpha}N^{1-\alpha}, \tag{2.12}$$
$$Y^* = A^*K^{*\alpha}N^{*1-\alpha}. \tag{2.13}$$

where K is capital, N is population size which is equal to labor supply and α is a constant with $0 < \alpha < 1$. Capital and population of the EU are assumed to be larger than those of Turkey (i.e. $N > N^*$ and $K > K^*$).

The representative household in the EU has the following utility function

$$U = \ln c^E + \beta \ln c^T. \tag{2.14}$$

Notice that there is no leisure term in the new utility function for the sake of analytic tractability. The representative European household maximizes equation (2.14) subject to

$$w + \frac{RK}{N} = c^E + pc^T$$

where R is the interest factor in the EU.

The first order conditions give:

$$c^E = \frac{w + RK/N}{1+\beta},$$
$$c^T = \frac{\beta(w + RK/N)}{p(1+\beta)},$$

The representative Turkish household maximizes the following utility function

$$U^* = \ln c^{*E} + \beta \ln c^{*T}. \tag{2.15}$$

subject to

$$pw^* + \frac{pR^*K}{N^*} = c^{*E} + pc^{*T}$$

where R^* is the interest factor in Turkey. The first order conditions give:

$$c^{*E} = \frac{p(w^* + R^*K^*/N^*)}{1+\beta},$$
$$c^{*T} = \frac{\beta(w^* + R^*K^*/N^*)}{1+\beta}.$$

Prices result from the competitive behavior of firms, which leads to equalization of marginal costs and productivities:

$$\begin{aligned} R &= \alpha A K^{\alpha-1} N^{1-\alpha}, \\ w &= (1-\alpha) A K^{\alpha} N^{-\alpha}. \end{aligned}$$

Symetrically, for Turkey we have:

$$\begin{aligned} R^* &= \alpha A^* K^{*\alpha-1} N^{*1-\alpha}, \\ w^* &= (1-\alpha) A^* K^{*\alpha} N^{*-\alpha}. \end{aligned}$$

When goods market clear subject to equation (2.5) p reads as

$$p = \beta \frac{A K^{\alpha} N^{1-\alpha}}{A^* K^{*\alpha} N^{*1-\alpha}}.$$

It is obvious that an increase in the TFP of Turkey will reduce p. We can write the utility level of the representative European household as follows

$$U = \ln \frac{A K^{\alpha} N^{-\alpha}}{1+\beta} + \beta \ln \frac{A^* K^{*\alpha} N^{*1-\alpha}}{(1+\beta) N}. \tag{2.16}$$

2.4.2 After Accession

We will discuss two accesssion alternatives in this subsection. In the first alternative, the representative European household pays a lum-sum transfer to the Turkish household whereas a TFP shift occurs in Turkey after accession. In the second alternative, in addition to these changes accession also leads to free capital mobility between the countries.

The representative household in the EU maximizes her utility function, which is equation (2.14) subject to the new budget constraint:

$$w + \frac{R S^*}{N} - \theta = c^E + p c^E, \tag{2.17}$$

whereas the Turkish household maximizes equation (2.15) subject to

$$p w^* + \frac{p R^* S^*}{N^*} + n\theta = c^{*E} + p c^{*T} \tag{2.18}$$

Notice that capital level of each country is different from the initial capital. S and S^* stand for capital stock in the EU and Turkey upon capital markets integration. A positive difference between K and S corresponds to an outflow of the EU capital to Turkey, indicating an inflow of capital to Turkey, and conversely a negative difference between K and S corresponds to an inflow of the Turkish capital to the EU, meaning an outflow of capital from Turkey.

First order conditions for the maximization problems give:

$$\begin{aligned} c^E &= \frac{w + RS/N - \theta}{1+\beta}, \\ c^T &= \frac{\beta(w + RS/N - \theta)}{p(1+\beta)}, \\ c^{*E} &= \frac{pw^* + pR^*S^*/N^*) + n\theta}{1+\beta}, \\ c^{*T} &= \frac{\beta(pw^* + pR^*S^*/N^* + n\theta)}{p(1+\beta)}. \end{aligned}$$

Production functions of Turkey and the EU after accession are represented as

$$Y = AS^{\alpha}N^{1-\alpha}, \tag{2.19}$$
$$Y^* = \mu A^* S^{*\alpha} N^{*1-\alpha}. \tag{2.20}$$

Equation (2.20) clearly shows that a TFP increase in Turkey in the aftermath of accession increases output in Turkey.[4]

Factor prices resulting from profit maximization of the representative firm in the EU and Turkey are

$$\begin{aligned} R &= \alpha A S^{\alpha-1} N^{1-\alpha}, \\ w &= (1-\alpha) A S^{\alpha} N^{-\alpha}, \\ R^* &= \alpha \hat{A}^* S^{*\alpha-1} N^{*1-\alpha}, \\ w^* &= (1-\alpha) \hat{A}^* S^{*\alpha} N^{*-\alpha}. \end{aligned}$$

When goods market clears p reads as

$$p = \beta \frac{AS^{\alpha}N^{1-\alpha}}{\hat{A}^* S^{*\alpha} N^{*1-\alpha}}.$$

Equilibrium in capital markets requires that real interest factors should be equal:

$$pR^* = R.$$

Hence, equalization of interest rates yields

$$\frac{S^*}{S} = \beta.$$

[4]Notice that, since this is a static model, an increase in TFP has an effect on income and thus only on consumption. In a dynamic setting, however, a TFP growth does not only raise consumption but also raises investment through saving. This extra investment will cause an increase in the stock of capital, which will produce a further increase in output and consumption in the next period. Hence a TFP increase causes both consumption and capital to increase in the long run, but in the short run only consumption increases. Our model is not able to capture the long-run effects of this TFP increase.

Since sum of capital levels before and after capital mobility should be equal, capital levels upon capital markets integration in terms of initial capital levels read as

$$S = \frac{K+K^*}{1+\beta}, \tag{2.21}$$

$$S^* = \frac{\beta(K+K^*)}{1+\beta}. \tag{2.22}$$

Now that we have found new capital levels in terms of initial capital levels, we can write the utility of the European household for the second alternative.

$$\bar{U} = \ln \frac{A(K+K^*)^{\alpha}N^{-\alpha}}{(1+\beta)^{1+\alpha}} + \beta \ln \frac{\beta^{\alpha}A^*(K+K^*)^{\alpha}N^{*1-\alpha}}{(1+\beta)^{1+\alpha}N}. \tag{2.23}$$

where $\bar{U}$ denotes the utility of the European household when there is free capital mobility before accession.

$$\hat{U} = \ln \frac{A\left(\frac{K+K^*}{1+\beta}\right)^{\alpha}N^{-\alpha} - \theta}{1+\beta} + \beta \ln \frac{\beta\left(A\left(\frac{K+K^*}{1+\beta}\right)^{\alpha}N^{-\alpha} - \theta\right)}{1+\beta}\frac{1}{p} \tag{2.24}$$

where p stands for the new price of the Turkish good after accession when there is free capital mobility, which writes as

$$p = \frac{\beta^{1-\alpha}AN^{1-\alpha}}{\mu A^* N^{*1-\alpha}}.$$

Now we will compare two different alternatives. In the first one, capital is mobile only after Turkey's accession; in the second one, capital is mobile both before and after accession. Solving equation (2.8) for θ for equations (2.16) and (2.24) for the first alternative and equations (2.23) and (2.24) for the second alternative gives:

$$\tilde{\theta} = AN^{-\alpha}\left[\left(\frac{K+K^*}{1+\beta}\right)^{\alpha} - \left(K\left(\frac{\frac{K^*}{K}}{\beta\mu^{1/\alpha}}\right)^{\beta/(1+\beta)}\right)^{\alpha}\right], \tag{2.25}$$

$$\bar{\theta} = AN^{-\alpha}\left(\frac{K+K^*}{1+\beta}\right)^{\alpha}\left(\frac{\mu^{\beta/(1+\beta)}-1}{\mu^{\beta/(1+\beta)}}\right), \tag{2.26}$$

where $\tilde{\theta}$ is the level of transfer when there is no capital mobility before accession and there is capital mobility after accession and $\bar{\theta}$ is the level of transfer when there is already capital mobility prior to accession.

Proposition 2. *Assuming capital mobility before accession, there exists a unique positive* $\bar{\theta}$ *given by equation* (2.26)*, which is the solution to equation (2.8) if and only if* $\mu > 1$*.*

Proposition 2 is clear from equation (2.26) and it suggests that the utility loss of the European household due to the lump-sum transfer can only be compensated by an increase in μ, which reaffirms the discussion of Proposition 1. Hence, if capital markets have already been integrated prior to Turkey's accession, the result derived in the previous section is the same as the one derived in this section. A value of μ higher than 1 leads to a decline in the price of the Turkish good, and thus improves the utility of the European household, offsetting her utility loss due to the transfer. Not surprisingly, the higher μ, the higher the drop in the price of the Turkish good, and accordingly, the higher the level of transfer ($\bar{\theta}$) that the European household is willing to give.

Proposition 3. *Assuming no capital mobility before accession, there exists a unique positive* $\tilde{\theta}$ *given by equation* (2.25)*, which is the solution to equation (2.8) if and only if* $\mu \geq 1$*.* $\tilde{\theta}$ *is higher than* $\bar{\theta}$ *for any* $\mu \geq 1$*.*

Proof: See Appendix 2.7.2

Proposition 3 implies that capital markets integration upon Turkish accession enables the European household to improve her utility even if TFP shift does not arise in Turkey. Moreover, a TFP increase in Turkey accompanied by free capital mobility further increases her utility, thereby raising the level of transfer. Since a TFP increase in Turkey is required for $\bar{\theta}$ to exist, $\tilde{\theta}$ is higher than $\bar{\theta}$ for any value of μ, which is equal or bigger than 1. Also notice that capital mobility is favorable for the EU, irrespective of which direction capital flows, either to Turkey or to the EU. This result follows from free trade between Turkey and the EU. Since each good is consumed by each country's households, an increase in any of the country's stock of capital, and therefore in that country's production level raises the utility level of both countries' households. However, if capital markets were already integrated before accession, the benefits of the capital mobility would be reaped prior to the membership of Turkey and thus capital mobility would have no effect on the level of transfer.

In this subsection we have compared two accession alternatives of Turkey to the EU. In the first alternative, accession brings about an increase in Turkish TFP as well as a transfer payment from the EU to Turkey. In the second alternative, accession does not only lead to above mentioned changes but also leads to free capital mobility between the countries. We have seen that the maximum level of transfer that the representative European household is willing to give is lower in the first accession alternative. As a result, first accession alternative where there is already free capital mobility before accession appears to be unfavorable to be admitted to the Union.

2.5 Policy Implications for Turkey

Turkey liberalized its capital account in 1989. As Turkish nationals were permitted to purchase foreign securities and to borrow abroad without government permission, foreigners could buy Turkish securities and could open Turkish Lira accounts convertible into foreign exchange. After capital account liberalization, capital inflows to Turkey increased steadily after 1990, with net capital inflows reaching more than 4 percent of GDP in 1996 and 1997, and more than 6 percent of GDP in 2004 and 2005 (See Figure 2.1).[5]

While portfolio investments, deposits, loans and trade credits constitute the bulk of capital inflows, Foreign Direct Investment (FDI) performance never reached 1 percent of GDP apart from the exceptional year of 2001[6]. According to policy makers the Foreign Investment Law No: 6224, which was enacted in 1954 was insufficient to induce the inflows of FDI. To this end, in 2003 New Foreign Capital Law was introduced in order to make the investment environment more efficient and suitable for potential foreign investors by guaranteeing the transfer of capital gains, fees, royalties and dividends. Moreover, sectors that foreign capital operates were enlarged and free trade zones were created where foreign capital were allowed to operate without restrictions Dutz, Us, and Yilmaz (2005). After the law went into effect, a discernible progress has been observed in FDI performance. Indeed, net FDI flows reached 2.4 percent of GDP in 2005.

By capital account liberalization and New Foreign Capital Law, Turkey seemed to lay down the regulations required for free capital mobility before its accession into the EU. Our model envisages that capital markets integration adds to the utility of the European household irrespective of the direction of capital flows. Nevertheless, if capital markets integration takes place before candidate country's admission into the Union, the European household would benefit from the utility enhancing effect of free capital mobility prior to the accession of the candidate member country and would have no incentive to give a transfer. Since Turkey has abolished all capital controls first by capital account liberalization and second by Foreign Capital Law, the incentive of the EU to give a transfer to Turkey turns out to diminish according to our model.

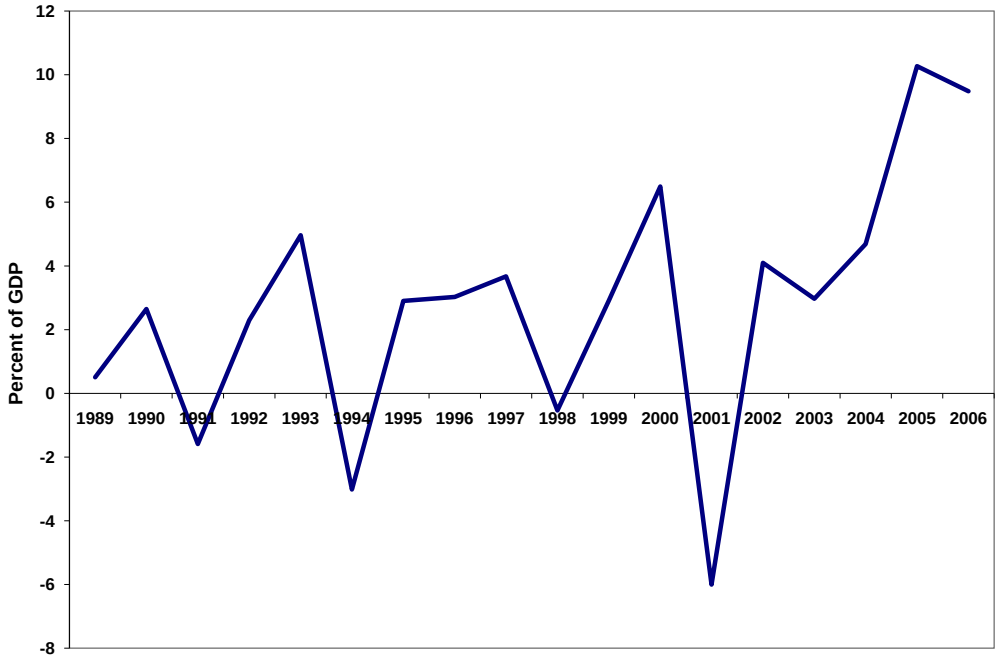
2.6 Variants of the Model

In this section we introduce two variations into our model and analyze how our previous results are affected.

[5]Data is obtained from the Central Bank of Turkey Statistics Database and United Nations National Accounts Main Aggregates Database

[6]The reason for this year's high performance compared to that of average is due to the sales revenue of third GSM license, sale of a Savings Deposit and Insurance Fund bank to a foreign bank and finally the sale of equity ownership of domestic automotive producer to the foreign partner.

Figure 2.1: Net Capital Flows (Percent of GDP)



2.6.1 Model with capitalists and workers

In the first variant of the model, we distinguish between workers and capitalists in both of the countries to discuss the effect of accession on two different groups. In this model workers earn only wage and capitalists earn only interest.

Production is made through a Cobb-Douglas constant returns to scale technology:

$$\begin{aligned} Y &= A(KN_c)^{\alpha}N_w^{1-\alpha}, \\ Y^* &= A^*(K^*N_c^*)^{\alpha}N_w^{*1-\alpha}. \end{aligned}$$

where N_c and N_w are the number of capitalists and workers in the EU, respectively. Number of Turkish capitalists and workers are denoted by *. After accession both groups in the EU give lump-sum transfer (θ) to the Turkish capitalists and workers. On the other hand, TFP

increases in Turkey upon accession ($\mu > 1$). The following model represents the case after accession. Thus, notice that θ is set to zero and μ is set to one before acession.

The representative European capitalist maximizes

$$U_c = \ln c_c^E + \beta \ln c_c^T. \tag{2.27}$$

subject to the budget constraint

$$\frac{RK}{N_c} - \theta = c_c^E + pc_c^T.$$

The first order conditions for the European capitalist are

$$\begin{aligned} c_c^E &= \frac{RK/N_c - \theta}{1+\beta}, \\ c_c^T &= \frac{\beta(RK/N_c - \theta)}{p(1+\beta)}. \end{aligned}$$

The representative European worker maximizes equation

$$U_w = \ln c_w^E + \beta \ln c_w^T. \tag{2.28}$$

subject to

$$w - \theta = c_w^E + pc_w^T$$

The first order conditions for the European worker yield:

$$\begin{aligned} c_w^E &= \frac{w-\theta}{1+\beta}, \\ c_w^T &= \frac{\beta(w-\theta)}{p(1+\beta)}. \end{aligned}$$

The representative Turkish capitalist maximizes the following utility function

$$U_c^* = \ln c_c^{*E} + \beta \ln c_c^{*T}. \tag{2.29}$$

subject to

$$\frac{pR^*K}{N_c^*} + n\theta = c_c^{*E} + pc_c^{*T}$$

The first order conditions are

$$\begin{aligned} c_c^{*E} &= \frac{pR^*K^*/N_c^* + n\theta}{1+\beta}, \\ c_c^{*T} &= \frac{p\beta R^*K^*/N_c^* + n\theta}{p(1+\beta)}. \end{aligned}$$

The representative Turkish worker maximizes equation

$$U_w^* = \ln c_w^{*E} + \beta \ln c_w^{*T}. \tag{2.30}$$

subject to

$$w + n\theta = c_w^{*E} + pc_w^{*T}$$

The first order conditions for the Turkish worker are:

$$\begin{aligned} c_w^{*E} &= \frac{w+n\theta}{1+\beta}, \\ c_w^{*T} &= \frac{\beta(w+n\theta)}{p(1+\beta)}. \end{aligned}$$

Demand schedules for for labor and capital in the EU are

$$\begin{aligned} R &= \alpha A K^{\alpha-1} N_c^{\alpha} N_w^{1-\alpha}, \\ w &= (1-\alpha) A (KN_c)^{\alpha} N_w^{-\alpha}. \end{aligned}$$

Symetrically, for Turkey we have:

$$\begin{aligned} R^* &= \alpha A^* K^{*\alpha-1} N_c^{*\alpha} N_w^{*1-\alpha}, \\ w^* &= (1-\alpha) A^* (KN_c)^{*\alpha} N_w^{*-\alpha}. \end{aligned}$$

Goods market clears subject to the following equation

$$Y = N_c c_c^E + N_w c_w^E + N_c^* c_c^E + N_w^* c_w^{*E}$$

which equates total consumption of the European good in both countries to the production of the European good.

