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What Are the Potential Economic Benefits of Enlarging the Gulf Cooperation Council?

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Abstract

This Working Paper should not be reported as representing the views of the IMF.
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This paper uses a variant of the IMF's Global Economy Model (GEM) to estimate the macroeconomic effects of Yemen's full accession into the Gulf Cooperation Council (GCC). After calibrating the model to Yemen and the GCC countries, several simulations were carried out to estimate the potential impact of economic integration on both. The paper draws two fundamental conclusions. First, further steps in regional integration would enhance competition and produce large economic benefits for both Yemen and the GCC countries. In particular, we show that in some cases economic integration could increase GDP in Yemen by as much as 18 percent and in the GCC by as much as 20 percent over the long run. Second, even if market structures do not improve substantially, GCC enlargement can still generate substantial spillover gains with consumption increasing by up to 7 percent in Yemen and 8 percent in the GCC, respectively.

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I. INTRODUCTION

This paper considers the economic impact of the Republic of Yemen's accession into the Cooperation Council for the Arab States of the Gulf (GCC), which consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. Although Yemen was accepted as a partial member of the GCC in 2002, its ultimate aim is full membership. One of the most important features of the GCC is that its member countries possess approximately 45 percent of the world's proven oil reserves, with Saudi Arabia alone controlling over 25 percent, estimated at over 250 billion barrels.[2]

The GCC countries have already taken important steps toward economic and financial integration, including the recent adoption of a unified common external tariff and the decision to create a monetary union by 2010. Further progress towards efficient integration and the eventual creation of a monetary union will likely strengthen the environment for non-oil economic activities and create employment opportunities for a rapidly growing national labor force—two important challenges facing GCC countries and Yemen.[3]

This paper uses a variant of the IMF's Global Economic Model (GEM) to estimate the effects of Yemen's accession into the GCC. Unlike traditional macroeconomic models, GEM is based on solid microeconomic foundations. The model posits imperfect competition which drives a wedge (markup) between the true marginal cost and actual price in both the goods and labor markets. These markups are inversely related to the degree of substitutability across goods, and hence to the underlying level of competition. After calibrating the model, we investigate how economic integration affects economic performance in Yemen and the GCC countries across a wide range of markups.

We find that economic integration improves competition and leads to sizable economic benefits for Yemen and the GCC countries. Indeed, our estimates of potential long-run gains indicate that reducing the markups in the goods and labor markets from 40 percent to 5 percent in Yemen and the GCC countries would increase GDP by up to 18 percent and 20 percent, respectively. Taking into account the salient features of each block—a more rigid labor market in the GCC countries and a more concentrated goods market in Yemen—enhancing competition in these markets would still lead to an output increase of 14 percent in Yemen and 5 percent in the GCC countries, with a substantial increase in consumption, investment, and employment. Moreover, improving competition in one block only would lead to a sizable positive spillover on the other block.

The rest of the paper is organized as follows. The next section briefly discusses the benefits of economic integration. Section III outlines the theoretical underpinning of the model and its calibration. Sections IV and V report on the results of the simulations. Section VI concludes.

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[2] Relatedly, the GCC countries also possess 20 percent of proven world natural gas reserves. With the discovery of the North Gas Field in 1971—the world's largest nonassociated natural gas field—Qatar itself controls 11 percent of proven global natural gas reserves.

[3] See Fasano (2003).

II. THE BENEFITS OF ECONOMIC INTEGRATION

Traditionally, the benefits of economic integration are assessed through its effect on trade. It is usually assumed that the trade impact is based on comparative advantages drawn from differences in productivity or factor endowments, and that firms take prices as given and produce homogenous goods. In general, low-income countries (with higher ratio of unskilled labor) are better served by economic integration than higher income countries due to income convergence (Venables, 2003). That is, the effects of integration are distributed differently depending on the country's initial conditions. Convergence takes place because integration maximizes trade creation, with low-income countries experiencing an improvement in their terms of trade and exports.

In the context of this paper, the economic benefits of economic integration are looked at from a different angle. By relaxing the strict assumption of perfect competition (which underlay other traditional models), the paper looks at the economic benefits from increased competition in the goods and labor markets through reducing price and wage markups.[4]

Although Yemen is much poorer than the current GCC members, its accession into the GCC would have a positive impact on the region. The main impact will occur through an increase in population, expanding the size of the market by over 50 percent (Table 2). Full membership will imply larger markets and the reduction (elimination) of entry costs, both of which will entice new firms to enter these markets, eroding the market power of existing firms and enhancing competition. This yields a number of potential long-run benefits.[5]

First, larger markets allow firms to exploit economies of scale more fully. Many of the countries are too small for activities that could benefit from large economies of scale. Regional integration overcomes the disadvantages of smallness and limited market access. By pooling resources and combining markets, countries can benefit from a combination of scale effects and changes in the intensity of competition. In a market of a given size, there is a trade-off between scale economies and competition.

Second, as monopolistic distortions are reduced, increased competition induces firms to cut prices and expand sales, which would benefit consumers and improve living standards throughout the region. As output increases and prices decline in one block due to increased competition, the real exchange rate depreciates, which would benefit consumers in the other block.

Third, openness and economic integration lead to efficiency gains in firms (Tybout, 2000).[6] At the same time, as more differentiated products become available, consumers' welfare in both blocks would improve.

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[4]   Another paper that investigates the issues of monopolistic competition and economic integration is Peretto (2003). Using a different approach, he considers a world economy populated with oligopolistic producers and argues that integration improves growth and enhances welfare.

[5]   For papers that consider the impacts of financial integration, see Edison, Levine, Ricci and Slok (2002), as well as Kose, Prasad, and Terrones (2003).

[6]   See also Horn, Lang, and Lundgren (1995), and Schiff and Winters (2003).

There is also growing evidence that economic integration tends to increase foreign direct investment (FDI), both from within and outside the region.[7] Larger markets enhance competition and improve policy credibility, which typically accelerates structural reforms. An increase in FDI would raise income both directly, by increasing the capital intensity of production, and indirectly, by encouraging technical progress. Recent studies including Baldwin and Forslid (1996) and Baldwin and Seghezza (1996) suggest that the rate of return on capital and investment can rise in all integrating countries regardless of capital abundance. FDI flows also entail knowledge spillovers. Blömstrom and Kokko (1997) argue that increased competition forces firms to use resources more efficiently, including by searching for new and more efficient technologies.

III. THE MODEL

The world economy consists of two blocks: Home (Yemen) and Foreign (the GCC).[8] Foreign variables are indexed with a star. The main purpose of this section is to outline some of the key features of GEM. For further details refer to the appendices and Bayoumi, Laxton, and Pesenti (2004).[9]

A. Consumption Goods

In each country, there is a continuum of symmetric firms producing a final consumption good indexed by $x \in [0, s]$, where $0 < s < 1$ is a measure of country size.[10] World size is normalized to unity, and Foreign firms producing the Foreign final good are indexed by $x^* \in [s, 1]$.

