

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

Gül Ertan Özgüzer<sup>†</sup>      Luca Pensieroso<sup>‡</sup>

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## Abstract

In this paper, we build a two-country dynamic general equilibrium model to study whether the European citizens would benefit from an eventual accession of Turkey to the European Union. Results show that Turkey's accession to the European Union is welfare enhancing for the Europeans, provided that the Turkish total factor productivity increases enough after the enlargement.

**Keywords:** European Union, Turkey, Enlargement, Dynamic General Equilibrium, Open Economy Macroeconomics

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## 1 Introduction

The possible entry of Turkey in the European Union raises more than an eyebrow. If many objections have a political flavour, one of them concerns

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<sup>†</sup>Izmir University of Economics and Department of Economics - IRES, Catholic University of Louvain. E-mail: gul.ertan@ieu.edu.tr

<sup>‡</sup>Chargé de Recherches FRS - FNRS, Department of Economics - IRES, Catholic University of Louvain. E-mail: luca.pensieroso@uclouvain.be

a typical economic aspect: transfers. As a new member state with GNP per capita 30% lower than EU-15 average (Lejour and de Mooij (2005)), Turkey would end up being a net recipient of the EU harmonization funds. Such a perspective is obviously hard to swallow for many incumbents, not so keen to see their net transfers from Brussels diminished again, few years after the 2004 enlargement.

This paper adopts a dynamic general equilibrium (DGE) perspective to verify 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 in the European Union may compensate or even outweigh the negative resource transfers from incumbent states to Turkey. The aim of this paper is to scrutinize the quantitative relevance of some among such mechanisms.<sup>1</sup>

Our analysis stems from the probable improvement of Turkish institutions due to 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 prompt better economic performance. To model this view in a DGE framework in the specific case of Turkey, we shall assume that accession to the European Union will push Turkish total factor productivity (TFP) up. This is not an unreasonable assumption, as analogous increases were observed in Spain and Portugal soon after their entry in the European Union (Caselli and Tenreyro (2005), Kutan and Yigit (2007)).

In this context, we shall build a two-country DGE model in the line of 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 enlargement.<sup>2</sup> Such a transfer is modelled as proportional to the EU-25 - Turkey output gap, with the proportionality factor estimated from the data.

We shall first study the price-effect of a TFP increase in Turkey, assuming factors' immobility. The idea is that a TFP increase in Turkey will cause the

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<sup>1</sup>Ertan Özgüzer (2007) deals with the same issue, in a static set up.

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

price of Turkish exports to decrease, thereby affecting the utility of the Europeans. This effect operates through two channels. First, the price decrease directly affects consumption, inducing both an income effect (the EU consumers get richer) and a substitution effect (the Turkish good costs relatively less). Second, employment in the European Union changes as a consequence of the shift in production.

By means of numerical simulations, we shall assess both the direction and the quantitative importance of these effects. We shall then compare them with the welfare effects due to the transfer. In fact, also the latter influences the terms of trade, and entails significant general equilibrium effects. This exercise will allow us to estimate how big the induced TFP increase must be in order to fully compensate the Europeans for the transfer.

We shall 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.

Results show that, within the assumption we made in this paper, Turkey's accession to the European Union might be beneficial for the European citizens, provided that TFP in Turkey increases enough (31% of the actual gap, in the model with no capital mobility; 45%, in that with capital mobility). We shall provide an assessment of our quantitative results in view of the available evidence about convergence between old and new EU members. Some robustness test will also be implemented.

The remainder of the paper is structured as follows. Section 2 describes the two-country model economy. In Section 3, we present the calibration of the parameters and discuss the results of the simulations. Section 4 draws the thread of the argument and advances some preliminary conclusions.

## 2 The benchmark model

We model the European Union and Turkey within a two-good, two-country DGE framework, in line with Backus, Kehoe, and Kydland (1994). Each country produces one good, denoted as  $Y$  for the European Union and  $Y^*$  for Turkey, using a constant-return-to-scale Cobb-Douglas production function:

$$y_t = e_t^s (k_t)^\alpha (l_t)^{1-\alpha}, \quad (1)$$

$$y_t^* = e_t^{s^*} (k_t^*)^{\alpha^*} (l_t^*)^{1-\alpha^*}. \quad (2)$$

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  $e^s$  is total factor productivity (TFP). Turkish variables are denoted by  $*$ .