When goods market clear p reads as

$$p = \beta \frac{A(KN_c)^{\alpha} N_w^{1-\alpha}}{A^*(K^*N_c^*)^{\alpha} N_w^{*1-\alpha}}.$$

We can write the utility level of the representative European capitalist before and after accession, respectively as follows

$$U_c = (1+\beta)\ln\left(\frac{\alpha Y/N_c}{1+\beta}\right)+\beta\ln\left(\frac{Y^*}{Y}\right), \tag{2.31}$$

$$\hat{U}_c = (1+\beta)\ln\left(\frac{\alpha Y/N_c-\theta}{1+\beta}\right)+\beta\ln\left(\frac{\mu Y^*}{Y}\right). \tag{2.32}$$

The transfer that equates these two utility levels is

$$\theta_c = \frac{\alpha Y}{N_c}\left(\frac{\mu^{\beta/(1+\beta)}-1}{\mu^{\beta/(1+\beta)}}\right).$$

The utility levels of the representative European worker before and after accession are represented as follows

$$U_w = (1+\beta)\ln\left(\frac{(1-\alpha)Y/N_w}{1+\beta}\right)+\beta\ln\left(\frac{Y^*}{Y}\right), \tag{2.33}$$

$$\hat{U}_w = (1+\beta)\ln\left(\frac{(1-\alpha)Y/N_w-\theta}{1+\beta}\right)+\beta\ln\left(\frac{\mu Y^*}{Y}\right). \tag{2.34}$$

The transfer that equates these two utility levels is

$$\theta_w = \frac{(1-\alpha)Y}{N_w}\left(\frac{\mu^{\beta/(1+\beta)}-1}{\mu^{\beta/(1+\beta)}}\right).$$

Let us now move to the comparison between θ_c and θ_w. The condition for θ_c to be higher than θ_w is as follows

$$\theta_c > \theta_w \qquad iff \qquad \frac{\alpha}{1-\alpha}\frac{N_w}{N_c} > 1. \tag{2.35}$$

Condition (2.35) states that, if the capital share in the production of the EU good is lower than the labor share, the number of workers must be sufficiently higher than the number of capitalists so that the capitalists would be willing to give away more transfer than the workers for the same increase in Turkish TFP. In other words, if the interest income is higher than the wage income, θ_c will be higher than θ_w.

So far in this subsection we have assumed that there is already capital mobility between the EU and Turkey before accession. Now we will assume that capital is mobile only after accession and will compare these two cases for the maximum level of transfer both for the capitalist and the worker.

New capital levels upon capital markets integration in the EU and Turkey are S and S^* as in equations (2.21) and (2.22). Replacing K and K^* with S and S^* in equation (2.32) and (2.34) to find the utility levels of the European capitalist and worker after accession and solving equation (2.8) for θ_c and θ_w gives

$$\begin{aligned}
\tilde{\theta}_c &= \alpha A N_c^{\alpha-1} N_w^{1-\alpha} \left[\left(\frac{K+K^*}{1+\beta} \right)^{\alpha} - \left(K \left(\frac{\frac{K^*}{K}}{\beta \mu^{1/\alpha}} \right)^{\beta/(1+\beta)} \right)^{\alpha} \right], \\
\tilde{\theta}_w &= (1-\alpha) A N_c^{\alpha} N_w^{-\alpha} \left[\left(\frac{K+K^*}{1+\beta} \right)^{\alpha} - \left(K \left(\frac{\frac{K^*}{K}}{\beta \mu^{1/\alpha}} \right)^{\beta/(1+\beta)} \right)^{\alpha} \right].
\end{aligned}$$

Notice that the expression in brackets in $\tilde{\theta}$, $\tilde{\theta}_c$, and $\tilde{\theta}_w$ is the same. Hence proposition (3) holds also for $\tilde{\theta}_c$, and $\tilde{\theta}_w$ confirming the intuition that capital mobility increases the welfare of the households irrespective of the direction of the capital flows. Indeed, there is a positive transfer both for the European capitalist and the European worker eventhough TFP does not rise in Turkey. This results from the positive effect of capital mobility on the utility of the European household.

Comparing $\tilde{\theta}_c$ and $\tilde{\theta}_w$, we find that the condition for $\tilde{\theta}_c$ to be higher than $\tilde{\theta}_w$ is the same as condition (2.35). Capital mobility has the same effect on the utility of the European capitalist and the worker so that the condition under which the maximum level of transfer that the European capitalist is willing to give is higher than the worker does not change.

2.6.2 Different Preferences

In the previous sections we have assumed that the European household and the Turkish household enjoy the same preference for the Turkish good. However the preference for the Turkish good is not necessarily the same in the EU and Turkey. In such a case, each representative European and Turkish household maximizes the same utility as in equations (2.14) and (2.15) except that β is now specific to each type of household:

$$\begin{aligned}
U &= \ln c^E + \beta^E \ln c^T, \\
U^* &= \ln c^{*E} + \beta^T \ln c^{*T}
\end{aligned}$$

where β^E is the preference parameter for the Turkish good for the European household and β^T is the preference parameter for the Turkish good for the Turkish household. We choose to normalize the preference term for the European good. We therefore express β^E and β^T in terms of the preference for the European good. The budget constraints to the household problems are represented by equations (2.17) and (2.18). Notice that the model below represents the

case after accession. Hence, θ is set to zero and μ is set to one for the case before accession. We also assume that there is already capital mobility before accession.

Then the first order conditions become:

$$\begin{aligned} c^E &= \frac{w + RK/N - \theta}{1+\beta^E}, \\ c^T &= \frac{\beta^E(w + RK/N - \theta)}{p(1+\beta^E)}, \\ c^{*E} &= \frac{p(w^* + R^*K^*/N^*) + n\theta}{1+\beta^T}, \\ c^{*T} &= \frac{\beta^T(pw^* + R^*K^*/N^* + n\theta)}{p(1+\beta^T)}. \end{aligned}$$

Obviously, the higher the European household's preference for the Turkish good, β^E, the more her consumption of the Turkish good, c^T, will be.

Price equation becomes

$$p = \frac{\beta^E Y(1+\beta^T) + \theta N(\beta^T - \beta^E)}{(1+\beta^E)\mu Y^*}. \tag{2.36}$$

Equation (2.36) shows that after accession not only an increase in μ but also the transfer from the EU to Turkey, θ, has an effect on the price of the Turkish good. Notice that the transfer from the EU to Turkey reduces the price of the Turkish good if and only if $\beta^E > \beta^T$. In fact, Samuelson (1952) showed that in a competitive, two-good, two-country model, price of the import good for the transfer paying country decreases if and only if its marginal propensity to consume its import good is greater than that of the recipient. We may think that marginal propensities represent preferences between Turkish and European goods of a representative household of each country. Comparing the ratios c^E/c^T and c^{*E}/c^{*T} also gives this intuitive result.

To summarize there are two mechanisms that affect the price of the Turkish good in terms of the European one after accession: TFP increase in Turkey and the transfer from the EU to Turkey. While the TFP increase reduces the price of the Turkish good as it improves the efficiency of production in Turkey, the transfer causes the price to decrease if and only if $\beta^E > \beta^T$. The second mechanism highlights that rising θ has not only the direct effect of reducing the utility of the Europeans, but it has also an indirect price effect on European utility.

We can write the utility level of the representative European household before and after accession, respectively as follows

$$
\begin{aligned}
U &= \ln\left(\frac{Y}{N(1+\beta^E)}\right) + \beta^E \ln\left(\frac{Y^*}{N(1+\beta^T)}\right), \\
\hat{U} &= (1+\beta^E)\ln\left(\frac{Y/N-\theta}{1+\beta^E}\right) + \beta^E \ln\left(\frac{\beta^E(1+\beta^E)\mu Y^*}{\beta^E Y(1+\beta^T)+\theta N(\beta^T-\beta^E)}\right).
\end{aligned}
$$

The proposition below summarizes the results that are drawn by solving equation (2.8) for θ that is the maximum level of transfer when the European household is indifferent between the two utility levels.

Proposition 4. *There exists a positive θ, which is the solution to problem (2.8) if $\mu > 1$ and $\beta^T > \beta^E$.*

Proof: See Appendix 2.8.3

The negative and direct effect of the transfer on the utility of the European household can be outweighted by the positive effect of the decline in the price of the Turkish good. Proposition (4) states that a sufficient condition to outweight the negative effect of the transfer on the utility of the European household is a TFP increase in Turkey coupled with the indirect positive effect of the transfer that leads to a decrease in the price. Hence, provided that $\mu > 1$, if European households prefer Turkish good more than Turkish households, there is a positive θ. Otherwise, μ must be sufficiently high to dominate both the direct and the indirect negative effect of the transfer on the utility.

2.7 Conclusion

Our aim in this paper is to show first whether a TFP increase in Turkey following its accession to the EU compensates for the cost of transfers and second whether free capital mobility before accession is unfavorable for admission to the Union.

We have assumed that the European household gives a lump-sump transfer to the Turkish household, whereas TFP increases in Turkey because of the positive effect of accession on institutional development after Turkey's membership to the EU. Thereafter, we have found the level of transfer that would make the European household indifferent towards Turkey's accession. There is a direct positive link between the production, and thus a TFP increase in Turkey and the utility of the European household under the assumption of free trade between countries, which makes available the consumption of the Turkish good in the EU without any additional cost. In this regard, an increase in Turkey's TFP lowers the price of the Turkish good, which leads to an improvement in the utility of the European household, and accordingly compensates for the cost of the transfer. Thus, we have shown that a TFP increase in Turkey

after its accession may compensate for the negative effect of transfers, thereby eliminating one of the economic obstacles to Turkey's admission into the Union.

To give an answer to the second question, we have analyzed the effects of capital markets integration on the level of transfer. Capital mobility after accession, which accompanies the TFP increase, further improves the utility of the European household, leading to an increase in the maximum transfer level that the European household would be willing to give. In fact, capital markets integration increases the European household's utility irrespective of the direction of capital flows. This result again follows from the positive relationship between Turkey's production and the utility of the European household. Nevertheless, capital mobility has no effect on the level of transfer, if it is allowed before accession. In this case, European households would already profit from capital mobility through an increase in their utility before Turkey's accession.

Several extensions may undoubtedly enrich the model. For example, it would be interesting to see the effect of a gradual increase in TFP in the aftermath of Turkey's accession on the variables of the model in a dynamic setting. Besides, endogenizing TFP would improve the quality of the model. These issues are left for future research.

2.8 Appendix

2.8.1 Proof of Proposition 1

When equation (2.8) holds, we have

$$\underbrace{(\beta A+\theta)A^{2/\beta}}_{f(x)} = \underbrace{\beta\mu(A-\theta)^{(2+\beta)/\beta}}_{f(y)}$$

$$\begin{aligned} f^{'}(x) &= A^{2/\beta} > 0 \\ f^{'}(y) &= -(2+\beta)\mu(A-\theta)^{2/\beta} < 0 \end{aligned}$$

When $\theta = 0$,

$$\begin{aligned} f(x) &= \beta A^{(2+\beta)/\beta} \\ f(y) &= \beta\mu A^{(2+\beta)/\beta} \end{aligned}$$

There is an intersection point between these two functions, and hence a unique solution to equation (2.8) if $f(y) > f(x)$ when $\theta = 0$. Thus, μ should be higher than 1 $(\mu > 1)$.‖

2.8.2 Proof of Proposition 3

It is easy to see that there exists a positive $\tilde{\theta}$ when $\mu = 1$, if and only if the following inequality holds:

$$\frac{K+K^*}{1+\beta} > K\left(\frac{\frac{K^*}{K}}{\beta}\right)^{\beta/(1+\beta)}. \tag{2.37}$$

To prove this inequality, we must show that these two functions have only one intersection point and the function on the right hand side is concave. Since $\beta = \frac{K^*}{K}$ is the only intersection point, the next step is to prove the concavity of the right hand side function.

A continuous and differentiable function is concave in a variable, if its second derivative with respect to this variable is smaller than 0. Let us say that $\frac{K^*}{K} = x$. Hence, the function becomes

$$f(x) = \left(\frac{x}{\beta}\right)^{\beta/1+\beta}.$$

The second derivative yields

$$f''(x) = -\frac{\beta^{1/(1+\beta)}}{(1+\beta)^2} \quad x^{(-2-\beta)/(1+\beta)} < 0,$$

which gives the result.

To show that $\tilde{\theta}$ is higher than $\bar{\theta}$, we can arrange equation (2.26) in the form:

$$\bar{\theta} = AN^{-\alpha}\left[\left(\frac{K+K^*}{1+\beta}\right)^{\alpha} - \left(\left(\frac{K+K^*}{1+\beta}\left(\frac{1}{\mu^{1/\alpha}}\right)^{\beta/(1+\beta)}\right)^{\alpha}\right)\right].$$

Now, it is easier to notice that $\tilde{\theta}$ is higher than $\bar{\theta}$ when $\mu = 1$ as long as condition (2.37) holds. Since we have proved this condition above, $\tilde{\theta}$ is higher than $\bar{\theta}$ for any value of μ, which is equal or higher than 1.‖

2.8.3 Proof of Proposition 4

When equation (2.8) holds, we have

$$\underbrace{\left(\frac{Y/N}{Y/N-\theta}\right)^{(1+\beta^E)/\beta^E}}_{f(x)} = \underbrace{\frac{\beta^E Y(1+\beta^T)\mu}{\beta^E Y(1+\beta^T)+\theta N(\beta^T-\beta^E)}}_{f(y)}$$

$$\begin{aligned} f'(x) &= -\frac{Y}{N}\left(\frac{Y/N}{Y/N-\theta}\right)^{\frac{\beta^E}{1+\beta^E}} < 0 \\ f'(y) &= -\frac{\mu\beta^E Y(1+\beta^T)N(\beta^T-\beta^E)}{\left(\beta^E Y(1+\beta^T)+\theta N(\beta^T-\beta^E)\right)^2} \end{aligned}$$

Notice that $f'(y) > 0$, if and only if $\beta^E > \beta^T$. When $\theta = 0$,

$$\begin{aligned} f(x) &= 1, \\ f(y) &= \mu. \end{aligned}$$

There is an intersection point between these two functions, and hence a solution to equation (2.8) if $f(y) > f(x)$ when $\theta = 0$. Thus, μ should be higher than 1 ($\mu > 1$).‖

Chapter 3

Worthy Transfers? A Dynamic Analysis of Turkey's Accession to the European Union *

3.1 Introduction

The possible entry of Turkey into the European Union raises more than an eyebrow. If many objections have a political flavour, one of them concerns an economic aspect: transfers. As a new member state with a GNP per capita which is 30 percent lower than the EU-15 average (Lejour and de Mooij (2005)), Turkey would be a net recipient of EU harmonization funds. Such a perspective is obviously hard to swallow for many incumbents, not keen to see their net transfers from Brussels diminished again, only a few years after the 2004 enlargement.

This paper adopts a dynamic general equilibrium (DGE) perspective to explore whether this objection to the accession of Turkey to the European Union is well-founded. The idea is that mechanisms may exist such that the general equilibrium effect of Turkey's entry into the European Union may compensate, or even outweigh the negative effect of transfers from incumbent members to Turkey. The aim of this paper is to scrutinize the quantitative relevance of some of these mechanisms.[1]

Our analysis stems from the probable improvement of Turkish institutions due to the full adoption of the Copenhagen criteria. Following the widespread literature (Acemoglu and Johnson (2005), Dawson (1998), Klein and Luu (2003), North (1990)), we accept the hypothesis that better institutions prompt better economic performance. To model this view in a DGE framework in the specific case of Turkey, we assume that accession to the European Union will push Turkish total factor productivity (TFP) up.

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[1]Ertan Özgüzer (2007) develops an analytical model that deals with the same issue in a static set up.

In this context, we build a two-country DGE model similar to those pioneered by Backus, Kehoe, and Kydland (1994). Turkey and the European Union are modelled as two countries trading in goods. To mimic the resource transfer from the European Union to Turkey, we shall assume that the EU household pays a lump-sum transfer to the Turkish one in the aftermath of the enlargement.[2] Such a transfer is modelled as proportional to the output gap between the EU-25 and Turkey, with the proportionality factor estimated from the data.

We shall first study the price-effect of a TFP increase in Turkey, assuming factor immobility. The idea is that a TFP increase in Turkey will cause the price of Turkish exports to decrease, thereby positively affecting the utility of Europeans. This effect operates through two channels. First, the price decrease directly affects consumption, inducing both an income effect (EU consumers get richer) and a substitution effect (Turkish goods cost relatively less). Second, hours worked in the European Union change as a consequence of the shift in production.

By means of numerical simulations, we assess both the direction and the quantitative importance of these effects. We then compare them with the welfare effects due to the transfer. In fact, the transfer also influences the terms of trade, and entails significant general equilibrium effects. This exercise allows us to estimate how big the induced TFP increase must be to fully compensate the Europeans for the transfer. We then extend the model to the case of perfect capital mobility, to verify whether mobile capital can affect the transmission mechanism of the model. It turns out that it does, and significantly so.

The results show that, within the assumptions made in this paper, Turkey's accession to the European Union might be beneficial for European citizens, provided that TFP in Turkey increases enough (23 percent of the initial gap, in the model with no capital mobility; 47 percent, in that with capital mobility).

The remainder of this paper is structured as follows. Section 3.2 describes the two-country model economy. In Section 3.3, we present the calibration of the parameters and discuss the results of the simulations. Section 3.4 discusses the TFP-convergence hypothesis, in terms of both theory and empirical evidence. Section 3.5 draws together the threads of the argument and advances some conclusions.

3.2 The Benchmark Model

We model the European Union and Turkey within a two-good, two-country DGE framework similar to Backus, Kehoe, and Kydland (1994). Each country produces one good, denoted as

[2] If accession takes place, Turkey will benefit from both the structural and the cohesion EU funds, which are typically granted for specific objectives or specific projects, in order to help backward regions in the Union. The EU Treaties' definition of a backward region is a region whose per capita income is less than 75 percent of the EU average. Since all the Turkish regions qualify for funds according to this criterion (Griffiths (2004)), our lump-sum transfer assumption is an innocuous simplification for the sake of analytical tractability.

Y for the European Union and Y^* for Turkey, using a constant-return-to-scale Cobb-Douglas production function:

$$y_t = e_t^z (k_t)^\alpha (l_t)^{1-\alpha}, \tag{3.1}$$

$$y_t^* = e_t^{z^*} (k_t^*)^{\alpha^*} (l_t^*)^{1-\alpha^*}. \tag{3.2}$$

In the expression above, lowercase variables stand for per capita (i.e. $y_t = \frac{Y_t}{N_t}$ and $y_t^* = \frac{Y_t^*}{N_t^*}$), and subscripts for time; k is capital, l hours worked, and the scale factor e^z is total factor productivity (TFP). Turkish variables are denoted by *.

We choose one unit of the European good as the numéraire. We shall therefore denote as p_t the price in period t of one unit of Y^*, expressed in terms of Y.

Both goods can be consumed in both countries. The representative European household can consume both the European, (c^E), and the Turkish (c^T) good. Aggregate consumption per-capita in the EU, c, is

$$c_t = (c_t^E)^\gamma (c_t^T)^{1-\gamma}, \tag{3.3}$$

where $0 < \gamma < 1$. Accordingly, for the representative Turkish household we have

$$c_t^* = (c_t^{*E})^{\gamma^*} (c_t^{*T})^{1-\gamma^*}, \tag{3.4}$$

with $0 < \gamma^* < 1$. The variables c^j and c^{*j}, for $j = E, T$, stand for the goods produced in country j and consumed by European and Turkish households, respectively.[3] Total real expenditures on consumption in the EU can be written as follows:

$$p^c c = c^E + p c^T \tag{3.5}$$

where p^c is defined as the European consumption price index. Symetrically, for Turkey we have:

$$p^{*c} c^* = c^{*E} + p c^{*T} \tag{3.6}$$

where p^{*c} is defined as the consumption price index in Turkey.