Home firm x's output at time t is denoted by $A_t(x)$.[11] The consumption good is produced with the following CES technology:

$$A_t(x) = \left(\nu_A^{\frac{1}{\mu_A}} Q_{A,t}(x)^{1-\frac{1}{\mu_A}} + (1-\nu_A)^{\frac{1}{\mu_A}} \left[M_{A,t}(x) \left(1 - \Gamma_{MA,t}(x)\right) \right]^{1-\frac{1}{\mu_A}} \right)^{\frac{\mu_A}{\mu_A-1}} \tag{1}$$

Two intermediate inputs are used in the production of the consumption good A: a basket Q_A of domestically-produced tradable goods, and a basket M_A of imported tradable goods.[12] The elasticity of substitution between domestic and imported inputs is $\mu_A > 0$. This elasticity is a critical determinant of the long-run spillover effects of changes in the degree of competition

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[7] See Schiff and Winters (2003) Chapter 4 for further details.

[8] Multi-country versions of GEM are currently under development, however, we believe a two-country version of GEM captures the main features we wish to highlight.

[9] The model introduced in this section is a simpler variant of the IMF's GEM based on the work of Bayoumi, Laxton, and Pesenti (2004). For a more detailed presentation of GEM, see Laxton and Pesenti (2003).

[10] The production of the investment good is analogous and is stated in Appendix II.

[11] The convention throughout the model is that variables which are not explicitly indexed (to firms or households) are expressed in per capita (average) terms. For instance, $A_t \equiv (1/s) \int_0^s A_t(x)dx$.

[12] Although the details are deferred to Appendix I, these imported goods are all differentiated products which motivate the existence of monopolistic competition.

in one country on other countries, because it affects the response of the real exchange rate and therefore, the average spillover effects on per capita real income and consumption. For example, as $\mu_A \to \infty$, goods become perfectly substitutable and hence relative changes in demands for domestic and import goods do not have any impact on the real exchange rate. The parameter $\nu_A \in (0,1)$ is the weight of local inputs in the production of the good A, which is a measure of home bias in consumption. A larger value of ν_A implies a relatively closed economy.

B. Intermediate Goods

We denote by $T(h)$ the supply of each Home-country intermediate h according to the following CES technology:

$$T_t(h) = Z_t \left[(1-\alpha)^{\frac{1}{\xi}} \ell_t(h)^{1-\frac{1}{\xi}} + \alpha^{\frac{1}{\xi}} K_t(h)^{1-\frac{1}{\xi}} \right]^{\frac{\xi}{\xi-1}} \tag{2}$$

Firm h uses labor $\ell(h)$ and capital $K(h)$ with constant elasticity of input substitution $\xi > 0$, while Z is a productivity shock common to all producers of Home tradables.

Firms producing intermediate goods take the prices of labor inputs, W_t, and that of capital, R_t, as given. Deferring the details to the Appendix III, cost minimization in the intermediate sector yields:

$$\ell_t(h) = (1-\alpha) \left(\frac{W_t}{MC_t(h) Z_t} \right)^{-\xi} \frac{T_t(h)}{Z_t} \tag{3}$$

where the marginal cost $MC(h)$ is given by:

$$MC_t(h) = \frac{1}{Z_t} \left[(1-\alpha) W_t^{1-\xi} + \alpha R_t^{1-\xi} \right]^{\frac{1}{1-\xi}} \tag{4}$$

The condition for capital is analogous and similar considerations hold for the production of Foreign intermediates.

C. Price Setting

Consider now profit maximization in the Home country's intermediate sector. Each firm h takes into account the demand for its product in both countries and sets the nominal prices $p(h)$ in the Home market and $p^*(h)$ in the Foreign market by maximizing the present discounted value of its real profits. In both markets, there is sluggish price adjustment due to resource costs measured in terms of total profits.

Denoting the nominal exchange rate as $\mathcal{E}$ (defined as Home currency per unit of Foreign currency), firm h sets its prices by maximizing its profits. Consider the solution to this problem when prices are fully flexible. The optimization problem collapses to the standard markup rule:

$$p_t(h) = \frac{\theta}{\theta-1} MC_t(h) \tag{5}$$

where the fixed gross markup $\theta/(\theta-1)$ is a monotonically decreasing function of the elasticity of

input substitution. More crucially, equation (A-4) clarifies the link between imperfect competition and nominal rigidities: as $\theta \to \infty$, $p_t(h) \to MC_t(h)$. This implies that in a competitive economy (large θ), prices must move in tandem with the shocks affecting marginal costs, even though such flexibility entails large adjustment costs. Instead, if price setters have strong monopoly power (θ is close to one, its minimum value), they can charge a high average markup over marginal costs. In this case, when marginal costs increase due to cyclical conditions, firms find it optimal to maintain prices relatively stable and absorb such changes through a markup squeeze. In fact, when θ is small, monopolistic distortions are such that firms can minimize their adjustment costs while maintaining their prices well above marginal costs, and changes in demand can be accommodated through supply adjustments without corresponding changes in prices.[13]

Similar considerations hold for the price of goods h abroad, $p^*(h)$. If nominal rigidities in the export market are highly relevant, the prices of Home goods in the Foreign market will be characterized by significant inertia.[14] In this case, exchange rate pass-through in the Foreign economy will be low due to the fact that exports are invoiced in Foreign currency and prices are sticky in the consumer currency. In the absence of price stickiness, optimal price setting is consistent with the cross-border law of one price:

$$\mathcal{E}_t p_t^*(h) = p_t(h) = \frac{\theta}{\theta - 1} MC_t(h) \tag{6}$$

Foreign variables are similarly characterized.

D. Consumer Optimization

In each country, there is a continuum of symmetric households. Home households are indexed by $j \in [0, s]$ and Foreign households by $j^* \in [s, 1]$, the same indexes of labor inputs.

Households' preferences are additively separable in consumption and labor effort. Denoting with $\mathcal{W}_t(j)$, the lifetime expected utility of Home agent j, we have:

$$\mathcal{W}_t(j) \equiv E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \left[U\left(C_\tau\left(j\right)\right) - V\left(\ell_\tau(j)\right) \right] \tag{7}$$

where β is the discount rate, assumed to be identical across countries.[15]

Households' maximize utility subject to a budget constraint which yields the familiar first-order conditions. Although the details are in the appendix, the Euler equation, for example, highlights the households' strong preference to smooth consumption.

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[13]   Labor services provided by the households are also differentiated products as explained in Appendix III.

[14]   This is the "local currency pricing" scenario analyzed by Devereux and Engel (2003), Corsetti and Pesenti (2003), and others.

[15]   The exact specification of the utility function is stated in Appendix V.

E. Calibration and Model Properties

This section describes the baseline calibration of the model. In what follows, we refer to Yemen as the Home country and to the GCC countries as the Foreign country.[16] Table 1 provides a summary of the key parameter values as well as steady-state values for some key variables in the baseline solution of the model. Since data necessary to estimate the behavioral parameters of the model are not available, we used the calibration in Bayoumi, Laxton, and Pesenti (2004). Below, we highlight some of the key parameters.[17]

In the base-case calibration of the model, we set the elasticity of substitution between domestic and imported inputs in the production of consumption and investment goods (μ_A and μ_E) equal to 1.5. Once again, these elasticities are critical determinants of the long-run spillover effects of changes in the degree of competition in one country on other countries, because they affect the response of the real exchange rate and therefore the average spillover effects on per capita real income and consumption.[18]

The steady-state price and wage markups are allowed to vary in the simulations.[19] The wage markup is equal to $\psi/(\psi-1)$, so that a markup of 1.4 reflects an elasticity of substitution among labor inputs (ψ) equal to 3.5. Similarly, the steady-state price markup is $\theta/(\theta-1)$, so that a markup of 1.1 would imply an elasticity of substitution among differentiated goods (θ) equal to 11.