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. Its aggregate consumption per-capita,  $(c)$ , will be

$$c_t = (c_t^E)^\gamma (c_t^T)^{1-\gamma}, \quad (3)$$

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

$$c_t^* = (c_t^{*E})^{\gamma^*} (c_t^{*T})^{1-\gamma^*}, \quad (4)$$

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 the Europeans or the Turkish, respectively.<sup>3</sup>

We assume free trade between countries and perfect competition within countries. 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.

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

This model can be solved by adopting a two-step procedure. First, in each period  $t$ , given preferences, endowments and technical conditions, households in each country determine the optimal allocation between different kinds of goods, given the total amount of consumption and investment. This problem is static by its nature. Second, households have to decide how to allocate their

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<sup>3</sup>Assuming a Cobb-Douglas aggregator is tantamount to assuming  $\sigma = 1$  in an Armington aggregator of the kind

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

In this formulation,  $\sigma$  stands for the elasticity of substitution between the home and foreign good. The empirical evidence about its value is controversial. Typical macroeconomic estimates of  $\sigma$  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 for instance Corsetti, Dedola, and Leduc (2008) choose a lower 0.85 value. We run a sensitivity analysis to verify the robustness of our results to change in the assumed form of the Armington aggregators. For any simulation presented in this paper, we simulated two additional models, one with  $\sigma = \sigma^* = 0.5$ , one with  $\sigma = \sigma^* = 1.5$ . As expected, the higher the complementarity between the home and foreign goods, the less powerful the terms-of-trade transmission mechanism highlighted in this paper is. However, changes in the results are qualitatively negligible and quantitatively minor.

wealth intertemporally, thereby determining their consumption and savings plan. This is the dynamic part of the model, and it is again country-specific.

The two parts, together with the equilibrium conditions defining the current account fully determine the intertemporal path of all the variables involved.

## 2.1 The static problem

### 2.1.1 Firms

In each period  $t$ , the representative European firm chooses labour and capital so as to maximize its profits

$$\Pi = y - wl - rk, \quad (5)$$

subject to the technical constraint (1).<sup>4</sup> The variable  $w$  is the real wage, whereas  $r$  is the interest rate.

The first order conditions for this problem give the static demand schedules for labour and capital in the European Union, that is

$$w = (1 - \alpha)e^s(k)^\alpha(l)^{-\alpha}, \quad (6)$$

$$r = \alpha e^s(k)^{\alpha-1}(l)^{1-\alpha}. \quad (7)$$

Symmetrically, for Turkey we shall have:

$$w^* = p(1 - \alpha^*)e^{s^*}(k^*)^{\alpha^*}(l^*)^{-\alpha^*}, \quad (8)$$

$$r^* = p\alpha^*e^{s^*}(k^*)^{\alpha^*-1}(l^*)^{1-\alpha^*}. \quad (9)$$

### 2.1.2 Households

For any given total amount of aggregate consumption  $\bar{c}$ , the representative European household chooses a combination of European and Turkish consumption goods so as to maximize equation (3) subject to

$$c^E + pc^T \leq \bar{c}. \quad (10)$$

The solution to this problem gives the European demand for each variety of good as a function of both its relative price and aggregate consumption:

$$c^E = \gamma p^c c, \quad (11)$$

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<sup>4</sup>Given the static nature of the problem, we omit time subscript for simplicity.

$$c^T = (1 - \gamma) \left( \frac{p^c}{p} \right) c. \quad (12)$$

The price index  $p^c$  is defined as the minimum expenditure  $\bar{c} \equiv c^E + p c^T$  such that  $c = 1$ , given  $p$ . This amounts to

$$p^c = \frac{p^{1-\gamma}}{\gamma^\gamma (1 - \gamma)^{(1-\gamma)}}. \quad (13)$$