We assume free trade between countries and perfect competition.[4]

[3] Assuming a Cobb-Douglas aggregator is tantamount to assuming $\sigma = 1$ in an Armington aggregator of the kind

$$c_t = \left[\gamma (c_t^E)^{\left(\frac{\sigma-1}{\sigma}\right)} + (1-\gamma)(c_t^T)^{\left(\frac{\sigma-1}{\sigma}\right)}\right]^{\frac{\sigma}{\sigma-1}}.$$

In this formulation, σ stands for the elasticity of substitution between the home and foreign good. The empirical evidence about its value is controversial. Typical macroeconomic estimates of σ in the United States range from 1 to 2. Backus, Kehoe, and Kydland (1994) and Chari, Kehoe, and McGrattan (2002) set $\sigma = 1.5$, while Corsetti, Dedola, and Leduc (2008) choose a lower value of 0.85. We run a sensitivity analysis to verify the robustness of our results to changes in the assumed form of the Armington aggregators. For every simulation presented in this paper, two additional models are simulated, one with $\sigma = \sigma^* = 0.5$, and the other with $\sigma = \sigma^* = 1.5$. As expected, the higher the complementarity between the home and foreign goods, the less powerful is the terms-of-trade transmission mechanism highlighted in this paper.

[4] A customs union between Turkey and the EU has been in place since Janury 1996. It involves the abolition of customs duties, the abolition of charges on industrial and processed agricultural products, the abolition of quotas, as well as a common tariff towards third countries. Turkey also adopted most of the EU commercial and competition policies.

Labour and capital are assumed to be internationally immobile. Population growth is set to zero in both countries. We call n the ratio of the European to the Turkish population ($n = \frac{N}{N^*}$), which is therefore assumed to be constant.

3.2.1 The Optimal Solution

The infinitely-living representative European household maximizes its lifetime expected utility

$$\max_{\{c^E_{t+s}, c^T_{t+s}, l_{t+s}, a_{t+s}\}} V_t = \sum_{t=0}^{\infty} \beta^s \left[\ln c_{t+s} + \varphi \ln(1 - l_{t+s})\right], \tag{3.7}$$

with respect to $c^E_{t+s}, c^T_{t+s}, l_{t+s}, a_{t+s}$ subject to the budget constraint and wealth accumulation equation

$$a_{t+1} = (1 - \delta)a_t + s_t, \tag{3.8}$$

$$a_t = k_t, \tag{3.9}$$

$$y_t - \theta_t \geq c^E_t + p_t c^T_t + s_t. \tag{3.10}$$

In Problem (3.7), we have chosen a log-log utility function. The parameter β is the intertemporal discount factor, while φ is the preference for leisure. The variable a stands for assets, s for savings. Equation (3.8) is the law of motion of wealth, with δ being its (constant) depreciation rate. In this model, we have assumed that all savings are invested in financial assets and capital is not mobile across countries. Equation (3.9) ensures that domestic financial wealth is wholly invested in domestic capital. Equation (3.10) is the budget constraint equating disposable income to expenditure. In the latter, we have modelled the per-capita transfer from the EU to Turkey, (θ), as a lump-sum direct transfer from the European to the Turkish representative household.

We can now write the Langrangian as

$$L = \left\{ \sum_{s=0}^{\infty} \beta^s U(c_{t+s}, l_{t+s}) + \lambda_{t+s} \left[y_{t+s} - \theta - c^E_{t+s} - p_t c^T_{t+s} - a_{t+s+1} + (1 - \delta)a_{t+s} \right] \right\}.$$

The first order conditions of this problem are given by

$$\begin{aligned}
\frac{\partial L}{\partial c^E_{t+s}} &= \beta^s \frac{\gamma}{c^E_{t+s}} - \lambda_{t+s} = 0, \\
\frac{\partial L}{\partial c^T_{t+s}} &= \beta^s \frac{(1-\gamma)}{c^T_{t+s}} - \lambda_{t+s}\, p_t = 0, \\
\frac{\partial L}{\partial l_{t+s}} &= -\beta^s \frac{\varphi}{1-l} + \lambda_{t+s}\left[(1-\alpha)\, e^z (a)^{\alpha} (l)^{-\alpha}\right] = 0, \\
\frac{\partial L}{\partial a_{t+s}} &= \lambda_{t+s}\left[\alpha\, e^z (a)^{\alpha-1} (l)^{1-\alpha}\right] - \lambda_{t+s-1} = 0.
\end{aligned}$$

From the conditions for $\partial L/\partial c^E_{t+s}$ and $\partial L/\partial c^T_{t+s}$, and setting $s = 0$, we obtain the European demand for each variety of good as a function of both its relative price and aggregate consumption:

$$c^E_t = \gamma p^c_t c_t, \tag{3.11}$$

$$c^T_t = (1-\gamma)\left(\frac{p^c_t}{p_t}\right) c_t. \tag{3.12}$$

The price index p^c_t is written as

$$p^c_t = \frac{p_t^{1-\gamma}}{(1-\gamma)^{1-\gamma}\, \gamma^{\gamma}}. \tag{3.13}$$

The first order conditions for $\partial L/\partial l_{t+s}$ and $\partial L/\partial a_{t+s}$ will yield

$$\frac{1}{c_t}\left(\frac{p_t}{p^c_t}\right) = \beta \frac{1}{c_{t+1}}\left(\frac{p_{t+1}}{p^c_{t+1}}\right)(1 + \alpha\, e^z_{t+1} (a_{t+1})^{\alpha-1} (l_{t+1})^{1-\alpha} - \delta), \tag{3.14}$$

$$\frac{\varphi}{1-l_t} = \frac{1}{c_t p^c_t}(1-\alpha) e^z (a)^{\alpha} (l)^{-\alpha}. \tag{3.15}$$

Equation (3.14) is the Euler equation governing the intertemporal allocation of consumption. Equation (3.15) is the European labour supply.

The representative Turkish household maximizes its lifetime expected utility

$$\max_{\{c^{*E}_{t+s}, c^{*T}_{t+s}, l^*_{t+s}, a^*_{t+s}\}} V^*_t = \sum_{t=0}^{\infty} \beta^{*s}\, [\ln c^*_{t+s} + \varphi^* \ln(1 - l^*_{t+s})], \tag{3.16}$$

with respect to $c^{*E}_{t+s}, c^{*T}_{t+s}, l^{*}_{t+s}, a^{*}_{t+s}$ subject to the budget constraint and wealth accumulation equation

$$a^{*}_{t+1} = (1-\delta)a^{*}_{t} + s^{*}_{t}, \tag{3.17}$$

$$a^{*}_{t} = k^{*}_{t}, \tag{3.18}$$

$$y^{*}_{t} + \theta^{*}_{t} \geq c^{*E}_{t} + p_t c^{*T}_{t} + s^{*}_{t}. \tag{3.19}$$

Writing the Langrangian and solving the symmetric problem for Turkey yields

$$c^{*E} = \gamma^{*} p^{*c} c^{*}, \tag{3.20}$$

$$c^{*T} = (1-\gamma^{*}) \left(\frac{p^{*c}}{p} \right) c^{*}, \tag{3.21}$$

$$p^{*c} = \frac{p^{1-\gamma^{*}}}{(\gamma^{*})^{\gamma^{*}} (1-\gamma^{*})^{(1-\gamma^{*})}}. \tag{3.22}$$

$$\frac{1}{c^{*}_{t}} \left(\frac{p_t}{p^{*c}_{t}} \right) = \beta^{*} \frac{1}{c^{*}_{t+1}} \left(\frac{p_{t+1}}{p^{*c}_{t+1}} \right) \left(1 + \alpha^{*} e^{z*}_{t+1} (a^{*}_{t+1})^{\alpha^{*}-1} (l^{*}_{t+1})^{1-\alpha^{*}} - \delta \right), \tag{3.23}$$

$$\frac{\varphi^{*}}{1-l^{*}_{t}} = \frac{1}{c^{*}_{t} p^{*c}_{t}} \left(1-\alpha^{*}\right) \left(1-\alpha^{*}\right) e^{z*} (a^{*})^{\alpha^{*}} (l^{*})^{-\alpha^{*}}. \tag{3.24}$$

3.2.2 Equilibrium Conditions

To finish the model, we need to specify the equilibrium conditions. For the trade balance between Turkey and the European Union, we assume

$$p_t c^{T}_{t} - \frac{1}{n} c^{*E}_{t} + \theta_t = i_t - s_t, \tag{3.25}$$

where

$$i_t = k_{t+1} - (1-\delta) k_t, \tag{3.26}$$

stands for the European investment in physical capital. Equation (3.25) is the standard balance of payment equilibrium which equates trade surplus, or deficit, to the difference between investment and saving. This condition also ensures equality between the supply and demand for all goods. Since we assume that capital is not mobile across countries in the benchmark model, the right-hand-side of Equation (3.25) turns out to be zero.

Finally, although households in both countries perceive the amounts θ and θ^* as a lump-sum transfer, we want them to be correlated with the output gap between the two countries, and therefore endogenously determined by the model. In the following, we assume

$$\theta_t^* = b(y_t - p_t y_t^*), \tag{3.27}$$

$$\theta = \frac{\theta_t^*}{n}, \tag{3.28}$$

where Equation (3.28) scales the transfer to take the difference between the populations of the European Union and Turkey into account.

As households do not take Equations (3.27) and (3.28) into account in solving the optimization problem, the transfer acts here as an externality.

3.3 Worthy Transfers? The Dynamic Impact of a TFP Increase in Turkey

Equipped with the benchmark model developed in the previous section, we can assess quantitatively whether, in a European perspective, enlargement of the EU to include Turkey is welfare enhancing, and therefore worth the price of the resource transfer. Specifically, in this section we study the theoretical and quantitative implications of a TFP increase in Turkey for the EU in the aftermath of the enlargement. The idea is that adherence to the Copenhagen criteria leads to a generic improvement in the Turkish institutions, which in turn increases TFP in the model.

3.3.1 Calibration and Simulation

In order to simulate the model, we first need to calibrate the structural parameters. Table 3.1 illustrates our choices. The 'Target' column reports the reference variable used for the calibration of each parameter. We also report initial capital stock values for both of the countries.

The unit period is the year.

The capital shares α and α^* are set equal to one minus the labor-income shares in the EU-27 and Turkey, respectively, as measured by the European Commission (European Commission (2007)) The parameter γ indicates the proportion of the EU produced good in the European consumption bundle.

Given that imports from Turkey amount to 3 percent of total European imports, 52 percent of which are consumption goods, and total imports constitute 71 percent of consumption

Parameter	*Value*	*Target*
k_0	5.33	Steady state value of capital in the EU
k_0^*	3.19	Steady state value of capital in Turkey
α	0.43	Labour income share in the EU
α^*	0.47	Labour income share in Turkey
γ	0.988	Share of European consumption good imports from Turkey
γ^*	0.104	Share of Turkish consumption good imports from the EU
β	0.96	Real interest rate in the model in the EU
β^*	0.96	Real interest rate in the model in Turkey
δ	0.1	Depreciation rate of capital in the RBC literature
φ	1.64	Steady-state hours in the model in the EU
φ^*	1.59	Steady-state hours in the model in Turkey
b	0.007	Regression of net transfers on the GDP gap for the EU-25
n	6.4	Population ratio between the EU and Turkey
ρ	1.35	Steady state level of z^*

Table 3.1: Calibration of the parameters

expenditures in the EU, we take this to mean that 98.8 percent of total European consumption does not come from Turkey (Eurostat (2007)).[5] While calibrating γ^*, we use a different method. It is a well-known fact that domestic production in Turkey relies heavily on imported intermediate goods (See for instance Boratav (2010) and Yukseler and Turkan (2008)). Moreover, the EU is dominant in Turkey's imports of high technology and value added products, most of which are intermediate goods. In fact, taking only the share of final consumption goods in total imports to calculate the share of European consumption goods in Turkish consumption basket would underestimate the significance of EU imports. For this reason, while calibrating γ^*, we do not take only European consumption goods but also European intermediate goods used to produce consumption goods in Turkey.[6]

The preferences for leisure, φ and φ^*, are calibrated so that both l and l^* are 1/3 in the pre-accession steady state. The depreciation rate of capital, δ, is set to 0.1, a common value in the literature (Kydland and Prescott (1982)). We gave both β and β^* the same 0.96 value,

[5]Data for the share of consumption goods in imports from Turkey and and the share of imports coming from Turkey in total imports are obtained from `http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113456.pdf`. We take food, drinks, tobacco, and other manufactured goods as consumption goods.

[6]Yukseler and Turkan (2008) has calculated the ratio of imported intermediate goods to consumption goods as 0.21 for 2006. We borrow this ratio to calculate the share of imported intermediate goods in Turkish consumption. The share of consumption goods in total imports is 11.6 percent in 2006 according to the data obtained from State Planning Organization of Turkey. Using total consumption expenditures and total imports data from Central Bank of Turkey, we find the share of imported consumption goods in consumption basket of Turkey. Since imports from the EU constitute 40.8 percent of total imports to Turkey, we assume 40.8 percent of imported consumption goods come from the EU and calculate γ^* accordingly.

which guarantees a net real interest rate of about 4 percent in both countries. Therefore, we have assumed that both EU and Turkey are initially at steady state. Table 3.1 reports steady state capital stock values in the EU and in Turkey.

We calibrated the parameter b, the sensitivity of the transfer to the output gap, by regressing the net per-capita transfers received in 2005 by each EU-25 country on the gap between the average EU-25 GDP per capita and the country's GDP per capita. Table 3.2 shows the output from the regression.

Regressor	Coefficient	S. E.	t stat.	p-value
GDP gap	0.00794759	0.00249689	3.1830	0.0040

Mean dependent variable	25.49415	S.D. dependent variable	141.2745
Sum of squared residuals	348243.7	S.E. of regression	120.4581
R^2	0.296836	Adjusted R^2	0.296836
$F(1, 24)$	10.13145	P-value(F)	0.004002
Log-likelihood	−154.7457	Akaike criterion	311.4915
Schwarz criterion	312.7103	Hannan–Quinn	311.8295

Table 3.2: Calibration of b using an OLS regression with the net transfers as the dependent variable

The parameter n is computed by taking the ratio of the EU-25 population to Turkey's population (Eurostat (2007)). Finally, to model the post-accession Turkish TFP increase, we assume that TFP grows monotonically along an S-shaped path, until the (exogenous) catch-up process is over.

$$z_t^* = \rho z_{t-1}^* (1 - z_{t-1}^*) + \epsilon_t \tag{3.29}$$

The parameter ρ governs the curvature of the function, and the steady-state level of z^*.

3.3.2 Comments on Results

We simulated how the model reacts to a positive productivity shock in Turkey. The shock is such that the TFP gap between Turkey and the EU is reduced by half at the post-enlargement final steady state. Specifically, the model starts with the steady-state productivity levels $z = 0.47$ and $z^* = 0$. This means that at the pre-accession steady state, the Turkish TFP is set equal to 62.5 percent of the European one, which roughly corresponds to the TFP gap between Turkey and France in the data (Eicher, Garcia-Peñalosa, and Teksoz (2006)).[7] According to our catch-up hypothesis, the new steady state after enlargement is characterised by $z^* = 0.26$, which implies that the Turkish TFP has increased to 81.05 percent of the European.

[7]We use France as representative of the EU average.

Assuming that there are no transfers before accession, b is set to 0 at the initial steady state. After accession, Turkey starts to receive transfers from the European Union, according to Equation (3.27), with $b = 0.007$. We assume that households know the entire sequence of shocks.

Figures 3.1, 3.2, and 3.3 display the results of this simulation. Notice that the graphs of Turkish variables have a larger scale. This is because the effect of the shocks on the Turkish variables is greater. European variables are not affected by the shocks as much as Turkish variables do.

There are two impulse mechanisms in this model; the transfer from the European Union to Turkey, and the assumed post-accession TFP increase in Turkey. Both have an effect on p, the price of the Turkish good in terms of the European one, although in opposite directions. While the TFP increase reduces the price of the Turkish good, because it enhances the efficiency of production in Turkey, the unilateral lump-sum transfer causes p to increase. The increase in p is the standard terms-of-trade effect found in the international trade literature (see Devereux and Smith (2007), Djajic, Lahiri, and Raimondos-Moller (1998) and Galor and Polemarchakis (1987), among others), in a model with capital immobility, and no international borrowing or lending.

At the beginning of the simulation, the impact of the transfer from the EU to Turkey is the dominant impulse mechanism. It induces a negative income effect in the EU and thus a fall in the European consumption. On the other hand, the transfer has a positive impact on the price index, diminishing the value of the marginal utility of future consumption. The return on capital rises (see Equation (3.14)), making saving more attractive. The fall in consumption leads to a rise in the number of hours worked, and a drop in wages. The utility of the European household decreases.

As expected, the transfer has the opposite initial impact on the Turkish variables.

Due to the assumed S-shaped path of the TFP catch-up by Turkey, the TFP growth gains momentum as time passes, and finally dominates the transfer effect, leading to a fall in the Turkish price after the first decade. Eventually, the terms of trade, p, decrease by more than 30 percent.

The drop in the relative price of the Turkish good explains the increase in the demand for the Turkish good both in Turkey and in the EU. While European and Turkish agents substitute the cheaper Turkish good for the more expensive European one, the Europeans will also be experiencing a positive income effect, as now their own good buys more units of the Turkish one. Eventually, these effects almost cancel out. The European household also experiences a negative income effect due to the transfer payment to the Turkish household. These three effects together explain why the European demand for its own consumption good, c^E, ('ceu' in the graphs) stays constant after an initial drop, in spite of its increasing price. Symmetrically, a negative income effect will affect Turkish households. Such a negative income effect is counterbalanced by the sudden transfer that the Turkish agents receive from the European

Union, and by the gradual improvement of their own TFP. On the whole, these contrasting influences result in a sudden increase of c^{*E} ('ceustar' in the graphs), the demand for the European consumption good by the representative Turkish household, that reaches the new steady state immediately, and then stays roughly constant around it.

Aggregate consumption rises in both countries. However the increase in consumption is much higher in Turkey than in the European Union. As well as being a consequence of the demand patterns for the EU and the Turkish good discussed above, such behaviour also depends on the different values assigned to γ and γ^* in Equations (3.3) and (3.4). As c^T represents a small share of total consumption in the EU, its variations only have a small effect on c. On the other hand, c^* is affected by small variations in c^{*E}, due to its relatively high value in the consumption bundle of the Turkish household.

A peculiarity of this model with immobile capital is that both labour and wealth (capital) in Europe adjust immediately to the new steady-state level, leaving the behaviour of consumption after the initial period to be explained by variations of the terms of trade. In other words, labour- and capital-related variables in Europe are influenced by the transfer, but not by the TFP increase in Turkey.