The following steady-state ratios were calibrated to be consistent with recent data from national accounts. The steady-state investment-to-GDP ratio was set to be equal to 20 percent in Yemen, with 13 percent representing private sector investment and 7 percent representing investment by the government. The same ratio was 22 percent in the GCC countries, with 16 percent representing private sector investment and 6 percent public sector investment.

The import-to-GDP ratio was set at 35 percent for Yemen and 31 percent for the GCC countries, indicating relatively open economies. The split of imports into investment and consumption goods was based on recent data from the statistical appendices of IMF country reports . For Yemen, the 35 percent ratio is split between 30 percent for consumption and the remainder for investment. For the GCC countries, the 31 percent is distributed between 20 percent for consumption and 11 percent for investment. These ratios were calibrated by setting the appropriate values for the scale

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[16]   We consider a range of country sizes for Yemen based on population, GDP, and per capita income. There are not substantial changes in our results for a range between 5 to 20 percent.

[17]   The calibration of the parameters is for the most part very standard, see Bayoumi, Laxton, and Pesenti (2004) for further details and discussions.

[18]   Consistent with Bayoumi, Laxton, and Pesenti (2004), the results are extremely robust to the calibration of these parameters.

[19]   These are the only parameters that change and thus distinguish the baseline nonstochastic steady state with the new nonstochastic steady state after the markups have been altered. Although it is conceivable that economic integration will affect other parameters, we are interested in isolating the impact due to the change in the market structure in each block.

parameters (ν_A and ν_E) in the import demand functions for both the Home and Foreign countries.

F.   Drawbacks and Advantages of GEM in the Present Context

There are a few drawbacks to a dynamic stochastic general equilibrium type model such as GEM in the present context. While GEM assumes that the goods market is highly differentiated, the goods markets in Yemen and the GCC countries are currently very homogenous as they are based almost entirely on hydrocarbons. In addition, in these countries, reducing the markups in the goods and labor markets may be more difficult, given the extent to which markets are segmented and information is costly. Therefore, the effectiveness of economic integration, which is measured in the context of GEM by the degree to which it reduces concentration and enhances competition in the labor and goods markets—by reducing the markups in both markets—may be more difficult than in developed countries. Relatedly, there are severe data limitations which hinder the calibration of the markups used in the model.

Nonetheless, the model is a very useful tool for analyzing the long-run impact of economic integration, especially in the absence of long time series needed for meaningful empirical investigations. Based on a few key parameters, using GEM illustrates the benefits that could accrue to both Yemen and the GCC countries from increasing competition, improving efficiency, and reducing barriers. Moreover, the robustness of the results could easily be tested by varying a few parameters and observing how the results would be affected. Although the economic structure in the two blocks is similar, there are serious efforts to diversify the economy and production base away from oil in the long run and, hence, GEM could help illustrate the impact of reducing rigidities in these markets and the adjustment path toward long-run steady state equilibrium.

IV. THE LONG-RUN ECONOMIC IMPACT OF GCC ENLARGEMENT

A larger regional market intensifies competition—by reducing the ability of firms and workers to exploit market power—and hence leads to a higher level of output, investment, consumption, employment, and trade. The combination of higher production levels and hence increased demand for imports from the other block induce a depreciation of the real exchange rate, boosting further real incomes and consumption. We first analyze the long-run consequences of economic integration as market power is reduced, where market power is gauged by wage and price markups. We then investigate the dynamic response path of key macroeconomic variables to economic integration as it promotes region-wide competition.

In the following experiments, we consider the long-run effects of Yemen's accession into the GCC. We start from a baseline scenario where market power diminishes as incumbent firms face competition from abroad. To illustrate the impact of reducing monopolistic power in both markets, we start from a baseline case where the markup in both the labor and goods markets is assumed at 40 percent in the two blocks—although it maybe more realistic to assume, as we do later, that the goods market is more concentrated in Yemen and the labor market is more rigid in the GCC. We then reduce the markups to reflect corresponding increases in competition due to regional integration, and estimate the effects on output, consumption, investment, employment,

and exports. The results also show the impact of each experiment on the real effective exchange rate.[20]

A.   Improving the Product and Labor Markets in Yemen

Table 3 represents our baseline scenario and displays the long-run impact of reducing the markups in both the goods and labor markets successively from 40 percent to 5 percent as a result of a more competitive environment in both blocks. Each column corresponds to the cumulative percentage change. For example, the first column shows the long-run consequences when the markups (in both markets) decrease from 40 percent to 35 percent. The last column depicts the cumulative response when competition increases significantly to an extent where the markup is reduced by 35 percent to 5 percent in the long run.[21]

As expected, increased competition, even marginally, leads to higher growth. In fact, the cumulative growth over the long run can be as high as 18 percent in Yemen. As the size of the market increases and entry barriers are eliminated, the inflow of new entrants erodes the market power of existing firms and increase output as firms try to raise sale volumes. At the same time, competition generally reduces the market power of workers within domestic markets since a relatively cheaper foreign labor becomes available, leading to an increase in output.[22] In addition, economic integration is usually accompanied by a surge in investment, reflecting in part the increase in FDI flows into the domestic economy. Initially, foreign firms incur sunk costs as they "set-up-shop" in order to penetrate the domestic market and reap the benefits of a larger consumer base.

While the impact of integration on output in the GCC countries is small—when the labor and goods markets in Yemen improve—spillover effects could lead up to a 4.3 percent increase in consumption, reflecting the impact of the real exchange rate depreciation caused by the increase in domestic output and the reduction in domestic prices in Yemen. This improved competitiveness leads to higher sales and thus larger consumption in the GCC. In addition, as Yemen increases production, it demands more intermediate goods from the GCC countries, increasing their exports and output.

It is interesting to note that the cumulative increase in some variables approaches an upper bound as the markups diminish. While an increase in competition will invariably lead to a significant improvement on macroeconomic activity—especially when the market structure is initially

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[20]   Even though in these experiments we compare the nonstochastic steady state in the baseline to a new nonstochastic long-run equilibrium, stochastic experiments are easily conducted using GEM.

[21]   It is important to highlight that each column reflects an individual experiment. We consider a broad range of markup decreases to capture a plausible depiction of the monopolistic structure in each block. Although in principle the markup can decline over time, this need not be the case. Moreover, regional integration can increase competition so that the markups only decline by an arbitrary percentage. Furthermore, the decrease in the markup need not start from the value of 40 percent.

[22]   This is more relevant to the GCC block, where labor market rigidities are more prevalent and where labor of locals is shorter in supply. See Section IV C for further details.

very concentrated—these improvements in competition will improve economic activity at a diminishing rate.[23]

Separating the Impact of the Product and Labor Markets in Yemen

We conduct an analogous experiment except that now regional integration only has an impact on the competitiveness of the product market in Yemen (Table 4). While this set of simulations is highly stylized because competition in labor and product markets is intimately related, it is nonetheless useful to examine the relative importance of each market. The results are qualitatively similar, but the overall impact is somewhat muted. This is expected as there are no synergies from improved labor market conditions on the product market. As such, increased competition in the product market on account of regional integration is responsible for most of the economic gains and spillovers.