In view of the symmetry of the problem for Turkey, its demand functions and price index are immediately derived.

$$c^{*E} = \gamma^* p^{*c} c^*; \quad (14)$$

$$c^{*T} = (1 - \gamma^*) \left( \frac{p^{*c}}{p} \right) c^*; \quad (15)$$

$$p^{*c} = \frac{p^{1-\gamma^*}}{(\gamma^*)^{\gamma^*} (1 - \gamma^*)^{(1-\gamma^*)}}; \quad (16)$$

## 2.2 The Dynamics

The infinitely-living representative European household chooses its lifetime consumption and leisure patterns so as to maximize its lifetime expected utility, subject to the resource constraints.

$$\max_{\{c_t, l_t, a_{t+1}\}} \sum_{t=0}^{\infty} \beta^t [\ln c_t + \varphi \ln(1 - l_t)], \quad (17)$$

subject to:

$$a_{t+1} = (1 - \delta)a_t + i_t, \quad (18)$$

$$r_t a_t + w_t l_t - \theta_t \geq p_t^c c_t + i_t. \quad (19)$$

In problem (17), we have chosen a log-log utility function. The variable  $a$  stands for assets. The parameter  $\beta$  is the intertemporal discount factor, while  $\varphi$  is the preference for leisure. Equation (18) is the law of motion of wealth, with  $\delta$  being its (constant) depreciation rate, while equation (19) is the budget constraint equating disposable income to expenditures. In the latter, we have modelled the per-capita transfer from the EU to Turkey,  $(\theta)$ , as a lump-sum direct transfer from the European to the Turkish representative household.

The first order conditions of this problem are given by

$$\frac{1}{c_t} \left( \frac{1}{p_t^c} \right) = \beta \frac{1}{c_{t+1}} \left( \frac{1}{p_{t+1}^c} \right) (1 + r_{t+1} - \delta), \quad (20)$$

$$\frac{\varphi}{1 - l_t} = \frac{1}{c_t p_t^c} w_t. \quad (21)$$

Equation (20) is the Euler equation governing the intertemporal allocation of consumption. Equation (21) is the European labour supply, which, together with equation (6), clears the labour market.

By solving the symmetric problem for Turkey, one gets

$$\frac{1}{c_t^*} \left( \frac{p_t}{p_t^{*c}} \right) = \beta^* \frac{1}{c_{t+1}^*} \left( \frac{p_{t+1}}{p_{t+1}^{*c}} \right) (1 + r_{t+1}^* - \delta), \quad (22)$$

$$\frac{\varphi^*}{1 - l_t^*} = \frac{1}{c_t^* p_t^{*c}} w_t^*. \quad (23)$$

## 2.3 Equilibrium Conditions

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

$$p_t c_t^T - \frac{1}{n} c_t^{*E} + \theta_t = (k_{t+1} - (1 - \delta)k_t - i_t). \quad (24)$$

Equation 24 is the standard balance of payment equilibrium equating trade surplus, or deficit, to the difference between investments and savings. This condition also insure equality between supply and demand for all the goods.

As in the benchmark model we assume that capital is not mobile across countries, domestic financial wealth is wholly invested in domestic capital:

$$a_t = k_t, \quad (25)$$

$$a_t^* = k_t^*. \quad (26)$$

Accordingly, the right-hand-side of equation (24) turns out to be zero.

Finally, although households in both countries perceive the amounts  $\theta$  and  $\theta^*$  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 shall assume

$$\theta_t^* = b(y_t - p_t y_t^*), \quad (27)$$

$$\theta = \frac{\theta_t^*}{n}. \quad (28)$$

where the last equation scales the transfer to take the difference between the populations of the European Union and Turkey into account.

As households do not take into account equations (27) and (28) in solving the optimisation problem, the transfer acts here as an externality.

### 3 Worthy transfers? The dynamic impact of a TFP increase in Turkey

Equipped with the benchmark model developed in the previous section, we can run simulation exercises to assess whether, in a European perspective, enlargement to Turkey is welfare enhancing, and therefore worth the price of the resource transfer. Specifically, in this section we shall study the theoretical and quantitative implications for the EU of a TFP increase in Turkey in the aftermath of the enlargement. The idea is that the adherence to the Copenhagen criteria will lead to a generic improvement in the Turkish institutional and business environment, which translates in the model in a TFP increase.