However, the TFP increase in Turkey does affect the capital and labor dynamics there. The reason for such a different reaction of labour and capital in the two countries is that the terms of trade cannot affect the production side of the European economy, while the TFP increase that causes the variation in the terms of trade has, by definition, direct effects on production in Turkey.

After the initial jump, transfers from the EU to Turkey follow an almost constant pattern. Figure 3.3 plots the dynamics of the transfer ('thetastar' in the graphs) as the percentage of Turkish output. The positive level of the transfer in the final steady state stems from two assumptions: first, that the two countries are asymmetric; and, second, that Turkey will not completely catch up with Europe in terms of productivity.

Figure 3.3, shows both the behaviour of the instantaneous utility function (u) and the intertemporal utility function (V) of the EU household. Instantaneous utility decreases slightly in the initial post-accession years, to increase thereafter. Intertemporal utility shows a clearly increasing pattern. We also compare the life-cycle utility after enlargement with the counterfactual case of no accession. To carry out this exercise, we chose an horizon of 300 periods, after which the value of the discount rate β^t is approximately zero, for $\beta = 0.96$. Then, we computed

$$\Delta_u = \sum_{t=1}^{300} \beta^t u_t - \left(\sum_{t=1}^{300} \beta^t \bar{u} \right), \tag{3.30}$$

where $\bar{u}$ is the constant steady state level of utility, the one that Europeans would have enjoyed, had no enlargement occurred (and had no transfer been paid). We got $\Delta_u > 0$, meaning that, conditional on the assumptions we have made in this exercise, Europeans would be better off, if Turkey were admitted to the European Union. In fact, consumption process of the

European household would increase by 0.5 percent and Turkish household's gain in terms of consumption would be 33 percent, if enlargement occurred.

As an additional quantitative exercise, we computed the necessary increase in Turkish TFP for the Europeans to be indifferent towards the accession of Turkey to the European Union (i.e. to get $\Delta_u = 0$). It turns out that, within the framework considered here, the Europeans are indifferent, if Turkish TFP rises from 62.5 percent to 71.1 percent of European TFP, i.e. if the initial TFP gap is reduced by 23 percent.

3.3.3 Capital Mobility

So far we have assumed that capital does not move between the European Union and Turkey. For all its being a useful simplification, such an assumption is nonetheless at variance with the available evidence. Turkey liberalised capital flows as early as 1989. In 2003, the New Foreign Capital Law was introduced, so as to facilitate foreign direct investment (FDI) in the country. In 2007, Turkey received 2.5 percent of the total EU-25 FDI, and its market integration index was 1.9, compared with a value of 3.5 for the EU-25[8].

In this section, we relax the immobile capital assumption. That is, households of both countries now have direct access to the ownership of capital in the other country. In terms of the benchmark model, we substitute

$$\alpha \, e_t^z (a_t)^{\alpha-1} (l_t)^{1-\alpha} = \alpha^* e_t^{z*} (a_t^*)^{\alpha^*-1} (l_t^*)^{1-\alpha^*}, \tag{3.31}$$

and

$$a_t + \frac{1}{n} p_t a_t^* = k_t + \frac{1}{n} p_t k_t^*, \tag{3.32}$$

for Equations (3.9) and (3.18).

Equation (3.32) implies that the sum of the value of assets in Turkey and the EU must equal the aggregate value of capital. Capital market equilibrium (Equation 3.31)) requires that the rates of return on capital are the same in the two countries.

This new formulation makes a distinction between saving (the variation in the stock of assets) and investment (the variation in the stock of capital). Whenever the former exceeds the latter, domestic households own capital in the foreign country, and vice versa. Accordingly, the right-hand-side of Equation (3.25) is no longer constrained to be zero, meaning that countries can experience unbalanced trade accounts. The equality between interest rates ensures that agents will exhaust all the arbitrage possibilities.

[8]Data are from Eurostat, `http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database`. The market integration index is the average of inward and outward FDI flows divided by gross domestic product (GDP). The index measures the intensity of investment integration within the international economy.

The simulation exercise is the same as before. We started from the pre-accession steady state, and we assumed that after accession, half of the TFP gap between Turkey and Europe is closed, while the Europeans start to pay the transfer. Figures 3.1 to 3.3 display the simulation results.

The behavior of the model with capital mobility differs from the no-capital-mobility case. The increase in European consumption is now short lived. As Turkish productivity gains momentum, there is a reversal of the pattern of the terms of trade. The European household starts to invest in Turkey, which implies a shift from a trade deficit to a trade surplus. The reversal in the terms of trade comes from the no-arbitrage condition in Equation (3.31). When the growth of TFP starts to decrease, the return on capital in Turkey in terms of the Turkish good (i.e. the physical marginal productivity of capital in Turkey), starts to diminish. This implies that the price of the Turkish good must increase so as to equalize the rates of return between Turkey and the EU in terms of the European good. Consumption and investment in Turkey both increase appreciably. Such an increase, coupled with the progressive reversal of the terms of trade depreciation implies a widening trade deficit for Turkey.

Finally, capital mobility facilitates a stronger catch up by Turkey on Europe, as witnessed by the decreasing pattern of the transfer after the initial post-accession jump.

The general equilibrium effects considered so far imply that the pattern of the instantaneous utility of the European household is again non-monotone, and as a whole it is less affected than in the case of no capital mobility. Intertemporal utility again shows an increasing pattern. Still, by computing Equation (3.30), we obtained $\Delta_u > 0$, thereby confirming our previous results that, conditional on the assumptions we have made so far, the Europeans would be better off if Turkey entered the European Union. Specifically, European household's welfare gain in terms of consumption is 0.1 percent, which is lower than the value found in the benchmark case. Turkish household's consumption process, on the other hand, rises by 35 percent.

Finally in the case of capital mobility, the required TFP increase in Turkey to make the Europeans indifferent towards the accession of Turkey to the European Union is much bigger than in the previous case. It turns out that $\Delta_u = 0$ if the Turkish TFP goes from 62.5 percent to 80.25 percent of European TFP, meaning a 47 percent closure of the TFP gap.[9]

3.3.4 Sensitivity Analysis

Throughout this paper we have made the assumption that the TFP gap between Turkey and the EU is reduced by half at the post-enlargement steady state. This section discusses the

[9]In an exercise not shown in the text, we considered a model where agents anticipate the future accession of Turkey to the European Union in 15 years. The results show only a little qualitative change and no quantitative change. The TFP increase in Turkey necessary to make the Europeans indifferent between accession and no-accession in both of the cases does not change.

robustness of the previous findings to our assumption. Thus we carry out two alternative experiments, in one of which the TFP gap between Turkey and the EU is reduced by 90 percent and in the other one, it decreases by 10 percent. Figures 3.4, 3.5, and 3.6 display the results of the simulation exercise for 90 percent TFP gap catch-up of Turkey and Figures 3.7, 3.8, and 3.9 demonstrate those of the exercise where TFP gap is reduced by 10 percent. We recalibrated ρ, the parameter which governs the curvature of the TFP growth path, for each of the experiment. The benchmark experiment and the two alternative experiments make very similar predictions for the behaviour of the variables. However, due to the assumed S-shaped path of the TFP growth during the catch-up process, the pace of the variables' reaction to the TFP shock is different. In the benchmark experiment, TFP starts to increase 10 years after the accession and reaches its steady state value in 30 years. This makes all variables react initially at around year 10. In the 90 percent catch-up exercise, however, TFP rises very rapidly after the accession, reaching its steady state value in 20 years. Therefore, the variables react earlier than predicted in the benchmark experiment. For the same reason, variables react more slowly in 10 percent TFP catch-up exercise. It takes almost 30 years for the TFP growth to gain momentum in this experiment.

As expected, 90 percent TFP gap catch-up of Turkey leads to a greater quantitative change in both European and Turkish variables. In the same way, the magnitude of the response of variables is much smaller in the 10 percent TFP gap catch-up experiment.

In the 90 percent TFP gap catch-up exercise, European household's welfare gain expressed in terms of consumption is 0.7 percent in the case of no capital mobility and 0.3 percent, in that of capital mobility. Therefore, European household's utility gain rises as the TFP gap between the EU and Turkey closes. Yet, a 10 percent TFP gap catch-up is not sufficient to make the Europeans better off. We already know that the minimum TFP gap catch-up required to make the Europeans better off is 23 percent in the model with no capital mobility and 47 percent, in that with capital mobility. The results of this exercise show that European household's consumption process decreases by 0.8 percent, in the case of no capital mobility and by 0.02 percent, in that of capital mobility, if the TFP gap closure is only 10 percent.

To measure the role of transfers on capital accumulation in Turkey, we have also carried out an exercise, where Turkey does not receive transfers from the EU after enlargement, i.e. θ^*=0. The results show that capital accumulation in Turkey is higher when Turkey does not receive transfers from the EU in the aftermath of the enlargement. This stems from the fact that lump-sum transfers act mainly on Turkish consumption through its positive income effect.[10]

[10]In fact, EU funds can support real convergence to the extent that they encourage investment and productivity since the large GDP per capita gap between member countries and the EU average is the consequence of the new member countries' low TFP and capital stock. For instance, Gaspar and Pereira (1995) and Pereira and Gaspar (1999) find that transfers have a positive effect on recipient member countries' growth and thus on convergence in the EU. We have abstracted our analysis from the possible direct impact of transfers on TFP and investment of the recipient country.

3.4 The TFP-convergence Hypothesis

Throughout this paper, we have made two fundamental assumptions: first, Turkish accession to the European Union will improve Turkish institutions, and second, this institutional improvement can be proxied by relative TFP growth in Turkey. In this section we shall discuss these two hypotheses.

The first hypothesis, namely that Turkish institutions will improve in the bid for the EU membership is hardly controversial. Candidate countries have to comply with precise formal requirements to join the European Union. More specifically, these requirements include the implementation of the so-called 'Copenhagen criteria' and a minimum level of compliance with the EU law, i.e. the 'Community *Acquis*'. The Copenhagen criteria set down the requirements about the stability of institutions guaranteeing democracy, the rule of law, the respect of human rights and the existence of a functioning market economy that member countries must meet before accession. Compliance with the Community *Acquis* means the harmonization of Turkey's laws with those of the European Union. It is verified in progressive negotiations over 35 'chapters', including intellectual property and company law, institutions, environment, education and culture.

In the process of meeting these criteria on its way towards EU membership, Turkey has already gone through major institutional changes, and many more are expected to come. Central to the idea of this paper is that this conditional process will finally lead to an overall improvement of Turkish institutions.

The fact that better institutions foster economic growth is also commonly accepted. There exists a widespread literature that emphasises the role played by institutional features such as property rights and the rule of law in enhancing economic performance (Acemoglu and Johnson (2005), North (1990), among others).

The link between such institutional developments and the growth of TFP is less evident, although, we shall argue, no less compelling. It is common wisdom among growth theorists that cross-country differences in TFP are of primary importance in accounting for cross-country income disparities (Klenow and Rodrìguez-Clare (1997), Hall and Jones (1999)). This growth-accounting result, coupled with the notion that better institutions foster economic growth, leads to the conclusion that one way in which the quality of institutions stimulates economic growth must be through its effect on TFP. A number of empirical studies have already documented the existence of a positive link between institutions and TFP growth. For instance, using the economic freedom index as an indicator of institutional quality, Dawson (1998), Ayal and Karras (1998) and Klein and Luu (2003) find that economic freedom affects economic growth through its direct effect on TFP. Similarly, Moomaw and Yang (2006) find in a sample of 12 OECD countries, 8 of which are EU members, that increases in economic freedom since 1975 are positively correlated with TFP convergence. On the basis of these results, they conclude that analogous improvements in the economic freedom of recent EU members might boost their productivity growth, thereby reinforcing their convergence process.

If the arguments above provide a solid theoretical ground for the TFP-convergence hypothesis adopted in this paper, the historical evidence concerning TFP convergence among old and new EU members is more mixed.

Kutan and Yigit (2007) find that, between 1980 and 2004, five new members of the EU-15 (Spain, Portugal, Austria, Finland and Sweden) experienced stronger TFP growth than France, which is taken as representative of the original EU countries. They conclude that the integration into the EU stimulates productivity (TFP) and growth.

Crespo Cuaresma, Ritzberger-Grünwald, and Silgoner (2008) also argue that EU membership has a convergence-stimulating effect on long-run growth. They show that the poorer the country joining the EU, the stronger the effect is. Similar conclusions are reached by Parente and Prescott (2006). Comparing the labour productivity performance of the original members of the EU with that of Western European countries that either acceded to the Union in 1995 or have not yet acceded, they conclude that EU membership fosters labour productivity growth. In particular, non-member countries in 1993 were only 81 percent as productive as the original EU countries, although they were 106 percent as productive in 1957.

These positive results are, however, far from conclusive. Salinas-Jimenez, Alvarez-Ayuso, and Delgado-Rodrìguez (2006) find that the TFP contribution to labour productivity was negative for new members of the EU-15, during the 1980-1997 period. Delgado-Rodrìguez and Alvarez-Ayuso (2008) find similar results for five different periods between 1980 and 2002. Both studies point out that most of the observed labour productivity convergence was driven by capital deepening, not TFP increase. Fare, Grosskopf, and Margaritis (2006) find evidence for labour productivity convergence within three different groups of EU countries, rather than convergence among all EU members. Moreover, they argue that the contribution of TFP to productivity growth differs from country to country, although it is negative in most places.

In short, our TFP-catching up hypothesis is not an unreasonable theoretical assumption, although it lacks definitive empirical support. It should therefore be taken for what it is: a simplifying assumption that condenses complex institutional dynamics into the variation in one parameter.

3.5 Conclusions

The accession of Turkey to the European Union is currently much debated in Europe. If the core of the debate is about political, historical and cultural issues, the main economic objection to Turkey's possible membership concerns transfers. As a new member State considerably poorer than the average EU country, Turkey would end up being a net recipient of the European structural and cohesion funds.

In this paper, we have used a two-country DGE framework to show that the negative welfare effect for Europeans induced by the transfers might be balanced, and even outweighed, by

a positive general equilibrium effect, operating through an external TFP-driven improvement of the EU terms of trade, vis-à-vis Turkey. In that case, the transfer may be a price worth paying.

Our analysis rests on the hypothesis that EU membership produces better institutions, e.g. institutions that are more favourable to growth. We have modelled this view by assuming an exogenous increasing pattern for Turkish total factor productivity after accession. While the better-institutions hypothesis is crucial to our result, we do not attach much importance to the specific way in which we have modelled it. More realistic models could be devised to make the point, for instance by adding government, and modelling the institutional improvement as a decrease in the deadweight loss due to government inefficiencies. We leave the task of enriching the institutional set up presented here to future research.

Figures

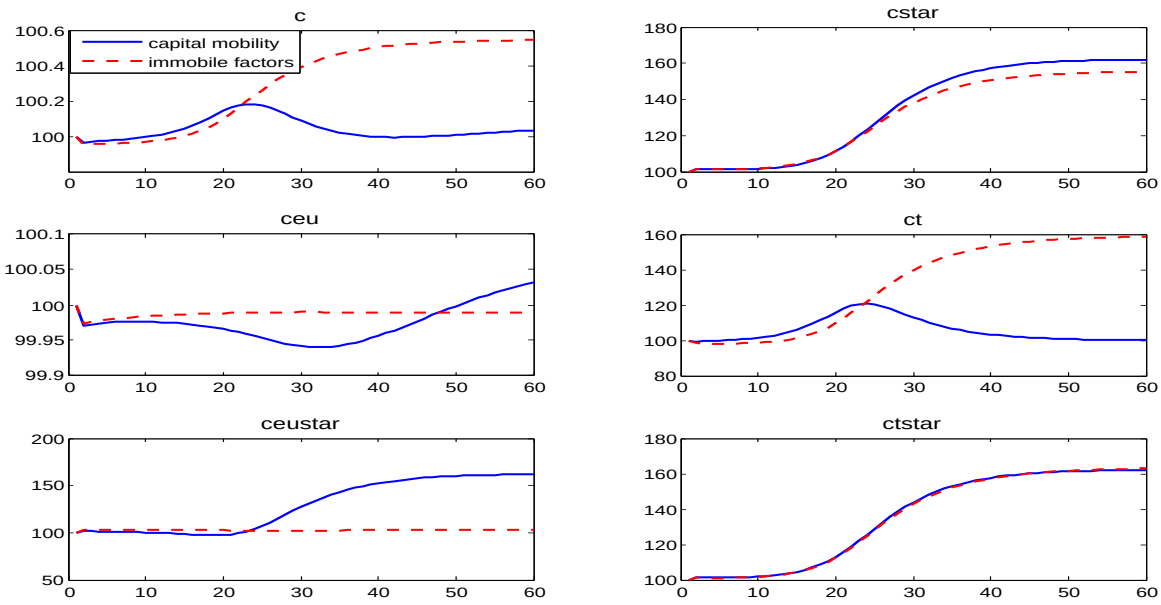

Figure 3.1: Simulation with half TFP-gap catch-up: the results of models with immobile factors and with capital mobility

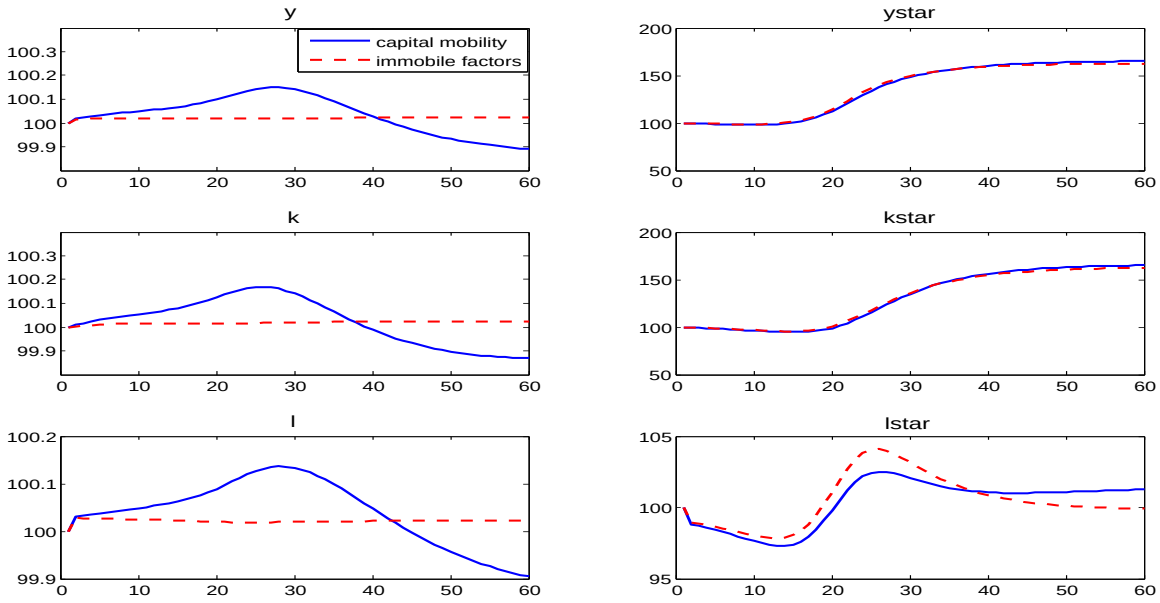

Figure 3.2: Simulation with half TFP-gap catch-up: the results of models with immobile factors and with capital mobility