In the case where Yemen's accession into the GCC has implications only for the labor market, the results are qualitatively similar but there are two important points to be made (Table 5). First, the impact of competitiveness on overall economic activity is lower relative to the previous case. This is primarily because labor is an input of production, and hence as we move up the production chain, its impact on economic performance diminishes. Second, we note that the combined effects, which are the addition of the results in respective columns (Tables 4 and 5), are slightly less than those in Table 3. This is once again a consequence of the non-linear structure of the model which can be traced back to consumer preferences. It is important to emphasize that even if the impact of regional integration on the industrial structure is limited, there are still economic spillover gains to reap.

B.   Improving the Labor and Product Markets in the GCC

To contrast the impact of enlarging the GCC on Yemen with its impact on the GCC countries, we examine the potential economic benefits from enhancing competition in the GCC markets only. As shown in Table 6, the GCC countries would benefit tremendously, experiencing a significant boost in investment, exports and employment, leading to a 20 percent increase in GDP over the long term. This larger impact is due to the fact that the GCC is a much larger block than Yemen and hence would tend to benefit more from improving its labor and product markets and thus from economic integration.

At the same time, Yemen would stand to gain from improved market structures in the GCC due to spillover effects, mainly from an improvement in the competitiveness of the GCC through the depreciation of the real exchange rate. GDP in Yemen would increase by almost 7 percent, reflecting essentially a boost in investment and consumption but more importantly an increase in exports to the GCC, coming as a result of their much higher growth.

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[23]   This stems from the slight nonlinearity, which is a consequence of consumer preferences for the continuum of differentiated products.

C.   Improving the Labor Market in the GCC and the Product Market in Yemen

Perhaps a more plausible experiment is one that looks at the impact of economic integration that takes into account the characteristics of the labor and goods market in the two blocks. Specifically, we assume that the labor market in the GCC is very rigid, and the goods market in Yemen is characterized by a high degree of concentration. There are several related reasons why we argue that GCC labor markets are relatively more rigid than those in Yemen. First, citizens in GCC countries have very high reservation wages. This is primarily because they have implicit guarantees of public sector employment, which provides relatively high wages and generous benefits. Second, the labor market is highly segmented with expatriate workers providing most of the low skilled labor services. This segmentation creates mismatches in the skills supplied by national workers hindering adjustment.[24] Third, expatriate workers typically are not able to work for the public sector in GCC countries, which is yet another friction hampering smooth adjustment. Finally, the hiring and firing of expatriate workers is costly to employers who incur the transportation and search costs. All of these factors make the internal and external reallocation of labor relatively more costly and contribute to the rigidity of the GCC labor market.[25]

As for the product markets, we assume that initially there is a high degree of concentration in Yemen relative to the GCC. Although there are agency laws in many GCC countries that only give a single trader the right to sell a foreign product in the country, in principle anyone can be an agent. Thus even if there is only one importer that sells a certain brand of a product, another agent can provide the market with another brand of the same product, still promoting competition. However, in Yemen, there is only a limited number of traders who actually have the resources to import goods into the market at nonprohibitive costs. This allows these traders to exploit their market power and reap the benefits of lucrative profit margins.

As such, in the experiments below, we assume that economic integration would lead to improved labor markets in the GCC countries (with no impact on the goods market) and to a more competitive goods market in Yemen (with no impact on the labor market). This experiment also reflects the fact that improving competition in Yemen's labor market will not attract workers from the GCC countries, at least not in the near and medium terms, due to nominal rigidities and to the fact that the GCC countries are net importers of labor and that wages in Yemen are very low. While the GCC has the capacity to enter the Yemeni product markets, Yemen could benefit from an expanded labor market in the GCC members over the long run.

Under this scenario (Table 7), each block unambiguously gains in terms of growth, consumption, employment, investment, and exports. Growth could increase by up to 14 percent in Yemen and by 7 percent in the GCC countries, with both blocks gaining much from increased consumption

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[24]   See Fasano and Goyal (2004) for further details.

[25]   In fact, many GCC countries realize the inherent problems in their respective labor markets. One policy that is being promoted to improve the efficiency of their labor market structure is to induce citizens to work in the private sector, especially in nonhydrocarbon-related industries. In Oman, Qatar, and Saudi Arabia, this policy is referred to as Omanization, Qatarization, and Saudization, respectively.

and employment. Investment increases substantially in Yemen, mainly reflecting large capital flows coming from the GCC countries. In addition, increased competition in the labor market in the GCC members and in the goods market in Yemen causes synergies and potentially produces enormous spillover effects and region-wide gains.

What if economic integration leads only to the erosion of the wage markup enjoyed by workers in the GCC countries? As shown in Table 8, the GCC members seems to benefit the most in terms of GDP and employment growth over the long run. Integration intensifies competition in the labor market, lowering the average reservation wage and raising employment by up to 6 percent and output by 5 percent in the GCC countries, while the impact on Yemen's growth is limited to 1.5 percent over the long run. The resulting increase in output and the real exchange rate depreciation in the GCC countries boosts their exports. Simultaneously, Yemen also enjoys large spillovers as the real exchange rate appreciation induces larger consumption of foreign goods and hence increased prosperity.

V. DYNAMIC SIMULATIONS

The objective of these dynamic simulations is to show the adjustment path resulting from economic integration. While in the previous section we investigated the potential gains of regional integration due to increased competition, here we investigate how the economies make a transition from the benchmark steady state to the new long-run equilibrium.[26] Using GEM, we assume that the markup in one country gradually converges to the lower markup of the other country as competition increases in the product and good markets.[27] More specifically, we consider what happens over 25 years (100 periods) when the markup gradually decreases from 30 percent to 15 percent in the labor and product markets, with the lower markup representing the new steady state.

Figure 1 illustrates the gradual decline in the margins in both the labor and product markets in Yemen associated with GCC enlargement. In this baseline scenario, we assume that these markets are more competitive in the GCC, with a fixed markup of 15 percent. Although this experiment is somewhat contentious, it serves to illustrate how both economies respond to this improvement in competition. After initial adjustments, due to costs associated with capital accumulation, labor reallocation, and trade frictions, GDP in Yemen increases by about 7 percent over 25 years. This increase in output results from higher investment as firms raise their stock of capital. At the same time, as competition in the product market increases, firms increase their output and their demand for factors of production.

While the increase in production in Yemen generates real exchange rate depreciation, the latter

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[26]   It is important to emphasize that these dynamic simulations are not impulse response functions. Rather, we take a novel approach and provide the path of a boundary value problem. Each experiment depicts the evolution of the economic indicators from the baseline nonstochastic steady state ($t = 0$), to the new nonstochastic steady state ($t = 100$), that is the new long-run equilibrium.

[27]   This gradual rate of convergence was chosen to reflect the slow effects of most structural changes on the respective economies.

fails to generate an initial trade surplus. This is because imported intermediate goods used for production are needed to increase capacity in Yemen. Although a real depreciation makes goods produced in Yemen relatively cheaper, it also makes imported goods used in the production of domestic final goods more expensive. Therefore, the expenditure switching effect induced by the real exchange rate depreciation does not initially generate an expansionary devaluation effect.

The real depreciation of Yemen's exchange rate will have a positive spillover effect on the GCC, since Yemeni products become relatively cheaper. This positive spillover enhances the economic gains realized by the GCC block. As can be seen in Figure 1, since the structure of the Yemeni economy has changed, most of the benefits have accrued to Yemen. However, the GCC countries still benefit from increased output and consumption.