#### 3.1 Calibration and Simulation

In order to simulate the model, we first need to assign numerical values to the structural parameters. Table 1 illustrates our choices. The capital shares  $\alpha$

and  $\alpha^*$  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  $\gamma$  indicates what the value of the share of goods produced by the European Union is in the European consumption bundle. Given that imports from Turkey amount to 3% of total European imports, we take this to mean that 98.8% of the total European consumption does not come from Turkey (EUROSTAT (2006)).

In a similar way, we set  $\gamma^*$  by computing the share of Turkish imports from the European Union over total Turkish imports. Such a share turns out to be 45% (Undersecretariat of the Prime Ministry for Foreign Trade (2007)).

The preferences for leisure,  $\varphi$  and  $\varphi^*$ , are calibrated so that both  $l$  and  $l^*$  are 1/3 in the pre-accession steady state.

The depreciation rate of capital,  $\delta$ , is set to 0.1, its common value in the literature.



|             |       |
|-------------|-------|
| $\alpha$    | 0.43  |
| $\alpha^*$  | 0.47  |
| $\gamma$    | 0.988 |
| $\gamma^*$  | 0.14  |
| $\beta$     | 0.96  |
| $\beta^*$   | 0.96  |
| $\delta$    | 0.1   |
| $\varphi$   | 1.64  |
| $\varphi^*$ | 1.59  |
| $b$         | 0.007 |
| $n$         | 6.4   |
| $\rho$      | 1.35  |

Table 1: Calibration of the parameters

We gave to both  $\beta$  and  $\beta^*$  the same 0.96 value, which guarantees a net real interest rate of about 4% in both countries. We have assumed the same discount factor for both countries.

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.

The parameter  $n$  is computed by taking the ratio of the EU-25 population over Turkey's population (EUROSTAT (2007)).

Finally, to model the post-accession Turkish TFP increase, we assumed that TFP grows monotonically along an S-shaped path, until the (exogenous) catch-up process is over.

$$s_t^* = \rho s_{t-1}^* (1 - s_{t-1}^*) + \epsilon_t \quad (29)$$

The parameter  $\rho$  governs the curvature of the function, and the steady-state level of  $s^*$ .

### 3.2 Comments on Results

In the first exercise, we have assumed that, in the post-enlargement final steady state, Turkey will fulfill about half of the TFP gap with the European Union. Technically, we have initialised the model assuming that  $s = 0.47$  and  $s^* = 0$ . This means that in the pre-accession steady state, the Turkish TFP is set equal to 62.5% of the European one, which roughly corresponds to the

TFP gap between Turkey and France in the data (Eicher, Garcia-Peñalosa, and Teksoz (2006)). Our catch-up hypothesis means that, after enlargement, the new steady state is characterised by  $s^* = 0.26$ , with the Turkish TFP now being 81.05% of the European one. We have assumed that  $\epsilon$  equals 0.001 in the very first year of accession, and 0 thereafter. This assumption within equation (29) guarantees that the Turkish TFP increases very slowly immediately after the accession, with increasing growth rates in the middle of the catch-up process, to cool down towards the end of it.

We have started the simulation from a zero-transfer condition, modelled by imposing  $b = 0$  at the initial steady state. After the accession, Turkey starts to receive transfers from the European Union, according to formula (27), with  $b = 0.007$ .

Simulation results are shown in figures 1, 2, 3 and 4 (red line).

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, though a different one. The TFP increase reduces the price of the Turkish good, as it enhances the efficiency of production in Turkey. The unilateral lump-sum transfer, instead, causes  $p$  to increase. The latter 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. On the whole, as TFP grows sufficiently, the TFP-induced effect dominates, resulting in a decrease of  $p$  by more than 30%.