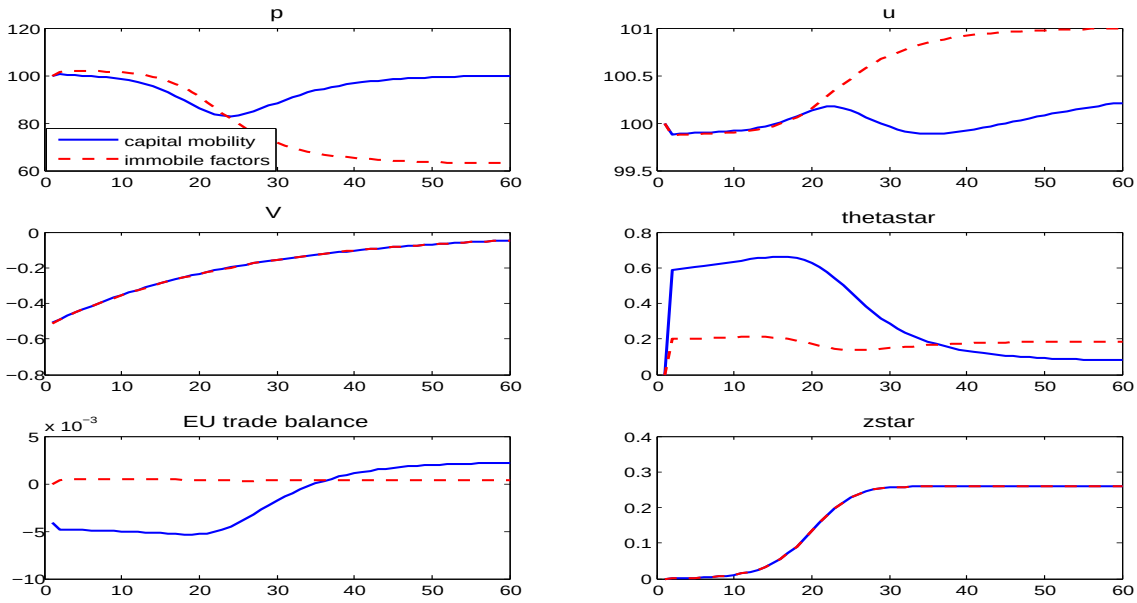

Figure 3.3: Simulation with half TFP-gap catch-up: the results of models with immobile factors and with capital mobility

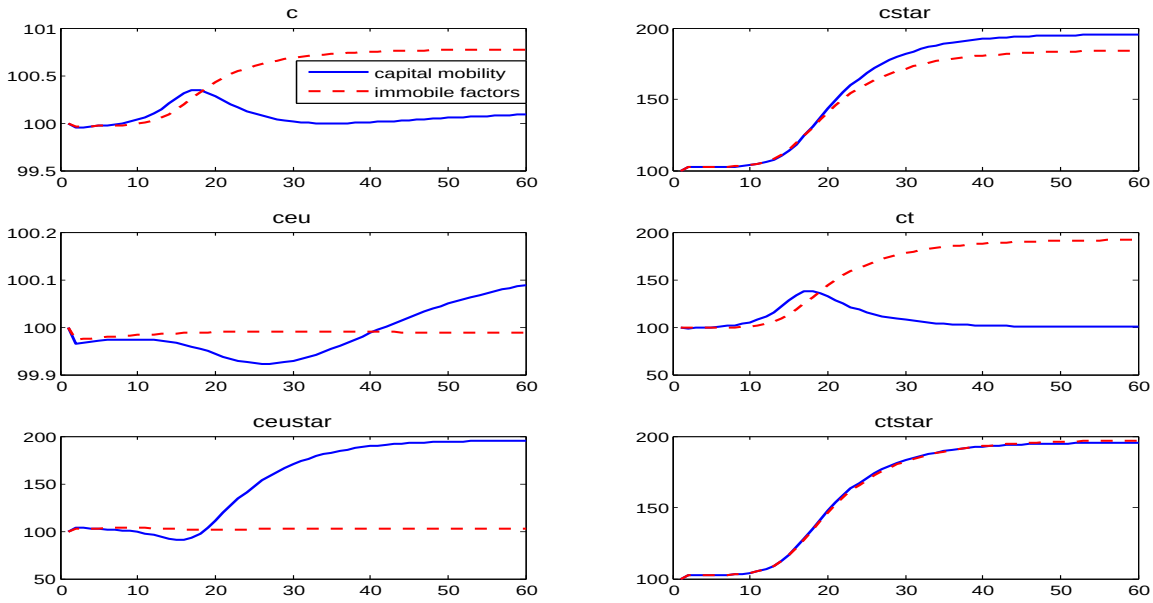

Figure 3.4: Simulation with 90% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

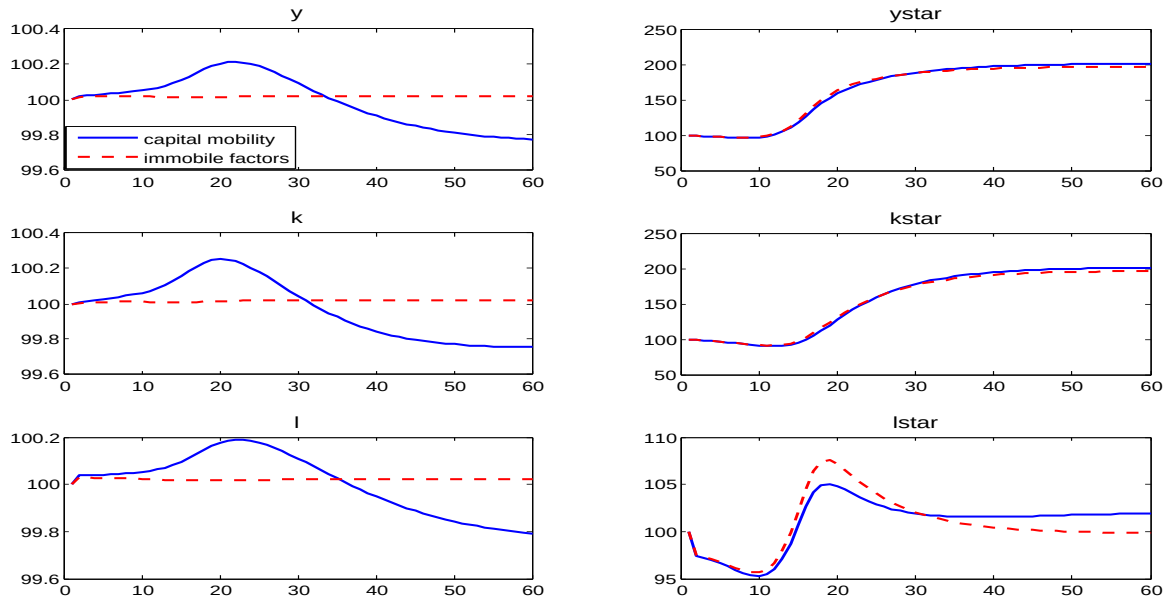

Figure 3.5: Simulation with 90% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

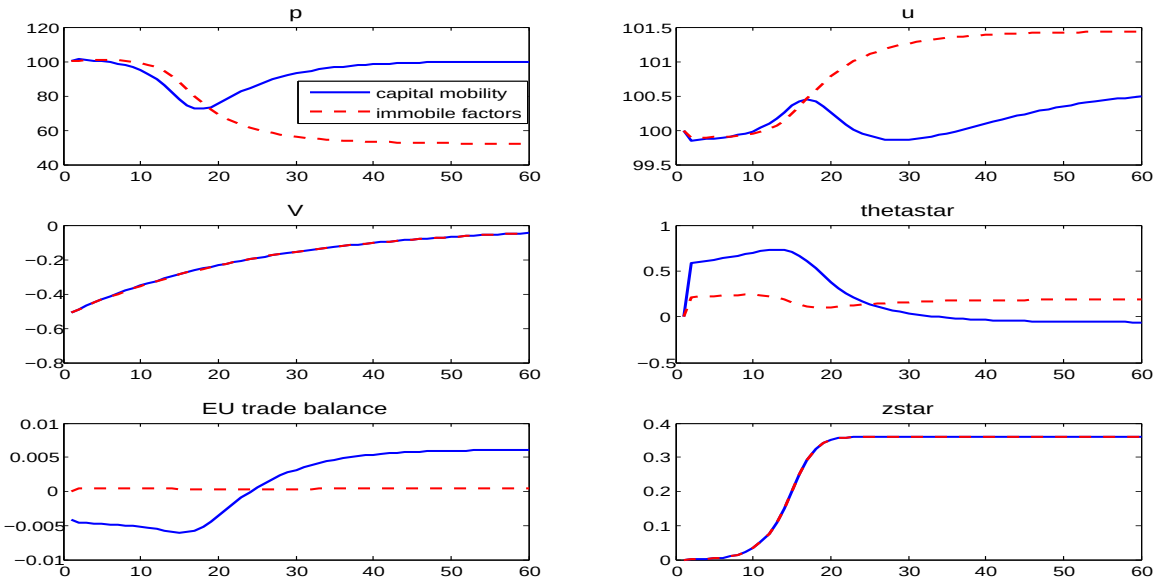

Figure 3.6: Simulation with 90% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

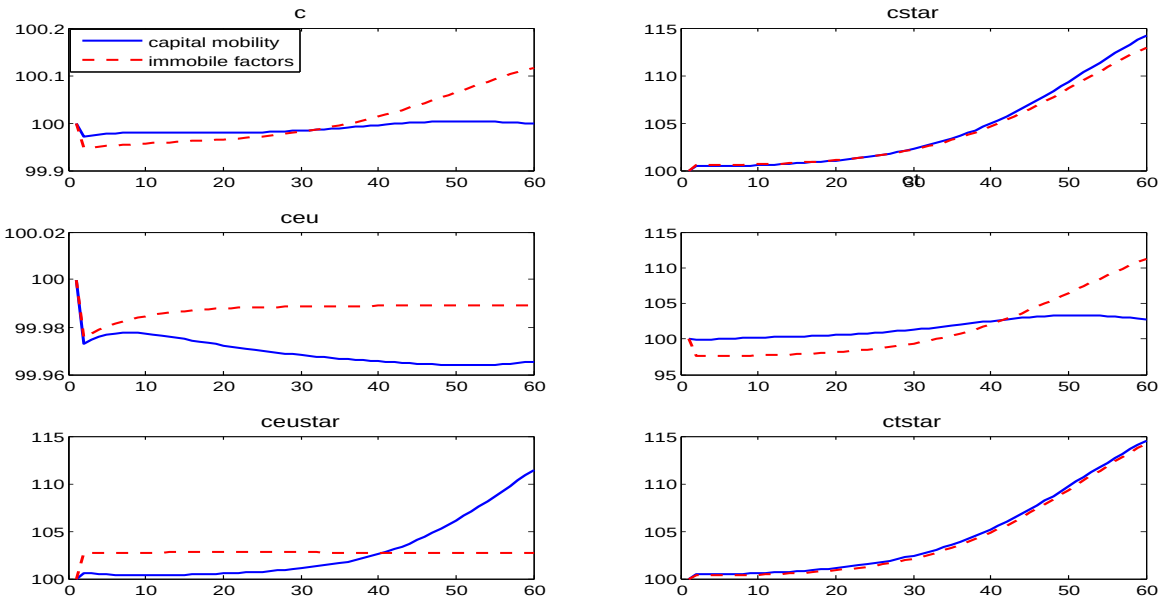

Figure 3.7: Simulation with 10% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

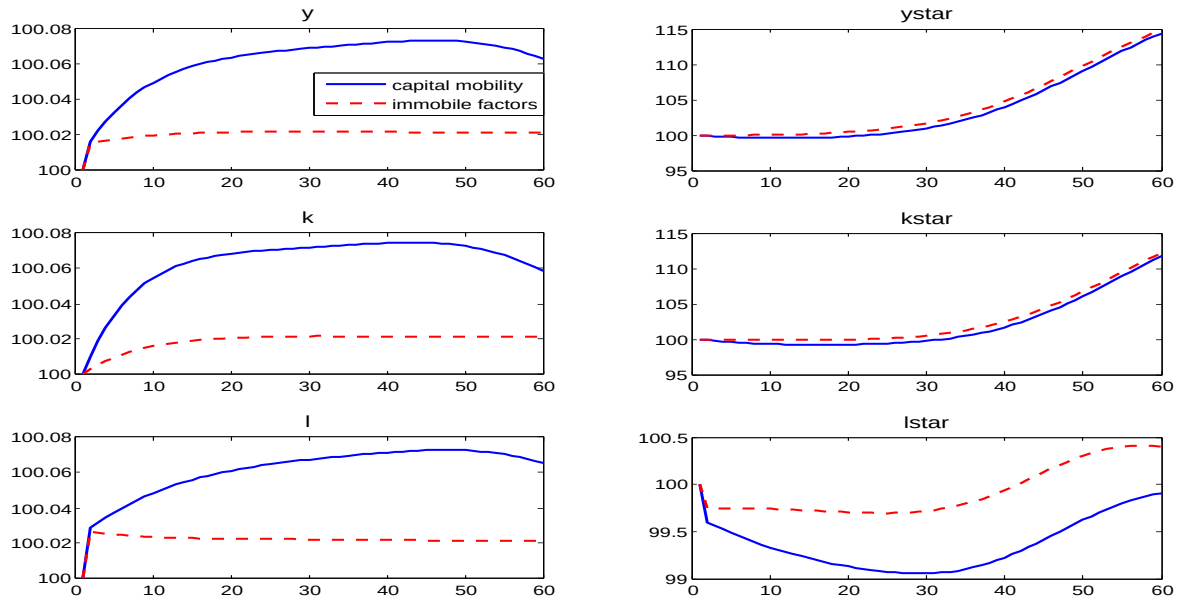

Figure 3.8: Simulation with 10% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

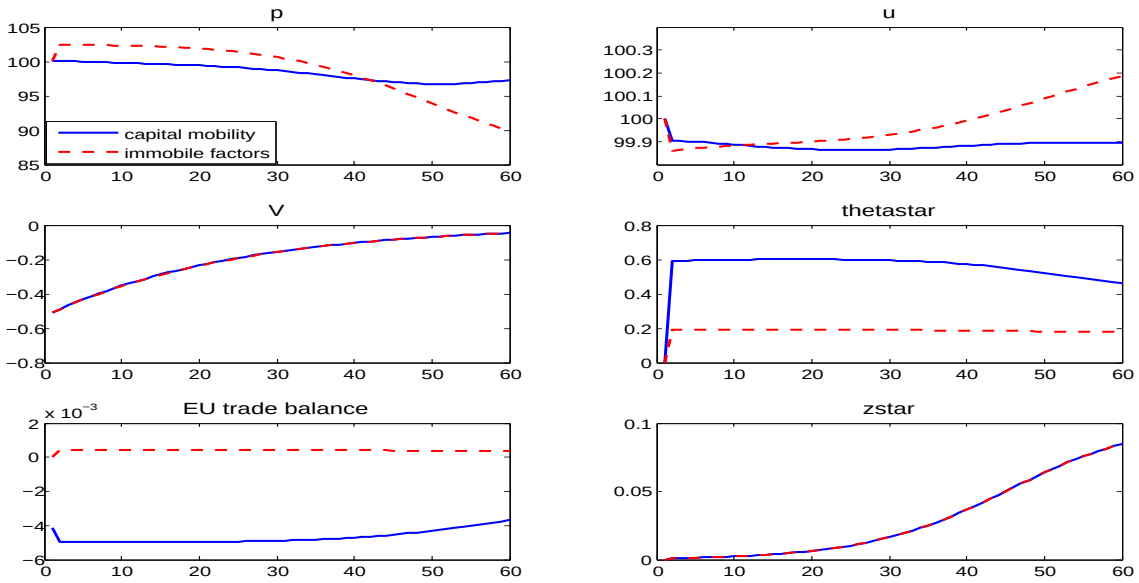

Figure 3.9: Simulation with 10% TFP-gap catch-up: the results of models with immobile factors and with capital mobility

Chapter 4

Capital Account Liberalization: The Case of Turkey

4.1 Introduction

Turkey liberalized its capital account in 1989, taking the final step of economic and financial reforms that started in the beginning of 1980s. In what follows, capital inflows and trade deficits increased remarkably, domestic currency, the Turkish lira, entered into an appreciation trend and booms and busts in Turkish economy became closely associated with capital flows. Yet, trade deficits and real exchange rate appreciations following the liberalization were reversed by trade surpluses and real exchange rate depreciations first in 1994 and then in 2001.

The purpose of this paper is to quantitatively account for the features of the Turkish economy in the aftermath of the capital account liberalization, and give a quantitative answer to the question of whether Turkish households are better or worse off due to liberalization. To this aim, we construct a two-sector dynamic general equilibrium model of a small open economy with tradable and nontradable sectors, which is similar to the one presented by Perri and Quadrini (2002).[1] The model is calibrated for Turkey, which we simulate as an economy that suddenly opens up to international capital flows.

We find that the model can capture the main dynamics of trade balances in Turkey. These results hinge on two main features of the model: first, at the year of opening to capital flows, Turkey is modeled as a capital poor economy, which has a growing working age population. Turkey starts to borrow when it opens to capital flows because it is capital poor and this borrowing persists over time because of its high population growth rate. Second, two specifications introduced exogenously into the model, the interest rate premium and the remittance flows, determine the shape of trade deficits.

[1] Perri and Quadrini (2002) uses this model to explain the Great Depression in Italy.

We then investigate the welfare effect of this capital account liberalization compared to what would have happened if the economy had not opened to capital flows. Our results show that Turkish households have a welfare gain because of this opening up. According to our model Turkish households would have to give up 26 percent of their lifecycle consumption in the open economy case in order to have the same level of welfare as in the counterfactual case of the closed economy.

Fernandez de Cordoba and Kehoe (2000) employ a two-sector dependency model to explain capital inflows after Spain's entry to the European Union where a capital poor country opens itself to capital flows. Bems and Jonsson Hartelius (2006) use the same model by incorporating interest rate risk premium on foreign loans to investigate whether Baltic states' trade deficits that occurred after their transition will become a problem. Kehoe and Ruhl (2009) consider growing working age population to analyze Mexico's financial opening as well as its sudden stop in 1994. This paper complements Kehoe and Ruhl (2009), the most recent paper among the mentioned studies in this type of literature, by modeling Turkey as a capital poor economy with a high working age population growth rate, which faces interest rate premium while borrowing. In addition to these three features that determine the shape of trade balances, there is one more striking feature pertaining to both Mexico and Turkey, which has not been taken into account by Kehoe and Ruhl (2009): flows of remittances. Considering that Turkey is a major recipient of remittances, we introduce remittances into our model and calibrate it to the data for the Turkish economy.

The remainder of this paper is structured as follows. In section 4.2 we look at Turkish data after capital account liberalization and identify some developments in Turkish economy that are associated with capital flows. We demonstrate data for trade balance, real excange rate, real GDP growth rate, and net capital flows. Section 4.3 and 4.4 present the model and its calibration. In Section 4.5 we present the results of our baseline simulations and the results of a simulation exercise, which compares the welfare of the Turkish households after opening up with the counterfactual case of the closed economy. We also demonstrate the results of the sensitivity analysis where we use alternative parameters and initial capital stocks. Section 4.6 summarizes the basic findings and concludes.