We now consider an experiment where competitiveness improves only in the GCC block. Figure 2 depicts the case where a price and wage markup of 30 percent in the GCC declines to a presumed markup of 15 percent in Yemen. As expected, the results are qualitatively very similar to the previous experiment, given that the economies are assumed to be almost symmetric. The main differences arise because the GCC block has been calibrated to be a relatively larger economy than that of Yemen. The benefits of integration that now accrue to the GCC block are larger than those that were realized by Yemen. The increases in investment and output in the GCC block are larger than those experienced by Yemen, but the increase in consumption is the same in both cases, reflecting regional consumption smoothing.

Finally, we consider the most plausible experiment where the GCC enlargement lowers markups in the GCC labor market to those in Yemen and the markups in the product markets of Yemen to those in the GCC countries. Figure 3 shows the impact of both of these experiments simultaneously. Both countries gain substantially in terms of output, investment, and employment, reflecting the culmination of the best of both worlds. Higher competition in labor markets is the primary reason why output and consumption increase in the GCC. The decrease in markups in Yemeni product markets yields the familiar result where GDP, employment, and capital accumulation increase.

There are two important points to emphasize based on Figure 3. First, employment in the region increases monotonically. Since the generation of employment opportunities is one of the most important challenges in the GCC block—especially in the nonhydrocarbon sector—this is a very encouraging result. Second, spillovers are amplified in this case because of the synergies arising from increased competition in both countries. Intuitively, both countries benefit from integration as competition improves in the economy where market power is strongest. At the same time, there are mutual spillovers which enhance the overall gains from Yemen's accession into the GCC. Here, we argue that GCC enlargement—by intensifying competition throughout the region—can unambiguously benefit all.

VI. CONCLUSIONS

This paper examines the potential benefits of Yemen's accession into the GCC countries using a variant of the IMF's Global Economy Model (GEM)—a new open economy macroeconomic model based on solid microeconomic foundations. While a dynamic stochastic general equilibrium type model such as GEM may have some limitations in the context of Yemen and the GCC members, it is very useful in investigating the long-run benefits of economic integration as well as the adjustment process toward a long-run steady-state equilibrium—especially in view of the absence of long time series that could be used to carry out a meaningful empirical analysis in these countries. The model is calibrated on the basis of a few parameters and is used to perform simulations to gauge the potential benefits to Yemen and the GCC countries from regional integration. The model also illustrates the spillover effects of improving competition from one block to the other block.

The basic premise of the paper is that enlarging the GCC countries to include Yemen would lead to larger markets, lower entry costs, and better market structures in the two blocks. These factors will entice new entrants to benefit from potential opportunities in the respective economies, creating a potential for exploiting economies of scale and attracting foreign direct investment. As new entrants penetrate these markets, they will erode existing market powers, creating much more intense competition and efficiency gains within the region which would lead to increases in output, investment, consumption, and employment over the long run.

Although this paper concentrates on the economic impact of a larger regional market due to Yemen's accession into the GCC countries, it is needless to say that the benefits of regional integration would be enhanced further with the implementation of structural reforms and with the improvement in the quality of institutions. The unambiguous gains in terms of output and unemployment, in our most plausible experiment, could be substantially improved by adopting policies aimed at promoting factor mobility, increasing FDI flows, and improving resource allocation.

The paper conducts several experiments to quantify the impact of Yemen joining the GCC countries as a full member. One would tend to presume that most of the benefits would accrue to Yemen—being the poorest country that would benefit from income convergence—but the GCC's potential gains are quite significant. While improving competition in Yemen would generate a long-run increase in GDP by about 18 percent, improving competition in the GCC countries would have a larger impact, estimated at 20 percent increase in GDP in the long run. Under both scenarios, consumption growth is significant, leading to an increase in welfare.

Taking into account the characteristics of the labor and product markets, a more plausible scenario is carried out where the GCC's labor market becomes more flexible and Yemen's product market more competitive. Under such a scenario, output could grow by up to 14 percent in Yemen and by 7 percent in the GCC countries over the long run, with consumption increasing substantially in both blocks. At the same time, employment, which is one of the most important challenges in the region, increases in the two blocks.

I.

Consumption Goods

Home firm x's output at time t is denoted $A_t(x)$. The consumption good is produced with the following CES technology:

$$A_t(x) = \left(\nu_A^{\frac{1}{\mu_A}} Q_{A,t}(x)^{1-\frac{1}{\mu_A}} + (1-\nu_A)^{\frac{1}{\mu_A}} \left[M_{A,t}(x) \left(1 - \Gamma_{MA,t}(x) \right) \right]^{1-\frac{1}{\mu_A}} \right)^{\frac{\mu_A}{\mu_A-1}} \tag{A-1}$$

We assume that imports as a share of total production are subject to external adjustment costs Γ_{MA}:

$$\Gamma_{MA,t}(x) \equiv \frac{\phi_{MA}}{2} \left(\frac{M_{A,t}(x)}{A_t(x)} \Big/ \frac{M_{A,t-1}}{A_{t-1}} - 1 \right)^2 \tag{A-2}$$

The parameter ϕ_{MA}, quantifies the degree to which these frictions impede imports.

The basket Q_A is a CES index of differentiated intermediate tradables produced in the Home country. Defining $Q_A(h,x)$ the use by firm x of the intermediate goods produced by firm h, we have:

$$Q_{A,t}(x) = \left[\left(\frac{1}{s} \right)^{\frac{1}{\theta}} \int_0^s Q_{A,t}(h,x)^{1-\frac{1}{\theta}} dh \right]^{\frac{\theta}{\theta-1}} \tag{A-3}$$

where $\theta > 1$ are the elasticities of substitution across differentiated goods.

In the Home country, the price of the intermediate good is denoted $p(h)$. Each Home firm x takes these prices as given and minimizes its costs. Home firm x's demand for input h is then obtained as:

$$Q_{A,t}(h,x) = \left(\frac{p_t(h)}{P_{Q,t}} \right)^{-\theta} \frac{Q_{A,t}(x)}{s} \tag{A-4}$$

where P_Q is the cost-minimizing price of one basket of local intermediates:

$$P_{Q,t} = \left[\left(\frac{1}{s} \right) \int_0^s p_t(h)^{1-\theta} dh \right]^{\frac{1}{1-\theta}} \tag{A-5}$$

Similarly we can derive $M_A(f,x)$ and P_M — respectively firm x's optimal demand of imports f and the cost-minimizing price of the imports basket.

Next, each Home firm x minimizes $P_{Q,t}Q_{A,t}(x) + P_{M,t}M_{A,t}(x)$ subject to (1). Cost minimization in Home consumption good production yields:

$$Q_{A,t}(x) = \nu_A \left(\frac{P_{Q,t}}{P_t} \right)^{-\mu_A} A_t(x) \tag{A-6}$$

where the condition for the imported goods is analogous.

II.