Such a drop explains the observed increase in the demand for both  $c^T$  and  $c^{*T}$ . An income as well as a substitution effect are at work here. While both the European and the Turkish agents substitute the cheaper Turkish good for the more expensive European one, the formers will also be experiencing a positive income effect, as now their own good buys more units of the Turkish one, and a negative income effect due to the transfer payment to the Turkish household. Eventually, these effects almost cancel out. This helps to 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 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 Turkish representative household, that reaches the new steady state immediately, and then stays roughly constant around it.

The indices of total consumption  $c$  and  $c^*$  rise in both countries, although the relative magnitude differs. This different behaviour is obviously a consequence of the patterns of the demand for the EU and the Turkish good discussed here above. On top of that, however, such a behaviour also depends on the different values assigned to  $\gamma$  and  $\gamma^*$  in the aggregator (13). As  $c^T$  represents but a small share of total consumption in the EU, its variations, no matter how significant, will induce little action in  $c$ . On the contrary,  $c^*$  is more affected by variations in  $c^{*E}$ , due to its relatively high value in the consumption bundle of the Turkish household.

By construction, the qualitative behaviour of the price indices is fully explained by the drop in  $p$ . The quantitative differences among European and Turkish indices depend again on the different values of the shares in the Cobb-Douglas aggregators.

The aggregate European investments go up in the very first year of the simulation, and then fall back at the level compatible with the new level of the capital stock in Europe. On the contrary, investments in Turkey witness a slight initial decrease, to boom after the TFP increase.

As expected from the investment pattern, the model eventually witnesses a capital increase in Turkey, again after a lasting, if tiny decrease in the initial periods. The European capital stays constant after an initial increase.

The interest rates follow different patterns in the two countries. The European one is almost constant, slightly increasing in the first post-accession year (+0.02%), as a consequence of the increasing demand for investments, and then back at the steady state. The Turkish interest rate, instead, jumps at the very beginning of the simulation, increases for about 20 years after the accession, and finally fall down to a new steady state, when the catching-up process is over.

Let us try to disentangle the rationale behind the behaviour of these capital-related variables. As Turkey enters the European Union, the Europeans start to pay a transfer. The transfer has an immediate negative wealth effect, which in turns diminishes consumption, and has a negative impact on the interest rate. On the other hand, the transfer has a positive impact on the price indices, diminishing the value of the marginal utility of future consumption. This, in turns, entails an increase in the interest rate, to make saving more attractive, as encapsulated by the Euler equation (20). As expected, the transfer has the symmetrically opposed initial impact on the Turkish wealth and interest rate.

A peculiarity of this model with immobile capital is that wealth (capital) in Europe adjusts immediately to the new steady state level, leaving the behaviour of consumption after the initial period fully explained by the variations of the terms of trade. In other words, capital related variables in

Europe are influenced by the transfer, but not by the TFP increase in Turkey. The latter, on the contrary, deeply affects capital dynamics in Turkey. The reason for such a different reaction of 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 also appreciable direct effect on production in Turkey.

Accordingly, also the behaviour of hours worked is different between the two countries. While in Europe hours worked stay relatively constant but a first minor increase, in Turkey they witness a non-monotone path, first decreasing, then increasing, then decreasing again. The rationale behind hours behaviour in Europe is the usual one. The temporary increase in the interest rate above the steady state level makes working today (and saving) more attractive than working tomorrow. As for Turkey, things are more complex, because there the productivity shocks affecting the labour demand adds up to the traditional intertemporal substitution in labour supply. This explains the non-monotonic behaviour of hours worked in Turkey.

After the initial jump from zero, transfers from the EU to Turkey have an almost constant pattern. The positive level of the transfer in the final steady state stems from two assumptions. First, we have assumed that the two countries are asymmetric. Second, we have assumed that Turkey will not completely catch up with Europe in terms of productivity.