4.2 Effects of Capital Account Liberalization

In this section, we present the properties of the Turkish economy following capital account liberalization.[2] Net trade in goods and services as a percentage of GDP is presented in Figure

[2]We make a brief overview of macroeconomic effects of capital flows following liberalization, specifically focusing on GDP growth, trade deficits, and real exchange rate. To deal with structural weaknesses of the Turkish economy at the onset of capital account liberalization that pave the way for the crises in 1994 and 2001 and in turn capital outflows is beyond the scope of this paper.

4.1, which shows an increasing trend in trade deficits after liberalization.[3] Figure 4.2 plots capital flows and real GDP growth together.[4]

Capital inflows to Turkey increased steadily after 1989 reaching 13 billion dollars in the period 1992-1993 and giving rise to, predictably, trade deficits. GDP of Turkey grew by more than 4 percent each year in the beginning of the 1990s with sizable capital inflows except 1991, the year of Gulf Crisis, and 1994 when a severe currency crisis led to a contraction in Turkish GDP by almost 5 percent,[5] which simultaneously prompted net capital outflows and a trade surplus of 2.5 percent of GDP. Capital inflows to Turkey rose again after the 1994 currency crisis until the so-called Russian crisis of 1998, when there was a capital outflow from Turkey. Capital flows increased gradually in the 1999-2000 period, yet in 2001 Turkey was hit by a deep economic crisis, which triggered huge amounts of capital outflows where GDP contracted by almost 7 percent.[6]The Turkish economy recovered from the crisis attaining an average annual real GDP growth rate of 6 percent with substantial capital flows and widening trade deficits in the post-crisis period.

The series labeled RER in Figure 4.3 shows the change of the bilateral real exchange rate with Germany taking 1989, as the base year. We use nominal exchange rates and consumer price indices obtained from the International Financial Statistics (IFS) database to construct this series. We choose to present the real exchange rate with Germany, because it is the biggest trading partner of Turkey.

We define the real exchange rate for Turkey, vis-a-vis Germany, as

$$RER_{T,G,t} = NER_{T,G,t}\frac{p^C_{G,t}}{p^C_{T,t}} \tag{4.1}$$

where $NER_{T,G,t}$ is the nominal exchange rate expressed in units of Turkish Lira per DM and $p^C_{j,t}$ is the price index in country j.

We can rewrite equation (4.1) as

$$RER_{T,G,t} = \left(NER_{T,G,t}\frac{p^T_{G,t}}{p^T_{T,t}}\right)\left(\frac{p^T_{T,t}/p^C_{T,t}}{p^T_{G,t}/p^C_{G,t}}\right) = RER^T_{T,G,t}\, RER^N_{T,G,t} \tag{4.2}$$

[3]Trade balance data is obtained from balance of payments accounts of the Central Bank of Turkey and GDP series is from United Nations National Accounts Main Aggregates Database.

[4]Net capital flows to Turkey data is obtained from the balance of payments accounts of the Central Bank of Turkey and converted to constant dollars by using the producer price index for manufacturing in the USA taken from the Bureau of Labor Statistics. The base year is taken as 1989.

[5]Huge fiscal deficit combined with the effort of the government to supress interest rates while appreciating the real exchange rate led to a loss of the foreign exchange reserves and thus a sharp develuation of the currency. See Celasun (1998) for a detailed discussion.

[6]The root cause of this crisis was the combination of a fragile banking sector together with a high borrowing requirement of the public sector (Özkan (2005)).

where p^T is a price index for tradable goods. In Equation (4.2) $RER^T_{T,G,t}$ captures the price changes of tradable goods and $RER^N_{T,G,t}$ captures the price changes of nontradable goods.

We assume that law of one price holds for tradable goods, so that

$$p^T_{T,t} = NER_{T,G,t}\, p^T_{G,t}. \tag{4.3}$$

Therefore, $RER^T_{T,G,t}$ in equation (4.2) becomes 1 and changes in the real exchange rate can only result from movements in the price of nontradable goods across countries. Thus we obtain the following formula for the exchange rate by assuming that equation (4.3) holds

$$RER^N_{T,G,t} = \frac{p^T_{T,t}/p^c_{T,t}}{p^T_{G,t}/p^c_{G,t}}. \tag{4.4}$$

We will refer to this formula while calculating exchange rate in the model.

Figure 4.3 plots RER^N and RER together. We use producer price indeces for the manufacturing sector for each country. These series are obtained from IFS.

The series labeled RER in Figure 4.3 shows that capital inflows to Turkey are associated with the appreciation of the real exchange rate. This association is quite pronounced in the period after 2001. It further indicates that large capital outflows in the crisis years of 1994 and 2001 caused sharp real exchange rate depreciations in Turkey.

Figure 4.3 reveals, on the other hand, that most of the fluctuations in the real exchange rate can be explained by changes in the relative prices of tradable goods. After capital account liberalization both the real exchange rate and its nontradable componants appreciated. Notice that the two series move together: the correlation between the two series is calculated as 0.48. However, changes in nontradable goods can explain only 14 percent of the movement in the real exchange rate between 1989 and 2005. We only expect to account for the changes in the relative price of nontradables in this model.

4.3 The Model

We present a small open economy that produces two types of goods: one is nontradable and the other is tradable and serves as numeraire. The production of the tradable good can be consumed domestically or exported or used for physical capital investment while the nontradable good can be domestically consumed or used for physical capital investment. Both the tradable and nontradable sectors are perfectly competitive with firms producing homogenous goods. Firms in the tradable sector combine imported intermediate goods with the domestic value added to produce tradable goods. The law of one price holds with respect to tradable goods. The rest of the world is exogenous to the small open economy. The price of the imported good is assumed to be constant.

4.3.1 Firms

The production of nontradable goods takes place according to constant return-to-scale technologies

$$y_t^N = A_t^N (k_t^N)^{\alpha^N} (l_t^N)^{1-\alpha^N}, \tag{4.5}$$

where k^N is capital, l^N is hours worked, A^N is total factor productivity (TFP), and α^N is the share of capital in production for the nontradable sector.

Domestic tradable good producers combine an imported intermediate good f with a constant price p^M=1 and domestic value added v, according to the production function:

$$y_t^T = \left[\eta^{\frac{1}{\gamma}} (v_t)^{\frac{\gamma-1}{\gamma}} + (1-\eta)^{\frac{1}{\gamma}} (f_t)^{\frac{\gamma-1}{\gamma}}\right]^{\frac{\gamma}{\gamma-1}} \tag{4.6}$$

where η is the share of domestic value added and γ is the elasticity of substitution between domestic value added and imported inputs.

Domestic value added is produced using labor and capital as inputs:

$$v_t = A_t^T (k_t^T)^{\alpha^T} (l_t^T)^{1-\alpha^T}, \tag{4.7}$$

where k^T is capital, l^T is hours worked, A^T is total factor productivity (TFP), and α^T is the share of capital in production for the production of domestic value added.

Aggregate investment in sector $j = N, T$ is expressed as a CES index of nontradable investment, $z^{j,N}$, domestically produced tradable investment, $z^{j,T}$, and foreign investment, $z^{j,M}$.

$$i^j = \left[(\theta^j)^{\frac{1}{\sigma}} (z^{j,N})^{\frac{\sigma-1}{\sigma}} + (1-\theta^j)^{\frac{1}{\sigma}} \left((\mu^j)^{\frac{1}{\rho}} (z^{j,T})^{\frac{\rho-1}{\rho}} + (1-\mu^j)^{\frac{1}{\rho}} (z^{j,M})^{\frac{\rho-1}{\rho}}\right)^{\frac{\sigma-1}{\sigma}\frac{\rho}{\rho-1}}\right]^{\frac{\sigma}{\sigma-1}}$$

where the parameter θ^j and μ^j determine the share of investments. The elasticity of substitution between nontradable sector and a composite investment of domestically produced tradable investment and the foreign investment is σ. The parameter ρ is the elasticity of substitution between domestic tradable investment and the foreign investment.

The investment price index in sector $j = N, T$ is

$$q^j = \left[\theta^j (p^N)^{1-\sigma} + (1-\theta^j)\left(\mu^j + (1-\mu^j)(p^M)^{1-\rho}\right)^{\frac{1-\sigma}{1-\rho}}\right]^{\frac{1}{1-\sigma}}. \tag{4.8}$$

where p^N is the price of the nontraded good.

In an optimal investment plan, aggregate investment in sector $j = N, T$ is divided among nontradable investment, domestic tradable investment and foreign investment as

$$z^{j,N} = \theta^j \left(\frac{p^N}{q^j}\right)^{-\sigma} i^j, \tag{4.9}$$

$$z^{j,T} = \mu^j(1-\theta^j)\left(\frac{1}{q^j}\right)^{-\sigma}\left(\mu^j + (1-\mu^j)(p^M)^{1-\rho}\right)^{\rho-\sigma} i^j, \tag{4.10}$$

$$z^{j,M} = (1-\mu^j)(1-\theta^j)\frac{(p^M)^{-\rho}}{(q^j)^{-\sigma}}\left(\mu^j + (1-\mu^j)(p^M)^{1-\rho}\right)^{\rho-\sigma} i^j. \tag{4.11}$$

Firms face a static optimization problem. The firm in the nontradable sector chooses labor and capital so as to maximize its profits

$$p^N y^N - w^N\, l^N - q^N r^N k^N.$$

The solution to the firm's problem for the nontradable sector satisfies

$$w^N = p^N(1-\alpha^N)A^N(k^N)^{\alpha^N}(l^N)^{-\alpha^N}, \tag{4.12}$$

$$q^N\, r^N = p^N\, \alpha^N\, A^N(k^N)^{\alpha^N-1}(l^N)^{1-\alpha^N}. \tag{4.13}$$

The firm in the tradable sector chooses labor and capital so as to maximize the following equation

$$y^T - w^T\, l^T - q^T r^T k^T - p^M f.$$

Cost minimization for the tradable sector gives the factor demands:

$$w^T = (1-\alpha^T)(\eta)^{\frac{1}{\gamma}}(\frac{y^T}{v})^{\frac{1}{\gamma}}\frac{v}{l^T}, \tag{4.14}$$

$$q^T\, r^T = \alpha^T(\eta)^{\frac{1}{\gamma}}(\frac{y^T}{v})^{\frac{1}{\gamma}}\frac{v}{k^T} \tag{4.15}$$

$$p^M = (1-\eta)^{\frac{1}{\gamma}}(\frac{y^T}{f})^{\frac{1}{\gamma}}. \tag{4.16}$$

Because of labor and capital mobility across sectors, wage rates and returns to capital are equalized.

$$w^N = w^T = w.$$

$$q^T\, r^T = q^N\, r^N.$$

4.3.2 Households

The small open economy model is populated by identical infinitely lived households that value consumption and leisure. The representative household maximizes its lifetime utility

$$\sum_{t=0}^{\infty} \beta^t \left[\ln c_t + \varphi \ln(1 - l_t)\right], \tag{4.17}$$

where β is the intertemporal discount factor, φ is the preference for leisure, l is working hours, and c is a composite consumption good, which is a nested CES combination of nontradable goods, a^N, domestic tradable goods a^T, and imported tradable good, a^M.

$$c = \left[\theta^{\frac{1}{\sigma}}(a^N)^{\frac{\sigma-1}{\sigma}} + (1-\theta)^{\frac{1}{\sigma}}\left(\mu^{\frac{1}{\rho}}(a^T)^{\frac{\rho-1}{\rho}} + (1-\mu)^{\frac{1}{\rho}}(a^M)^{\frac{\rho-1}{\rho}}\right)^{\frac{\sigma-1}{\sigma}\frac{\rho}{\rho-1}}\right]^{\frac{\sigma}{\sigma-1}} \tag{4.18}$$

where θ is the preference for the nontradable good and μ is the preference for the domestic tradable good. The parameter σ is the elasticity of substitution between nontradable and tradable goods. The elasticity of substitution between domestically produced tradable good and imported good is ρ.

The price index p^C is

$$p^C = \left[\theta\,(p^N)^{1-\sigma} + (1-\theta)\left(\mu + (1-\mu)(p^M)^{1-\rho}\right)^{\frac{1-\sigma}{1-\rho}}\right]^{\frac{1}{1-\sigma}}. \tag{4.19}$$

In an optimal consumption plan, total consumption is divided among nontradable good, domestic tradable good, and imported good as

$$a^N = \theta\left(\frac{p^N}{p^C}\right)^{-\sigma} c, \tag{4.20}$$

$$a^T = \mu\,(1-\theta)\left(\mu + (1-\mu)(p^M)^{1-\rho}\right)^{\frac{\rho-\sigma}{1-\rho}}\left(\frac{1}{p^C}\right)^{-\sigma} c, \tag{4.21}$$

$$a^M = (1-\mu)\,(1-\theta)\left(\mu + (1-\mu)(p^M)^{1-\rho}\right)^{\frac{\rho-\sigma}{1-\rho}}\frac{(p^M)^{-\rho}}{(p^C)^{-\sigma}}\,c. \tag{4.22}$$

The representative household maximizes equation (4.17) subject to

$$
\begin{aligned}
p_t^C c_t + q_t^N i_t^N + q_t^T i_t^T + (1+n)b_{t+1} & \\
= \; w_t l_t + q_t^N r_t^N k_t^N + q_t^T r_t^T k_t^T + (1+r_t)b_t + rem_t, & \qquad (4.23)\\
(1+n)k_{t+1}^N = (1-\delta)k_t^N + i_t^N - \frac{\psi}{2}\left(\frac{(1+n)k_{t+1}^N - k_t^N}{k_t^N} - \delta\right)^2 k_t^N & \qquad (4.24)\\
(1+n)k_{t+1}^T = (1-\delta)k_t^T + i_t^T - \frac{\psi}{2}\left(\frac{(1+n)k_{t+1}^T - k_t^T}{k_t^T} - \delta\right)^2 k_t^T & \qquad (4.25)\\
r_t = r_t^* + \omega_t. & \qquad (4.26)
\end{aligned}
$$

Equation (4.23) is the budget constraint equating income to expenditures. Here, l_t is the endowment of labor, supplied at wage w_t; b_{t+1} is investment in a bond denominated in units of domestic tradable goods and earning the interest r_{t+1}. If b_{t+1} is negative, the economy is borrowing from the rest of the world. If b_{t+1} is positive, the economy is acquiring assets from the rest of the world. Equation (4.26) shows that the economy can borrow at a higher rate than the world interest rate and ω is the interest rate premium. The representative household receives remittances from abroad denoted by rem. We model the per-capita remittance receipts to Turkey as a lump-sum direct transfer to the Turkish representative household from abroad. Equations (4.24) and (4.25) show accumulations of two kinds of capital, with adjustment costs. Adjustment cost parameter, ψ is set equal for both tradable and non-tradable sectors. Notice that the specification of evolution of capital allows us to have capital adjustment costs at the steady state.

If the economy is closed in period t, there is no borrowing and lending, b_{t+1} is zero, and equation (4.26) does not hold. Therefore, the return on investment is endogenously determined in the model. If the economy is open, the interest rate is equal to an exogenously given international rate for net foreign asset position and b_{t+1} is endogenously determined.

The first order conditions for the consumer maximization problem for sectors $j = N, T$ are given by

$$
\begin{aligned}
\frac{1}{c_t}\frac{q_t^j}{p_t^C}(1+n)\left(1+\psi\left(\frac{(1+n)k_{t+1}^j - k_t^j}{k_t^j} - \delta\right)\right) = \beta\,\frac{1}{c_{t+1}}\frac{q_{t+1}^j}{p_{t+1}^C} & \\
\left(r_{t+1}^j + (1-\delta) + \frac{\psi}{2}(1+\delta)\left(\frac{(1+n)k_{t+2}^j - k_{t+1}^j}{k_{t+1}^j} - \delta\right)\right), & \qquad (4.27)\\
\frac{1}{p_t^C c_t} = \frac{\varphi}{1-l_t}\frac{1}{w_t}, & \qquad (4.28)\\
\frac{1}{c_t}\,\frac{1}{p_t^C}\,(1+n) = \beta\,\frac{1}{c_{t+1}}\,\frac{1}{p_{t+1}^C}(1+r_{t+1}) & \qquad (4.29)
\end{aligned}
$$

plus a transversality condition.

4.3.3 Equilibrium

To close the model, we need to specify the equilibrium conditions. The resource constraints are

$$\begin{aligned} y_t^N &= a_t^N + z_t^{N,N} + z_t^{T,N}, && (4.30)\\ y_t^T &= a_t^T + z_t^{N,T} + z_t^{T,T} + x_t, && (4.31)\\ m_t &= a_t^M + z_t^{N,M} + z_t^{T,M} + f_t && (4.32) \end{aligned}$$

where m are total imports and x are total exports.

The trade balance is given by

$$b_{t+1} - b_t(1 + r_t) = x_t - p_t^M m_t + rem_t. \quad (4.33)$$

4.4 Calibration

In this section, we first discuss the data and the methods used to calibrate the model to Turkey, and then present exogenous processes to simulate the model.

4.4.1 Calibration of the Household and Production Parameters

In calibrating the model, we would like to match some certain key data in the Turkish input-ouput matrix for 1989. Since there is no input-out matrix constructed for 1989, we base our calibrations on the input-output table for 1985.

We aggregate the 64 sector input-output matrix compiled by Turkish Institute of Statistics to obtain the two-sector matrix presented in Table 4.1. We classify each sector of the economy as tradable or nontradable according to the division that is commonly used in the literature (see for instance, Stockman and Tesar (1995) and Bems and Jonsson Hartelius (2006)). In order to to calibrate the parameters of the model, we use the equilibrium conditions of the model for the autarky steady state and normalize all prices except the rental rates of capital and wage rates to 1 for the initial year. The unit period is the year.

As mentioned above, we can not use input-output table for the last closed year in our calibration. However, relative price changes might occur between the beginning of simulation and the year for which parameter values are calibrated. Hence, we construct GDP deflators

Receipts	Expenditures								
	1	2	3	1+2+3	C+G	I	X	C+G+I+X	Total
1	16,649	3,160	0	19,809	16,997	2.239	4,839	24,075	43,885
2	3,325	1,098	0	4,423	6,394	3,519	1,079	10,992	15,415
3	0	0	0	0	1,788	0	0	0	1,788
1+2+3	19,974	4,258	0	24,233	25,179	5,758	5,918	36,855	61,087
wl	2,543	1,773	1,673	5,988					5,988
rk	12,446	7,523		19,969					19,969
depreciation	807	673	115	1,596					1,596
T	569	839	0	1,408					1,408
wl+rk+T	16,365	10,808	1,788	28,961					28,961
M	7,545	348	0	7,893					7,893
Total	43,885	15,415	1,788	61,087	25,179	5,758	5,918	36,855	

Source: Turkish Institute of Statistics ($http://www.tuik.gov.tr/VeriBilgi.do?tb_id=58\&ust_id=16$): 1, agriculture, fish, mining, manufacturing and communication (sectors 1-49); 2, energy, construction, wholesale and retail trade, hotel services, finance, real estate and plus services for sale (sectors 50-62); 3, public services and ownership of dwellings (sectors 63-64); *wl*, remuneration of employees, *rk*; net business income; *T*, net direct taxes and transfers including value added tax; *M*, imports; *C+G*, private consumption plus government consumption; *I*, investment plus inventory accumulation; *X*, exports.