Investment Goods

The investment good sector is similar to the consumption good sector described in the text. Symmetric Home firms producing the investment good under perfect competition are indexed by $y \in [0, s]$, and Foreign firms by $y^* \in (s, 1]$. Home firm y's output is denoted $E_t(y)$. Using self-explanatory notation, output is given by:

$$E_t(y) = \left(\nu_E^{\frac{1}{\mu_E}} Q_{E,t}(y)^{1 - \frac{1}{\mu_E}} + (1 - \nu_E)^{\frac{1}{\mu_E}} \left[M_{E,t}(y) \left(1 - \Gamma_{ME,t}(y) \right) \right]^{1 - \frac{1}{\mu_E}} \right)^{\frac{\mu_E}{\mu_E - 1}} \tag{A-1}$$

The other variables can be similarly derived. For instance, Home firm y's demand for the basket of local intermediates is:

$$Q_{E,t}(y) = \left[\left(\frac{1}{s} \right)^{\frac{1}{\theta}} \int_0^s Q_{E,t}(h, y)^{1 - \frac{1}{\theta}} \, dh \right]^{\frac{\theta}{\theta - 1}} = \nu_E \left(\frac{P_{Q,t}}{P_{E,t}} \right)^{-\mu_E} E_t(y) \tag{A-2}$$

where P_E is the price of one unit of E, and Home firm y's demand for input h is:

$$Q_{E,t}(h, y) = \left(\frac{p_t(h)}{P_{Q,t}} \right)^{-\theta} \frac{Q_{E,t}(y)}{s} \tag{A-3}$$

Aggregating across x- and y-type firms we obtain the following demand schedule for Home tradable intermediate goods h:

$$\int_0^s Q_{A,t}(h, x) \, dx + \int_0^s Q_{E,t}(h, y) \, dy = \left(\frac{p_t(h)}{P_{Q,t}} \right)^{-\theta} (Q_{A,t} + Q_{E,t}) \tag{A-4}$$

Similar considerations hold for the demand of Foreign tradable intermediate goods f, accounting for differences in country size s:

$$\int_0^s M_{A,t}(f, x) \, dx + \int_0^s M_{E,t}(f, y) \, dy = \frac{s}{1 - s} \left(\frac{p_t(f)}{P_{M,t}} \right)^{-\theta^*} (M_{A,t} + M_{E,t}) \tag{A-5}$$

Foreign variables are similarly characterized.

III.

Intermediate Goods

Denoting $T(h)$ as the supply of each Home-country intermediate h, we posit the following CES technology:

$$T_t(h) = Z_t \left[(1-\alpha)^{\frac{1}{\xi}} \ell_t(h)^{1-\frac{1}{\xi}} + \alpha^{\frac{1}{\xi}} K_t(h)^{1-\frac{1}{\xi}} \right]^{\frac{\xi}{\xi-1}} \tag{A-1}$$

Firm h uses labor $\ell(h)$ and capital $K(h)$ with constant elasticity of input substitution $\xi > 0$, while Z is a productivity shock common to all producers of Home tradables.

Home labor inputs are indexed by $j \in [0, s]$, Foreign labor inputs by $j^* \in (s, 1)$. We can then write:

$$\ell_t(h) = \left[\left(\frac{1}{s} \right)^{\frac{1}{\psi}} \int_0^s \ell(h,j)^{1-\frac{1}{\psi}} dj \right]^{\frac{\psi}{\psi-1}} \tag{A-2}$$

where $\ell(h, j)$ is the demand of the labor input of type j by the producer of good h and $\psi > 1$ is the elasticity of substitution among labor inputs. As $\psi \to \infty$, the labor services provided by the individual workers become identical and they lose all market power. As ψ becomes very small, workers are imbued with tremendous market power.

Firms producing intermediate goods take the prices of labor inputs and capital as given:

$$\ell_t(h,j) = \left(\frac{1}{s} \right) \left(\frac{W_t(j)}{W_t} \right)^{-\psi} \ell_t(h) \tag{A-3}$$

where $W(j)$ is the nominal wage paid to Home labor input j and the wage index W is defined as:

$$W_t = \left[\left(\frac{1}{s} \right) \int_0^s W_t(j)^{1-\psi} dj \right]^{\frac{1}{1-\psi}} \tag{A-4}$$

Notice that as $\psi \to \infty$, $W_t(j) = W_t$. In other words, perfect competition implies that workers do not have any market power and wages are determined purely by market forces. Cost minimization yields:

$$\ell_t(h) = (1-\alpha) \left(\frac{W_t}{MC_t(h)Z_t} \right)^{-\xi} \frac{T_t(h)}{Z_t} \tag{A-5}$$

where the marginal cost $MC(h)$ is given by:

$$MC_t(h) = \frac{1}{Z_t} \left[(1-\alpha) W_t^{1-\xi} + \alpha R_t^{1-\xi} \right]^{\frac{1}{1-\xi}} \tag{A-6}$$

The condition for capital is analogous and similar considerations hold for the production of Foreign intermediates.

IV.

Price Setting

Denoting the nominal exchange rate as $\mathcal{E}$ (defined as Home currency per unit of Foreign currency), firm h sets its prices by maximizing its profits:

$$\max_{\{p_\tau(h),p_\tau^*(h)\}_{\tau=t}^\infty} \mathsf{E}_t \sum_{\tau=t}^\infty D_{t,\tau} \left[(p_\tau(h) - MC_\tau(h)) \left(\frac{p_\tau(h)}{P_{Q,\tau}}\right)^{-\theta} (Q_{A,\tau} + Q_{E,\tau}) (1 - \Gamma_{PQ,\tau}(h)) \right.$$

$$\left. + (\mathcal{E}_\tau p_\tau^*(h) - MC_\tau(h)) \left(\frac{p_\tau^*(h)}{P_{M,\tau}^*}\right)^{-\theta} (M_{A,\tau}^* + M_{E,\tau}^*) \left(\frac{1-s}{s}\right) (1 - \Gamma_{PM,\tau}^*(h)) \right] \tag{1}$$

where $D_{t,\tau}$ is the appropriate discount rate (with $D_{t,t} = 1$), defined below. The adjustment cost are denoted $\Gamma_{PQ,t}(h)$ and $\Gamma_{PM,t}^*(h)$:

$$\Gamma_{PQ,t}(h) \equiv \frac{\phi_Q}{2} \left(\frac{p_t(h)/p_{t-1}(h)}{P_{Q,t-1}/P_{Q,t-2}} - 1\right)^2 \tag{A-2}$$

$$\Gamma_{PM,t}^*(h) \equiv \frac{\phi_M^*}{2} \left(\frac{p_t^*(h)/p_{t-1}^*(h)}{P_{M,t-1}^*/P_{M,t-2}^*} - 1\right)^2 \tag{A-3}$$

where $\phi_Q, \phi_M^*, \geq 0$. The quadratic costs of price adjustment are related to changes in firm h's price inflation relative to the past observed inflation rate in the relevant market, allowing the model to reproduce realistic inflation dynamics encompassing nominal inertias.