In figure 4, we have also plotted the behaviour of the instantaneous utility function of the EU household. Utility decreases a bit in the initial post-accession years, to increase later on. Therefore, to assess whether transfers are “worthy” for the Europeans, we need to compare the life-cycle utility after enlargement with the counterfactual case of no accession. To carry out this exercise, we have chosen an horizon of 300 periods, after which the value of the discount rate  $\beta^t$  is approximately zero, for  $\beta = 0.96$ . Then, we computed

$$\Delta_u = \sum_{t=1}^{300} \beta^t u_t - \left( \sum_{t=1}^{300} \beta^t \bar{u} \right), \quad (30)$$

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

As an additional quantitative exercise, we have computed the necessary increase of the 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

the Turkish TFP goes from 62.5% to 74.1% of the European one, meaning a 31% fulfilment of the initial TFP gap.

### 3.3 Capital Mobility

In this Section, we shall relax the assumption of immobile capital, making capital free to flee from one country to the other, in search for higher remuneration.

In terms of the benchmark model, we substitute equations (25) and (26) with

$$r_t = r_t^*, \quad (31)$$

$$a_t + \frac{1}{n}p_t a_t^* = k_t + \frac{1}{n}p_t k_t^*. \quad (32)$$

The new formulation makes a distinction between household savings (the variation of the stock of assets) and firms investments (the variation of the stock of capital). Whenever the former exceeds the latter, domestic households are owning capital in the foreign country, and viceversa. Accordingly, the right-hand-side of equation (24) 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.

The exercise is the same as before, namely we started from the no accession steady state, and we assumed that after accession, Turkey fulfils half of the TFP gap with Europe, while the Europeans start to pay the transfer.

Results from simulations with capital mobility are reported in Figures 1 to 4 (blue line).

The outcome of the new exercise differs significantly from the previous one. The possibility of capital movements magnifies the real effects of the transfer and TFP permanent shocks on the production side of both the countries. This is particularly true for Europe, where production and factors' employment follow a bell-shape pattern, till they converge to a lower steady state. Capital mobility enhances a deeper catch up by Turkey on Europe, as witnessed by the decreasing pattern of the transfer after the initial post-accession jump.

The increase in the European consumption is short lived. As Turkish productivity gains momentum, the European household starts to invest in Turkey, which in turns implies a reversal of the pattern of the terms of trade.

Real-wage reactions are much stronger than in the previous exercise, especially in Turkey, where the capital-to-labour ratio increases appreciably. Real

wage in Europe has only minor oscillations, converging towards a slightly lower steady state.

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 less affected than in the case of no capital mobility. Still, by computing equation (30), we obtained  $\Delta_u > 0$ , thereby confirming our previous results that, conditional on the assumptions we have made so far, the Europeans are better off if Turkey enters the European Union.

Last, in the case of capital mobility, the required TFP increase in Turkey for making the Europeans indifferent towards the accession of Turkey to the European Union is much bigger than in the previous case. It turns out of computations that  $\Delta_u = 0$  if the Turkish TFP goes from 62.5% to 79.45% of the European one, meaning a 45% fulfilment of the TFP gap.<sup>5</sup>

## 4 Conclusions

The accession of Turkey to the European Union is currently much debated in Europe. If the core of the debate concerns political, historical and cultural issues, the main economic objection to Turkey's possible membership is about 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 for the Europeans, the negative welfare effects induced by the transfer might be compensated, and even outweighed by a positive general equilibrium effect, which operates through an external TFP-driven improvement of the EU terms of trade, vis-à-vis to Turkey. In that case, the transfer may be a price worth paying for.

Our analysis rests on the hypothesis that the EU membership grants better institutions, e.g. institutions that are more favourable to growth. We have modelled this view by assuming an exogenous post-accession increasing pattern of the Turkish total factor productivity. While the better-institutions hypothesis is crucial for our result, we do not attach much importance to the

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<sup>5</sup>In an exercise not shown in the text, we have considered a model where agents anticipate the future accession of Turkey to the European Union in 15 years. Results show little qualitative change. The only significant change concerns a quantitative aspect. The TFP increase in Turkey necessary to make the Europeans indifferent between accession or no-accession becomes 32.8% of the actual TFP gap, in the case of no capital mobility, instead of 31%, the value found in the benchmark case without expectations. No such a change is instead observed when introducing expectations in the model with perfect capital mobility.

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 taxation. We leave the task of enriching the institutional set up presented here to future research.