Table 4.1: Aggregated input output-table for Turkey, 1985 (Billion Turkish Liras)

for tradable and non-tradable sectors and use them as price indeces to connect the normalized prices of 1989 and with prices of 1985.[7]

Nontradable ratios	$\frac{c^N}{y^N} = 0.72$	$\frac{i^{N,N}+i^{X,N}}{y^N}$=0.28	
Tradable ratios	$\frac{c^X}{y^X} = 0.64$	$\frac{i^{N,X}+i^{X,X}}{y^X}$= 0.06	$\frac{X}{y^X} = 0.25$
Import ratios	$\frac{c^M}{M} = 0.04$	$\frac{i^{N,M}+i^{X,M}}{M} = 0.16$	$\frac{X^M}{M} = 0.8$
Output ratio	$\frac{y^N}{y^X} = 0.58$		

Table 4.2: Aggregate ratios, 1985

Of crucial importance to the dynamic nature of the model is the calibration of inital capital stocks. We set the interest rate in Turkey to 0.09 and calibrate initial capital stock values accordingly.

The share parameters $\theta, \mu, \theta^T, \mu^T, \theta^N, \mu^N, \eta$ are calibrated to match the input-ouput ratios that are constructed from Table 4.1 and reported in Table 4.2. Import ratios are taken from imports by commodity groups data of Turkish Institute of Statistics. To pin down the seven

[7] According to our calculations there is no relative price change between 1985 and 1989.

share parameters, we set the ratio between the tradable inputs in the production of investment in the tradable and nontradable sectors to 0.6; that is $z^{T,T}/z^{N,T}$ = 0.6 as in Bems (2008). In Appendix we explain how we constructed the input-output matrix under the assumption that Turkey was closed to capital flows and how we obtained calibration parameters in more detail.

Following Backus, Kehoe, and Kydland (1994) and other studies in international business cycles we set ρ, the elasticity of substitution between domestic tradable goods and imported goods, equal to 1.5. The elasticity of substitution between tradable and nontradable goods in the consumption and the investment index, σ, is set equal to 0.5, following the empirical estimates in Kravis, Heston, and Summers (1982) and Stockman and Tesar (1995). The elasticity of substitution between imported intermediate good and domestic value added, γ, is set equal to 0.7 as in Rotemberg and Woodford (1996).

In our model c is conceptually private consumption plus government consumption. Moreover we set imports to be equal to the exports in the initial steady state since we assume Turkey is closed to capital inflows, which implies b_{1989}=0.

Following McGrattan and Prescott (2003), we set $r^* = 0.04$ in the balanced growth path. Requiring this interest rate to be consistent with the balanced growth path implies that $\beta = (1+n)/(1+r^*) = 0.976$.

Productivity parameters A^T and A^N are calibrated such that the value added in tradable and nontradable production fits the data in the input-output matrix of 1985. The depreciation rate is calibrated as $\delta = 0.016$.

Preference for leisure term, φ is calibrated so that the number of hours worked, l, is 0.33 at the autarkic steady state.

We are left with calibrating ψ, the capital adjustment cost parameter. In our baseline simulations we set $\psi = 1$, resulting in steady state adjustment cost of 0.03 percent of total output for the tradable sector and 0.04 percent of total output for the nontradable sector. As a sensitivity analysis, we also report the model dynamics of the cases for $\psi = 0.5$ and $\psi = 1.5$ in section 7. The calibration of parameters are presented in Table 4.3.

4.4.2 Exogenous Processes

There are three exogenous processes in the model: interest rate premium, population growth rate, and remittances.

Interest Rate Premium

As in Bems and Jonsson Hartelius (2006), we take Germany as the rest of the world. Turkey faces higher real interest rates than Germany, which are regarded as country specific interest

Parameter	*Value*	*Target*
b_{1989}	0	Trade balance
k^N_{1989}	1.79	Real interest rate in Turkey
k^T_{1989}	2.40	Real interest rate in Turkey
β	0.976	World real interest rate
φ	1.65	Ratio of hours worked to available hours
σ	0.5	Elasticity of substitution: tradable to nontradable
ρ	1.5	Elasticity of substitution: domestic tradables to imports
γ	0.7	Elasticity of substitution: domestic value added to imports
α^T	0.35	Capital's share of domestic tradable production
α^N	0.34	Capital's share of nontradable production
θ	0.39	Share of nontradable good in consumption
μ	0.98	Share of domestic tradable good in tradable consumption
θ^T	0.66	Share of nontradable investment in tradable sector
θ^N	0.58	Share of nontradable investment in nontradable sector
μ^T	0.37	Share of domestic tradable investment in tradable sector
μ^N	0.64	Share of domestic tradable investment in nontradable sector
η	0.76	Share of domestic value added
A^T	1.32	Value added in tradable production
A^N	1.37	Value added in nontradable production
ψ	1	Capital adjustment cost parameter
δ	0.016	Autarkic steady state level of k^X and k^N

Table 4.3: Calibration of the parameters

rate premium.[8] A country specific interest rate premium can slow down borrowing initally and determine the path of capital flows.

It is common in the literature to model the interest rate premium of the small open economy as a function of total debt, in line with Schmitt-Grohé and Uribe (2005). Table 4.4 reports the ratio of total external debt to GNI and interest rate premium together.[9] Afterwards, we will explain the method to calculate the interest rate premium reported in Table 4.4. A glance at this Table demonstrates that interest rate premium and total external debt are not very correlated. We only see a jump both in the external debt and in the interest rate premium in the crisis years of 1994 and 2001. Other factors that determine the interest rate premium in a country are such as the stability of institutions guaranteeing democracy, the rule of law, and the existence of a functioning market economy (See Eaton, Gersovitz, and Stiglitz (1986) and

[8]Turkey's real interest rates are higher than Germany after the opening excluding the exceptional years of 1989 and 1990. The low real interest rates in these years can be attributed to skyrocketing inflation rates during these years.

[9]Total debt includes both private and public external debt. The data for the ratio of total external debt to GNI is obtained from the Global Development Finance database.

Hutchison (2002)). We believe that these factors rather than the total debt impact on the determination of the the interest rate premium in Turkey. Since we do not model institutional development taking place in Turkey, we choose to introduce the empirically observed interest rate premium exogenously in the model as in Bems and Jonsson Hartelius (2006), Cook and Devereux (2006) and Kehoe and Ruhl (2009). Risk premium is introduced into the model in equation (4.26).

	External Debt GNI ratio (%)	Interest rate premium
1991	34	0.010
1992	36	0.005
1993	39	0.006
1994	52	0.037
1995	44	0.004
1996	45	0.010
1997	45	0.005
1998	36	0.007
1999	41	0.014
2000	44	0.007
2001	59	0.032
2002	57	0.007
2003	49	0.010
2004	41	0.010
2005	35	0.004

Table 4.4: The ratio of Total external debt to GNI and interest rate premium in Turkey (%)

Since the J.P. Morgan Emerging Market Bond Index spread is not available for the years before 1998, we obtain the comparable data for Turkey and Germany from IFS to construct the interest rate premium, and calculate it as the difference between the real money market interest rates in Turkey and Germany. However, these calculated series turn out to be very high so we follow the calibration strategy of choosing average ω to match average of simulated trade deficits between 1989-2005. The households perfectly anticipate the path of interest rate premium to be the same as in the data between 1989-2005. We assume that the interest rate premium in 1989 is the same as in 1990.

Population Growth Rate

When Turkey opens to capital flows, it borrows not only because it is capital poor, but also because it has a growing working age population. A rapidly growing average working age

population in Turkey leads to a steady borrowing over time. Hence, calibration of the path for working age population is of crucial importance to the dynamics of the model.

Population growth rate for Turkey is exogenous to the model. Average working age population growth rate is calculated as the difference between Turkish and German working age population growth rates. These growth rates are constructed from the observed data for the period 1989-2005 and from population projections made by the United Nations for 2005-2050. We assume that population growth differential between Turkey and Germany becomes zero after 2050.

Remittances

Turkish workers started to migrate, mainly to Western Europe and specifically to the Federal Republic of Germany, in the early 1960s. In 1964 remittances of Turkish migrants started to be recorded in the Turkish balance of payments. Since then, they have gradually grown and become a significant source of external financing for Turkey (Aydas, Metin-Ozcan, and Neyapti (2005)). Remittances of Turkish migrants had been around 2 percent of GDP up until the beginning of 2000s. Thus remittance flows must be accounted for in the model to succesfully replicate the data.[10]

We pursue a simple way of incorporating remittance flows to the model by exogenously introducing remittances in the budget constraint of the household, which we calibrate to the remittance flows that can be observed in the data in the 1990-2005 period.[11] The households perfectly foresee the path of remittances that are the same as in the data.

4.5 Experiments

In this section we simulate the model presented and calibrated in the previous sections. The economy is closed to capital flows in the initial year, which corresponds to 1989. We set the initial capital stocks in each sector such that they are below their autarkic steady state values in 1989 and open the economy to capital flows in 1990. Consequently, Turkey accumulates capital until it reaches the balanced growth path and population growth rates in Turkey and Germany are equalized. Turkey borrows from international capital markets initially and runs trade deficits to finance consumption and capital accumulation, implying that in steady state, it will run trade surpluses.

[10] Remittances have started to decline in the beginning of 2000s due to the fact that Turkish migrants' ties with the family members remaining in Turkey weakened with the passage of time (Sayan and Tekin-Koru (forthcoming)).

[11] Data for remittances is obtained from the balance of payments accounts of the Central Bank of Turkey.

4.5.1 Simulation Results

Simulation results are displayed in Figures 4.4, 4.5, 4.6, 4.7, and 4.8. To compare the model results with the data, we include the corresponding Turkish data in the figures.

Figure 4.4 plots the trade balance. We express the series in terms of the same period GDP and trade balance, since the data series are in current prices. The model is succesful to reproduce the shape of the trade balance. There is a strong correlation between the model and the data. It turns negative when the country liberalizes capital flows and fluctuates in line with the path of the interest rate premium. As in the data, trade deficit turns into surplus in 1994 and the country runs higher trade deficits after 2001.

Figure 4.5 plots the real exchange rate. Notice that the relavant data series for the real exchange rate is RER and not RER^N, and we therefore hope to explain only 14 percent of the real exchange rate. To calculate the real exchange rate in the model, we use equation (4.4) and use price indexes for Germany as in the data. Since households can borrow only tradable good, nontradable good becomes relatively scarce after opening to capital flows and accordingly its relative price increases. Our model captures the appreciation in the real exchange rate in the first years of liberalization. However, it predicts a smaller appreciation of the real exchange rate than that in the data. Furthermore, it does not account for either the sharp depreciation in the financial crisis year of 1994 or the appreciation trend after 2004.

Figures 4.6, 4.7, and 4.8 demonstrate the growth rates of output, consumption, and investment respectively. Simulated growth rates of output and investment move in correlation with those in the data. In the case of consumption, there is less correlation between the model and the data. Furthermore, the model underestimates the changes taking place in output, consumption and investment that we see in the data.

Table 4.5 reports simulated ratios along with the observed ratios constructed from 1998 and 2002 input-ouput matrices. We demonstrate three representative input-output ratios that are y^N/y^T, x/y^T, and a^N/y^N. The model is succesful to predict the direction of the ratios. It only fails to predict the downward movement of y^N/y^T between 1998 and 2002. The ratio of tradable output to exports, x/y^T, does increase between 1985 and 1998, but not as much as it does in the data. The model predicts a 4 percent decline in x/y^T between 1998 and 2002, but it decreases by 8 percent in the data. The model does a good job of generating the increase in a^N/y^N both in 1998 and 2002. However, it underpredicts this increase.

We also consider a model where households anticipate the capital account liberalization in 5 years. The results for output, consumption, exchange rate, and investment show no change both quantitatively and qualitatively. The shape of the trade balances shows no change either. The only change is observed in the quantitative results of the trade balance. Figure 4.9 shows that the size of the deficits in the model is much closer to that in the data. Since the households anticipate the opening before 1989, they do not perceive the opening as a shock and do not borrow heavily from abroad.

	x/y^T		y^N/y^T		c^N/y^N	
	model	data	model	data	model	data
1985	0.25	0.25	0.58	0.58	0.67	0.67
1998	0.27	0.39	0.62	0.75	0.70	0.73
2002	0.23	0.31	0.65	0.65	0.71	0.82

Table 4.5: Input-Output Ratios

4.5.2 Welfare Gain?

We now ask a new question: What were the effects on welfare of this financial liberalization compared to what would have happened if the economy had not opened up? To answer this question we need to compare the life-cycle utility after opening with the counterfactual case of no opening. Specifically, we start with the same equilibrium in both cases and simulate the closed economy using the same exogenous processes for remittances and population growth as the open one.

Let ξ denote the welfare loss/gain of opening the economy to capital flows. We measure ξ as the fraction of the consumption process that the household has to give up in the open economy case to be as well of in the closed economy one. Formally, ξ is defined by

$$\sum_{t=0}^{\infty} \beta^t u((1-\xi)c_t, l_t) = \sum_{t=0}^{\infty} \beta^t u(\bar{c}_t, \bar{l}_t) \tag{4.34}$$

where $\bar{c}$ is consumption and $\bar{l}$ is leisure in closed economy. If ξ is positive, there is a welfare gain because of opening. Otherwise,there is a welfare loss. To carry out this exercise, we choose a horizon of 400 periods, the value of the discount rate β^t is approximately zero, for $\beta = 0.976$. Then, we compute welfare loss/gain using the following formula

$$\xi = 1 - exp\left(\frac{\sum_{t=0}^{399}(\bar{u}_t - u_t)}{400}\right) \tag{4.35}$$

where $\bar{u}$ is the utility of the household, the one Turkish households would have enjoyed if there had been no capital account liberalization.We get $\xi > 0$, meaning that Turkish households have a welfare gain because of financial opening according to our model. Turkish hoseholds would have to give up 26.21 percent of their lifecycle consumption in the open economy case in order to have the same level of welfare as in the counterfactual case of the closed economy.

4.5.3 Sensitivity Analysis

Table 4.6 reports the results of the model under alternative initial capital stocks and parameter values. We recalibrate the other parameters of the model when required. We demonstrate

maximum simulated trade deficit as well as the initial trade deficit in 1990. We also carry the welfare gain exercise for each alternative experiment.

Experiments	Trade deficit (% of GDP)		Welfare gain
	1990	Max.	
Benchmark	4.13	7.42	26.21
$0.9k^T, 0.9k^N$	6.38	7.41	26.11
$1.1k^T, 1.1k^N$	2.11	7.45	26.30
σ=0.1	4.17	7.41	26.22
σ=0.9	4.09	7.41	26.22
ρ=1, ρ=2	4.13	7.42	26.21
γ=0.5, γ=0.9	4.13	7.42	26.21
ψ=0.5	8.78	7.50	27.26
ψ=1.5	1.86	7.40	25.32

Table 4.6: Sensitivity analysis

Choosing initial capital stock values is of crucial importance to the dynamics of the model. When Turkey liberalizes capital flows, it starts borrowing because it is modeled as a capital poor economy. Not surprisingly changing the initial capital stock values has considerable effects on the magnitude of these trade deficits. A 10 percent increase in the initial capital stock values leads to a 2.02 percent decline in the 1990 trade deficit whereas a 10 percent decrease raises the 1990 trade deficit by 2.25 percent. Yet, the higher the initial capital stock values are, the higher the welfare gain is.

We also vary the the elasticities of substitution, which are governed by σ, ρ, and γ in both directions. Welfare gain is insensitive to the change in elasticities of substitution. The magnitude of the trade deficits changes slightly as σ, the elasticity of substitution between tradables and nontradables, varies, whereas it is insensitive to varying two other elasticities.

Table 4.6 reveals that the capital adjustment cost parameter is important for the results of the model. A lower value of adjustment cost parameter induces larger trade deficits. This is not a surprising result as Fernandez de Cordoba and Kehoe (2000) and Bems and Jonsson Hartelius (2006) show that adjusment costs are crucial in matching the model dynamics to the data. Obviously a lower value of adjustment cost parameter leads to a higher welfare gain.[12]

[12]In an exercise not shown in the text, we considered a model where households anticipate interest rate premium shocks one period in advance. Trade balance dynamics of that experiment move mostly opposite to the data.

4.6 Conclusion

In this paper we have constructed a two-sector dynamic general equilibrium model and calibrated it to Turkey. The model can account for much of the trade balances in Turkey after capital account liberalization. When Turkey opened to capital flows, it started to borrow, not only because it was capital poor, but also it had a rapidly growing working age population. Futhermore, the specifications of interest rate premium and remittance flows determine the path of trade balances. We also found that Turkish households have a welfare gain because of this opening up. Turkish households would have to give up 26 percent of their lifecycle consumption in the open economy case in order to have the same level of welfare as in the counterfactual case of the closed economy.

On a negative note, our model fails to explain interest rate differentials between Turkey and Germany. We assume that real interest rate is constant at 4 percent in Germany and it starts from 9 percent in Turkey. However, the real interest rate in Turkey in 1989 and 1990 was lower than that in Germany, due to very high inflation rates in Turkey during these years and our model fails to demonstrate this.

4.7 Appendix

We aggregate the 64 sector input-output matrix to obtain the two sector matrix presented in Table 4.1. Notice that, in this matrix, the value of domestic tradable good production, z, is 16,365 and the value of nontradable good production, y^N, is 10,808.

We begin by calibrating capital shares and employ the method used by Fernandez de Cordoba and Kehoe (2000). The capital share in the tradable sector is

$$\alpha^T = 12,446/(12,446 + 2,453) = 0.83.$$

The figure for α^N is obtained analogously. Aggregate capital share turns out to be

$$\alpha = (\alpha^T z + \alpha^N y^N)/(z + y^N) = 0.82.$$

This number is too high because of including income of the self-employed workers in capital income. Therefore we assume a flat capital share of 0.35 as do Bosworth and Collins (2003) and make an adjustment for the capital shares in each sector. Because of lack of information to make this adjustment seperately, we do it proportionately, obtaining α^T=0.35 and α^N=0.34.

Because imported input into nontradable investment is the only component of nontradable imports, we set $z^{N,M}$=348. According to the data obtained from the Turkish Institute of Statistics, the ratio of investment goods in imports is 0.161. This would imply that $z^{T,M}$ is 922. Notice that in the input-output matrix, the sum of investments into tradable investment, $z^{N,T}$, $z^{T,T}$, and $z^{T,M}$, is 2,239. Subtracting $z^{T,M}$ from the total leaves us with $z^{N,T}$+ $z^{T,T}$=1,316. The sum of $z^{N,N}$ and $z^{T,N}$, and a^T are calculated analogously. Finally, we find tradable good production (y^T) by employing the equilibrium condition given by equation (4.31) and take it to be equal to the sum of intermediate imported goods (f) and domestic value added in tradable good production (v). Since the share of imported intermediate inputs is 0.8 according to the data obtained from the Turkish Institute of Statistics, f is calculated as 0.8 x 7,893=6,314. Subtracting this amount from y^T gives v. As the value we find for v is different from the one in the input-output matrix, we have adjusted the values of v and y^N proportionately in the matrix to match the value of v we have derived. Hence, we have the aggragate ratios for 1985 demonstrated in Table 4.2.