Denoting $\pi_t(h) = p_t(h)/p_{t-1}(h)$ and $\pi_{Q,t} = P_{Q,t}/P_{Q,t-1}$, the first-order condition to the optimization problem stated in equation A-1 with respect to $p_t(h)$ can be written as:

$$(1 - \Gamma_{PQ,t}(h))\,(p_t(h)\,(1-\theta) + \theta MC_t(h)) - (p_t(h) - MC_t(h))\,\frac{\partial \Gamma_{PQ,t}(h)}{\partial p_t(h)} p_t(h)$$

$$= \mathsf{E}_t \left(D_{t,t+1}\,(p_{t+1}(h) - MC_{t+1}(h)) \left(\frac{Q_{A,t+1} + Q_{E,t+1}}{Q_{A,t} + Q_{E,t}}\right) \left(\frac{\pi_{t+1}(h)}{\pi_{Q,t+1}}\right)^{-\theta} \frac{\partial \Gamma_{PQ,t+1}(h)}{\partial p_t(h)} p_t(h) \right) \tag{4}$$

Consider the solution to this problem when prices are fully flexible ($\phi_Q = 0$). The optimization problem collapses to the standard markup rule:

$$p_t(h) = \frac{\theta}{\theta - 1} MC_t(h) \tag{A-5}$$

where the fixed gross markup $\theta/(\theta - 1)$ is a negative function of the elasticity of input substitution, which was discussed in the main text.

V.

Consumer Optimization

In each country there is a continuum of symmetric households. Home households are indexed by $j \in [0, s]$ and Foreign households by $j^* \in (s, 1]$, the same indexes of labor inputs.

Households' preferences are additively separable in consumption and labor effort. Denoting with $\mathcal{W}_t(j)$ the lifetime expected utility of Home agent j, we have:

$$\mathcal{W}_t(j) \equiv E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \left[U\left(C_\tau\left(j\right)\right) - V\left(\ell_\tau(j)\right) \right] \tag{A-1}$$

where β is the discount rate, assumed to be identical across countries. There is habit persistence in consumption according to the specification:

$$U_t(j) = Z_{U,t} \frac{\left(\dfrac{C_t(j) - b_C C_{t-1}}{1 - b_C}\right)^{1-\sigma} - 1}{1 - \sigma} \tag{A-2}$$

where C_{t-1} is past per-capita Home consumption and $0 \le b_C < 1$. The term $Z_{U,t}$ is a preference shock common to all Home residents. The parametric specification of V is:

$$V_t(j) = Z_{V,t} \frac{\ell_t(j)^{1+\zeta}}{1+\zeta} \tag{A-3}$$

where $\zeta > 0$, and $Z_{V,t}$ is a shock to labor disutility. Foreign agent j^*'s preferences are similarly specified.

The individual flow budget constraint for agent j in the Home country is:

$$\mathcal{M}_t(j) + \mathcal{E}_t B_{t+1}^*(j) + B_{t+1}(j) \le \mathcal{M}_{t-1}(j) + (1 + i_t^*)\left[1 - \Gamma_{B,t}\right] \mathcal{E}_t B_t^*(j)$$
$$+(1 + i_t)B_t(j) + R_t K_t(j) + W_t(j)\ell_t(j)\left[1 - \Gamma_{W,t}(j)\right]$$
$$-P_t C_t(j)\left[1 + \Gamma_{S,t}(j)\right] - P_t I_t(j) + \Phi_t - NETT_t(j) \tag{A-4}$$

Home agents hold domestic money $\mathcal{M}$ and two bonds, B and B^*, denominated in Home and Foreign currency, respectively. The short-term nominal rates i_t and i_t^* are paid at the beginning of period t and are known at time $t - 1$. The two short-term rates are directly controlled by the national governments. Only the Foreign-currency bond is traded internationally: the Foreign bond is in zero net supply worldwide, while the Home bond is in zero net supply at the domestic level.

The financial friction Γ_B is introduced to guarantee that net asset positions follow a stationary process and the economies converge asymptotically to a steady state. Home agents face a transaction cost Γ_B when they take a position in the Foreign bond market. This cost depends on the average net asset position of the whole economy, which implies that in a non-stochastic steady state Home agents have no incentive to hold Foreign bonds. One would expect that financial

integration decreases the magnitude of these intermediation costs.

Home agents accumulate Home physical capital which they rent to Home firms at the nominal
rate R. The law of motion of capital is:

$$K_{t+1}(j) = (1 - \delta) K_t(j) + \Psi_t K_t(j) \qquad 0 < \delta \leq 1 \tag{A-5}$$

where δ is the depreciation rate. To simulate realistic investment flows, capital accumulation
is subject to adjustment costs. Capital accumulation is denoted $\Psi_t K_t(j)$, where $\Psi(.)$ is an
increasing, concave, and twice-continuously differentiable function of the investment/capital ratio
$I_t(j)/K_t(j)$ with two properties entailing no adjustment costs in steady state: $\Psi(\delta) = \delta$ and
$\Psi'(\delta) = 1$. The specific functional form we adopt is quadratic:

$$\Psi_t \equiv \frac{I_t(j)}{K_t(j)} - \frac{\phi_{I1}}{2} \left(\frac{I_t(j)}{K_t(j)} - \delta (1 + Z_{I,t}) \right)^2 - \frac{\phi_{I2}}{2} \left(\frac{I_t(j)}{K_t(j)} - \frac{I_{t-1}}{K_{t-1}} \right)^2 \tag{A-6}$$

where $\phi_{I1}, \phi_{I2} \geq 0$ and $Z_{I,t}$ is a temporary shock (an unexpected increase in $Z_{I,t}$ is equivalent to
an increase in the rate of capital depreciation that raises investment relative to baseline).

Each household is the monopolistic supplier of a labor input j. Each household sets the nominal
wage for type j-labor input facing a downward-sloping demand, obtained by aggregating equation
(A-3) across h-firms. Following Kim (2000), there is sluggish wage adjustment due to resource
costs that are measured in terms of the total wage bill. The adjustment cost is denoted $\Gamma_{W,t}$,
with:

$$\Gamma_{W,t}(j) \equiv \frac{\phi_W}{2} \left(\frac{W_t(j)/W_{t-1}(j)}{W_{t-1}/W_{t-2}} - 1 \right)^2 \tag{A-7}$$

where $\phi_W \geq 0$. As was the case for prices above, wage adjustment costs have two components.
The first one is related to changes of the nominal wage relative to its gross steady-state rate
of inflation. The second component is related to changes in wage inflation relative to the past
observed rate for the whole economy.

Consumption spending is subject to a proportional transaction cost Γ_S that depends on the
household's money velocity v, where $v_t(j) \equiv P_t C_t(j)/\mathcal{M}_t(j)$. Agents optimally choose their
stock of real money holdings $\mathcal{M}/P$ so that at the margin shopping costs measured in terms of
foregone consumption are equal to the benefits from investing in yield-bearing assets.

Home agents own all Home firms and there is no international trade in claims on firms' profits.
The variable Φ includes all profits accruing to Home households, plus all Home-currency revenue
from nominal adjustment rebated in a lump-sum way to all Home households, plus revenue from
financial intermediation which is assumed to be provided by Home firms exclusively. Also, Home
agents pay lump-sum (non-distortionary) net taxes $NETT_t(j)$ denominated in Home currency.
Similar relations hold in the Foreign country, with the exception of the intermediation frictions in
the financial market.