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# Figures

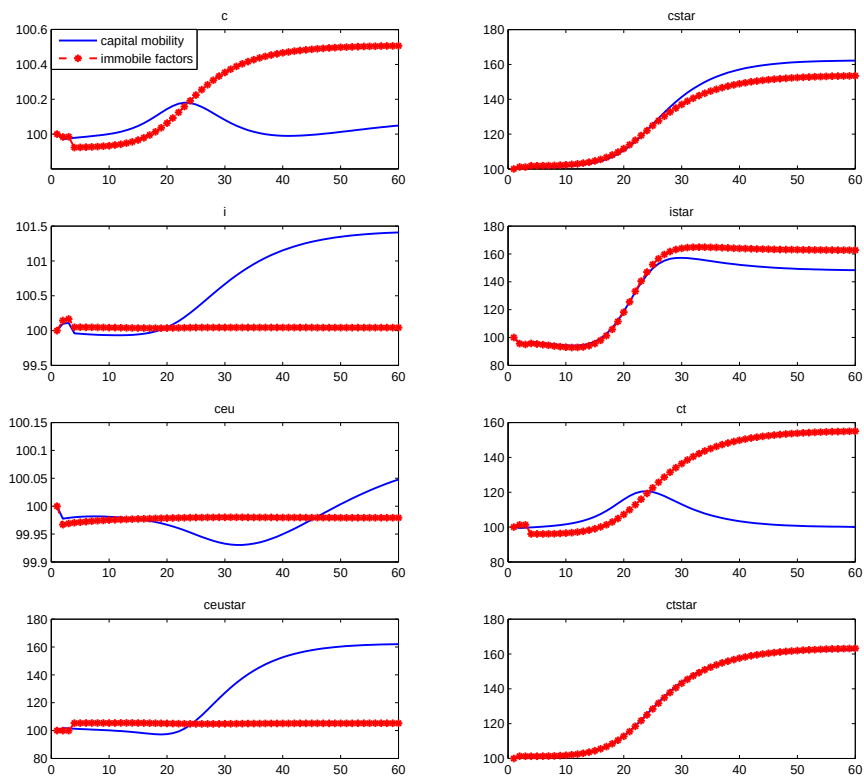


Figure 1: Simulation with half TFP-gap catch-up: model with immobile factors vs model with capita mobility

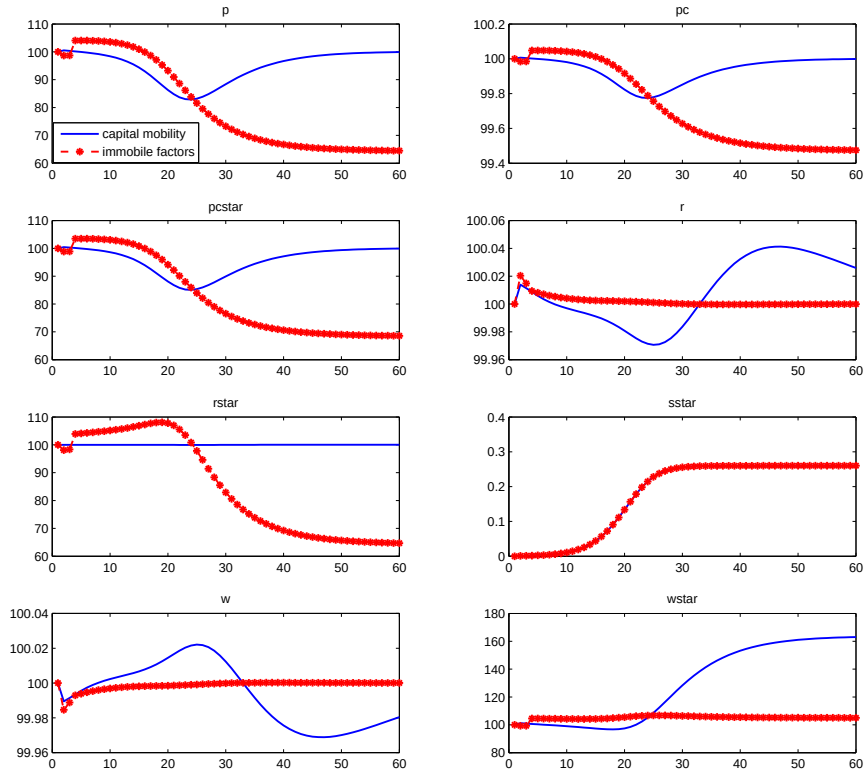


Figure 2: Simulation with half TFP-gap catch-up: model with immobile factors vs model with capital mobility