Figures

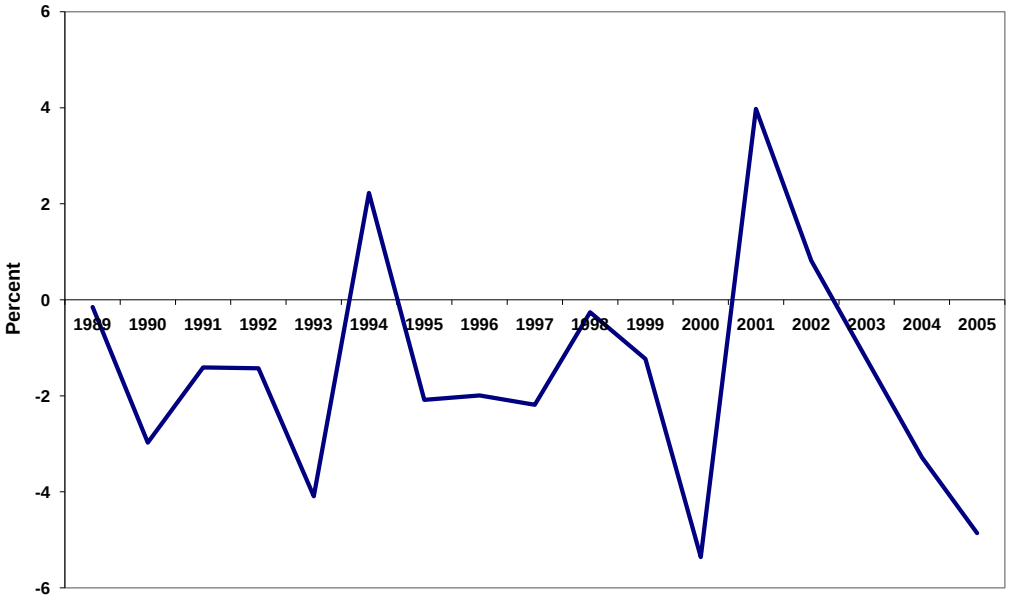

Figure 4.1: Trade Balance (percent of GDP)

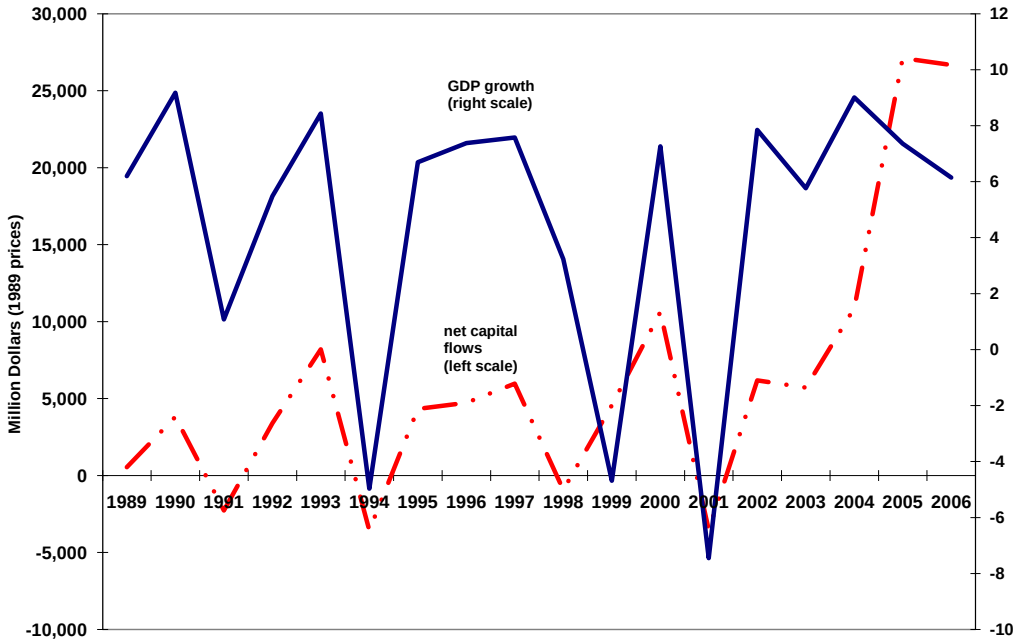

Figure 4.2: Capital Flows and GDP Growth

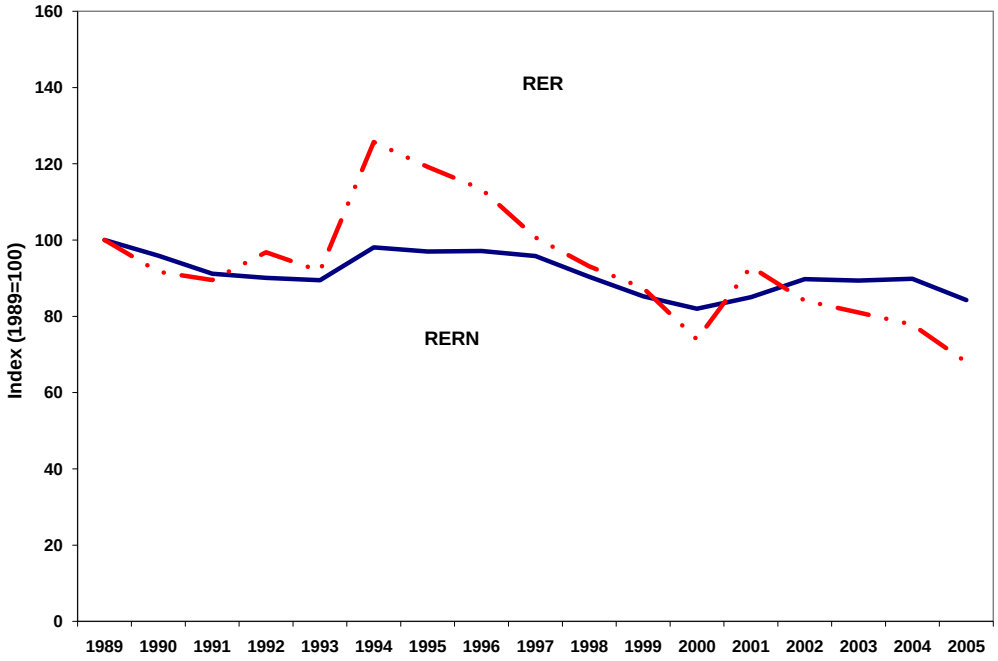

Figure 4.3: Real Exchange Rate

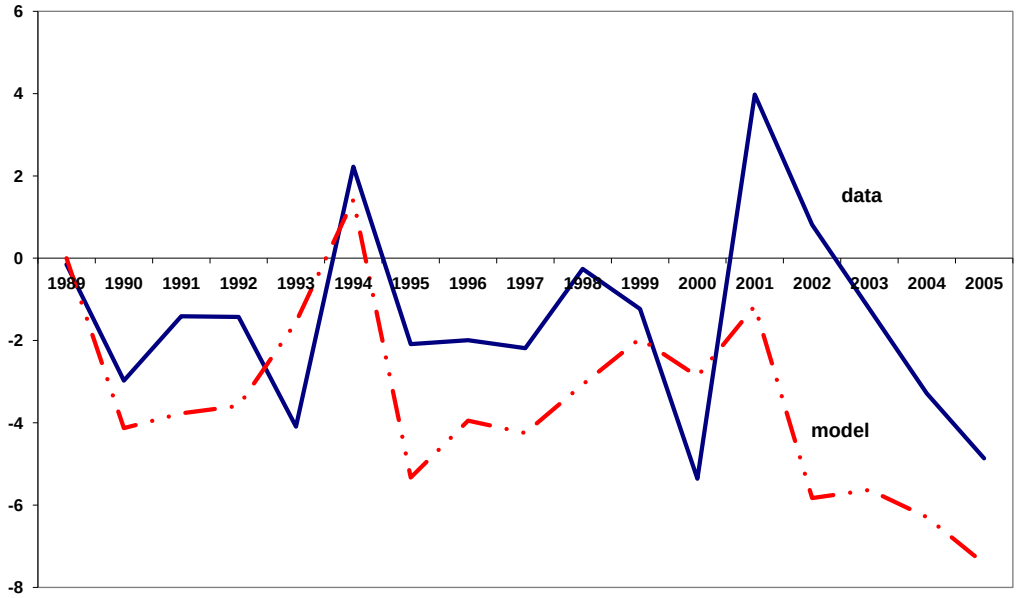

Figure 4.4: Simulation Results for Trade Balance (percent of GDP)

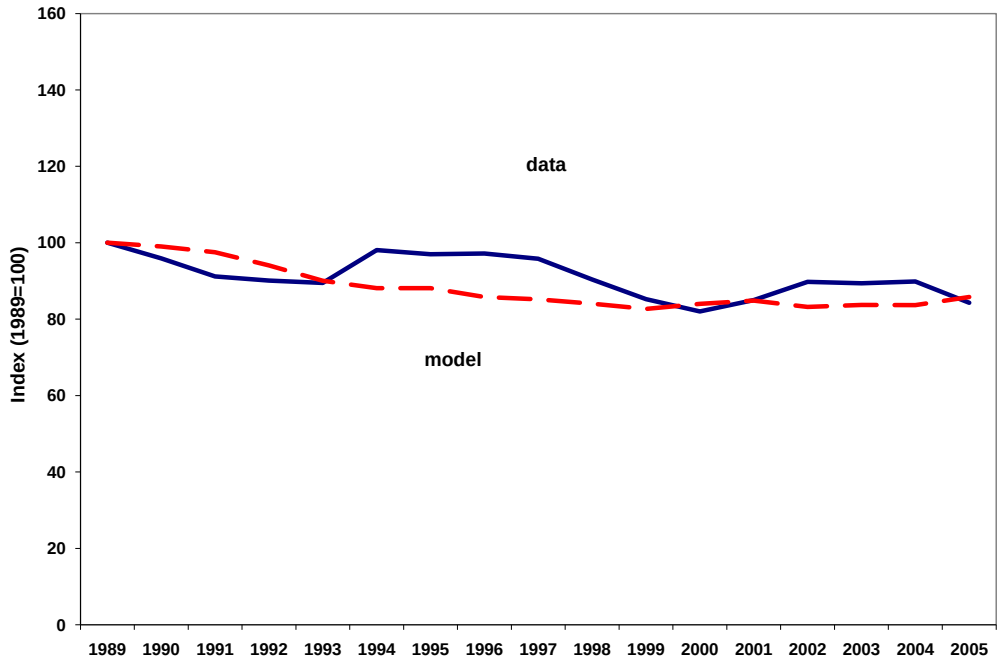

Figure 4.5: Simulation Results for the Real Exchange Rate

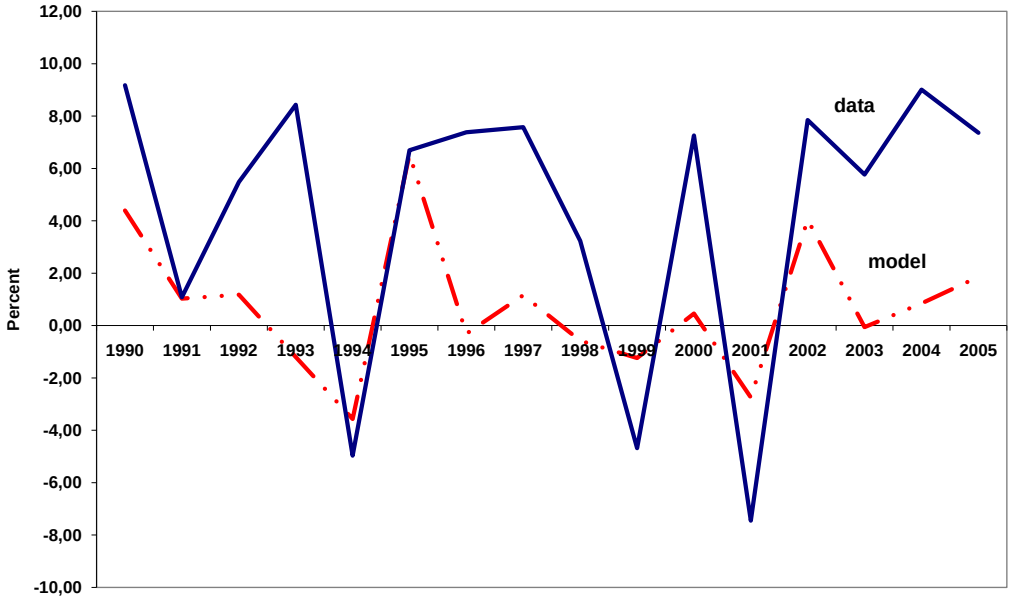

Figure 4.6: Simulation Results for the GDP growth rate

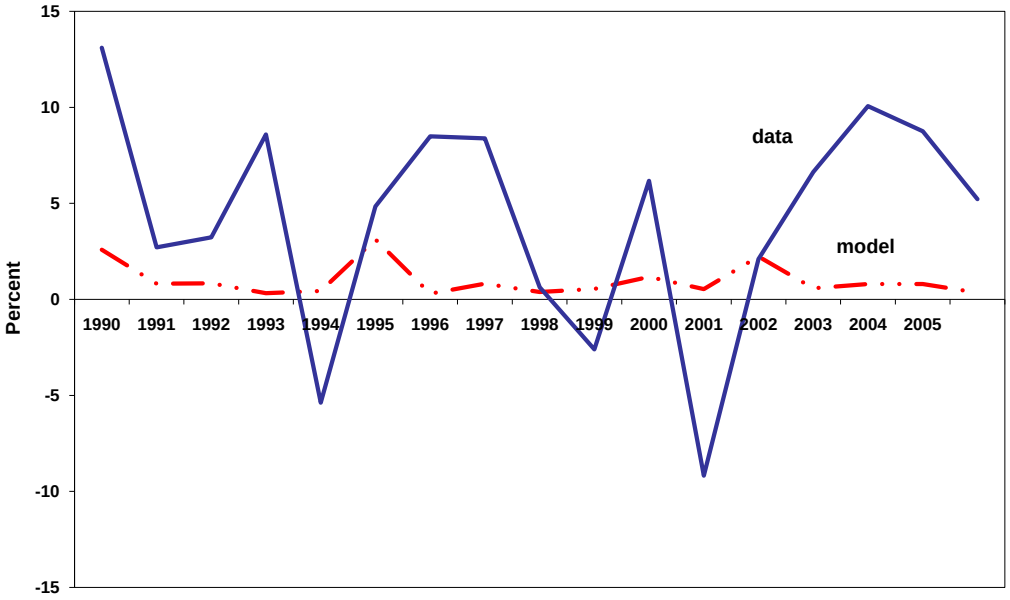

Figure 4.7: Simulation Results for consumption

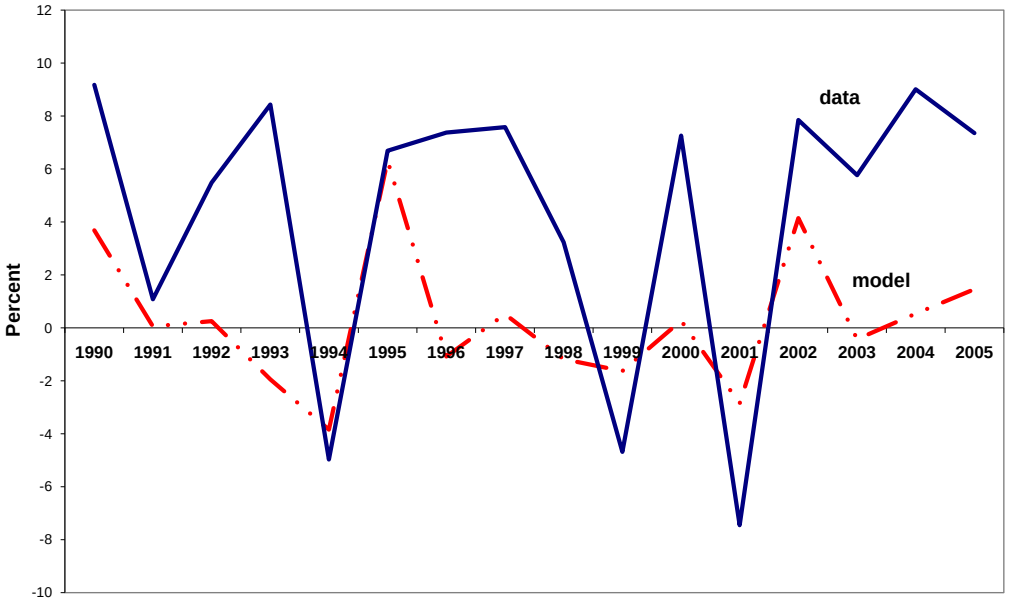

Figure 4.8: Simulation Results for investment

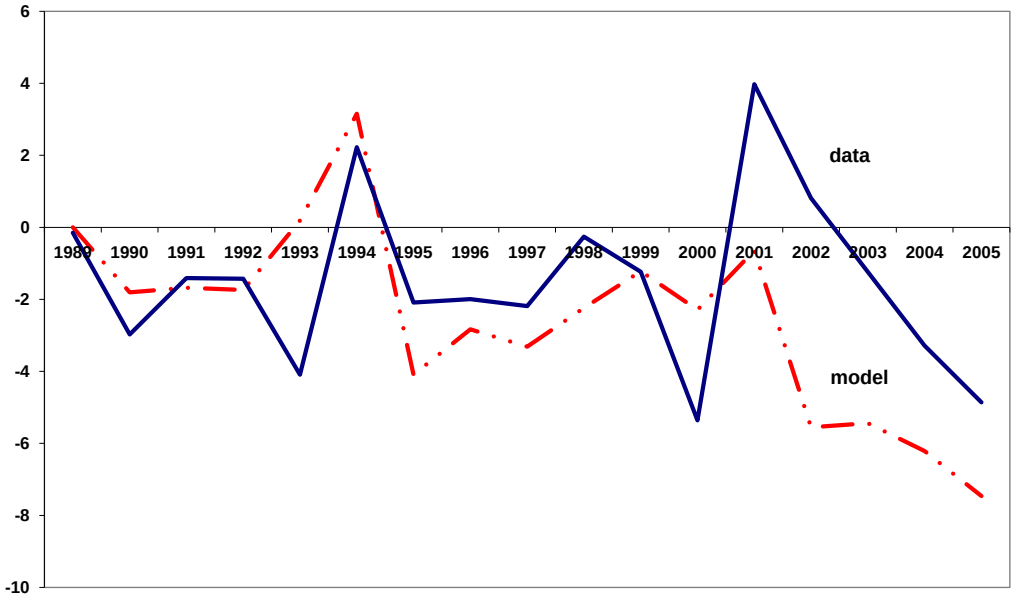

Figure 4.9: Simulation Results for the Trade balance (percent of GDP)

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