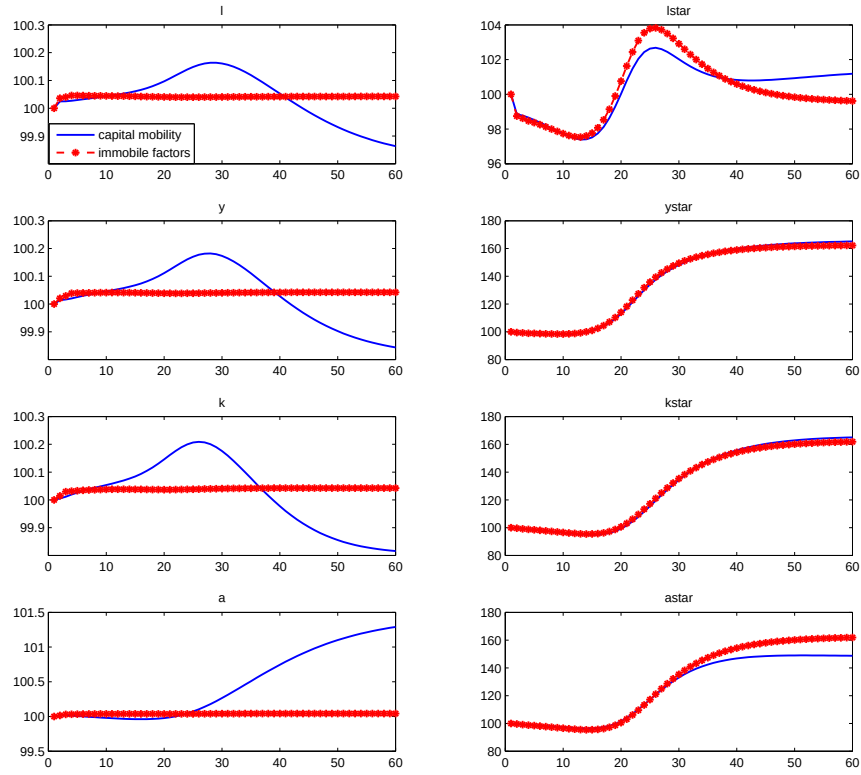


Figure 3: Simulation with half TFP-gap catch-up: model with immobile factors vs model with capital mobility

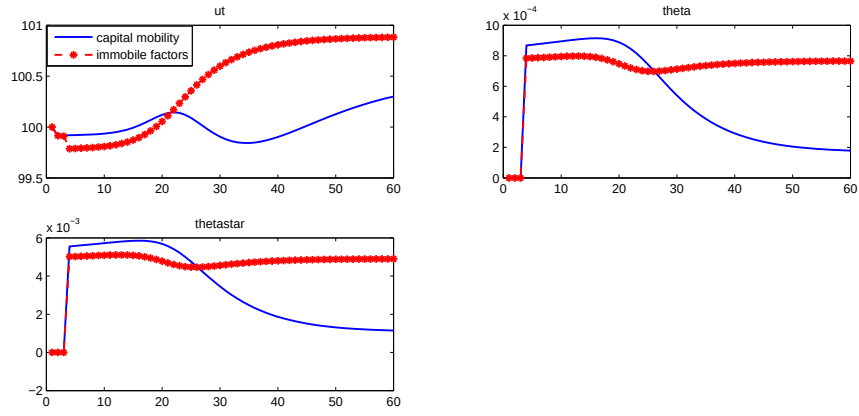


Figure 4: Simulation with half TFP-gap catch-up: model with immobile factors vs model with capita mobility