The representative Home household chooses bond and money holdings, capital and consumption paths, and sets wages to maximize its expected lifetime utility (7) subject to (A-4) and (A-5). Defining the variable $D_{t,\tau}$ as:

$$D_{t,\tau} \equiv \beta \frac{P_t U'(C_\tau) \left[1 + \Gamma_{S,t} + \Gamma'_{S,t} v_t\right]}{P_\tau U'(C_t) \left[1 + \Gamma_{S,\tau} + \Gamma'_{S,\tau} v_\tau\right]} \tag{A-8}$$

which is Home agents' stochastic discount rate and the Home pricing kernel, the first-order conditions with respect to $B_{t+1}(j)$ and $B^*_{t+1}(j)$ are, respectively:

$$1 = (1 + i_{t+1}) \, \mathsf{E}_t D_{t,t+1} = \left(1 + i^*_{t+1}\right) (1 - \Gamma_{B,t+1}) \, \mathsf{E}_t \left(D_{t,t+1} \mathcal{E}_{t+1} / \mathcal{E}_t\right) \tag{A-9}$$

The above expression is the risk-adjusted uncovered-interest-parity relationship, recalling that the return on lending to Foreign is reduced (and the cost of borrowing from Foreign is increased) by to the costs of intermediation Γ_B. In a non-stochastic steady state the interest differential $(1 + i) / (1 + i^*)$ is equal to the steady-state nominal depreciation rate of the Home currency and $1 + i = \pi/\beta$ where π is the gross steady-state inflation rate and $1/\beta$ is the steady-state real rate of interest (equal to the gross rate of time preference). Finally, since this paper does not explicitly consider fiscal and monetary policy, we defer the budget constraint of the government, the monetary policy rule as well as the other first-order and market clearing conditions to Bayoumi, Laxton and Pesenti (2004).

Table 1: Assumptions about Parameters and Steady-State Ratios

Parameters:	Yemen (H)	GCC (F)
Discount Rate (β)	$1.03^{-\frac{1}{4}}$	$1.03^{-\frac{1}{4}}$
Depreciation Rate on Capital (δ)	0.025	0.025
Habit Persistence Parameter (b_c)	0.95	0.95
Inverse Intertemporal Elasticity of Substitution (σ)	2	2
Elasticity of Input Substitution for Intermediate Goods (ξ)	0.7	0.7
Elasticity of Substitution for Consumption and Investment (μ_A, μ_E)	1.5	1.5
Inverse of Elasticity of Labor Supply (ζ)	3	3
Adjustment Cost Parameter for Imported Goods (ϕ_{MA}, ϕ_{ME})	10	10
Adjustment Cost Parameter for Capital Accumulation (ϕ_{I1})	1	1
Adjustment Cost Parameter for Investment Changes (ϕ_{I2})	80	80
Adjustment Cost Parameter for Structural Wage Persistence (ϕ_W)	2800	1400
Adjustment Cost Parameter for Import Price Persistence (ϕ_M)	0	0
Adjustment Cost Parameter for Domestic Prices Persistence (ϕ_Q)	2000	1000

Steady-State Ratios:	Yemen (H)	GCC (F)
Labor's Share	0.3	0.37
Consumption Goods-to-GDP Ratio	0.81	0.78
Private Consumption	0.69	0.52
Government Consumption	0.12	0.26
Investment Goods-to-GDP Ratio	0.2	0.22
Private Investment	0.13	0.16
Government Investment	0.07	0.06
Imports-to-GDP Ratio	0.35	0.22
Consumption Goods	0.3	0.2
Investment Goods	0.05	0.11

Sources: IMF and Authorities' estimates.

Table 2: Selected Economic Indicators for 2002

	Nominal GDP (Millions of U.S. dollars)	Nominal GDP per capita (U.S. dollars)	Population (Millions)[1]	Proven Oil Reserves (Billions of barrels)
Bahrain	8,506	11,619	0.7	0.06
Kuwait	33,215	15,098	2.2	97.68
Oman	20,290	7,515	2.7	5.70
Qatar	17,321	28,362	0.6	14.51
Saudi Arabia	188,960	8,567	22.1	261.70
United Arab Emirates	71,187	19,613	3.6	80.31
Yemen	9,802	522	18.8	3.20

Sources: IMF and Authorities' estimates.

[1] Includes expatriates.

Table 3: Gains from Higher Competition in Yemeni Product and Labor Market

		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	2.08	4.29	6.64	9.16	11.85	14.74	17.85
	Consumption	1.34	2.73	4.17	5.66	7.21	8.81	10.47
	Investment	4.90	10.23	16.08	22.50	29.57	37.40	46.12
	Employment	1.78	3.67	5.68	7.83	10.14	12.62	15.30
	Exports	1.41	2.89	4.45	6.10	7.84	9.70	11.67
	Real Exchange Rate[1]	0.58	1.19	1.82	2.48	3.18	3.91	4.67
GCC	GDP	0.38	0.77	1.19	1.62	2.08	2.56	3.07
	Consumption	0.53	1.09	1.67	2.28	2.92	3.60	4.31
	Investment	0.26	0.52	0.80	1.10	1.40	1.73	2.07
	Employment	-0.16	-0.32	-0.49	-0.66	-0.85	-1.04	-1.24
	Exports	0.82	1.68	2.58	3.53	4.52	5.57	6.69

Table 4: Gains from Higher Competition in Yemeni Product Market

|		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	1.52	3.13	4.83	6.63	8.55	10.59	12.78
	Consumption	0.79	1.58	2.39	3.21	4.03	4.86	5.69
	Investment	4.27	8.90	13.93	19.41	25.41	32.00	39.29
	Employment	1.00	2.06	3.19	4.39	5.67	7.05	8.53
	Exports	1.00	2.04	3.14	4.29	5.50	6.78	8.13
	Real Exchange Rate[1]	0.41	0.84	1.29	1.76	2.24	2.75	3.29
GCC	GDP	0.27	0.55	0.84	1.14	1.46	1.80	2.15
	Consumption	0.38	0.77	1.18	1.61	2.06	2.53	3.03
	Investment	0.18	0.37	0.57	0.77	0.99	1.22	1.45
	Employment	-0.11	-0.23	-0.35	-0.47	-0.60	-0.74	-0.88
	Exports	0.58	1.19	1.83	2.49	3.19	3.92	4.69

Source: IMF Staff estimates.

[1] An increase in the Real Exchange Rate implies a real depreciation for Yemen.

Table 5: Gains from Higher Competition in Yemeni Labor Market

|		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	0.55	1.12	1.72	2.35	3.01	3.70	4.43
	Consumption	0.55	1.12	1.73	2.35	3.02	3.71	4.44
	Investment	0.60	1.23	1.88	2.57	3.29	4.05	4.85
	Employment	0.77	1.57	2.42	3.30	4.23	5.21	6.25
	Exports	0.40	0.82	1.26	1.72	2.20	2.70	3.23
	Real Exchange Rate[1]	0.17	0.34	0.52	0.71	0.91	1.11	1.33
GCC	GDP	0.11	0.22	0.34	0.46	0.59	0.72	0.86
	Consumption	0.15	0.31	0.48	0.65	0.83	1.02	1.22
	Investment	0.07	0.15	0.23	0.31	0.40	0.49	0.58
	Employment	-0.05	-0.09	-0.14	-0.19	-0.24	-0.30	-0.36
	Exports	0.24	0.48	0.74	1.00	1.28	1.57	1.88

Table 6: Gains from Higher Competition in GCC Labor and Product Markets

		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	0.80	1.64	2.54	3.49	4.51	5.61	6.79
	Consumption	0.79	1.62	2.51	3.46	4.47	5.56	6.74
	Investment	0.57	1.17	1.81	2.49	3.22	3.99	4.82
	Employment	-0.17	-0.35	-0.54	-0.74	-0.95	-1.18	-1.41
	Exports	1.44	2.96	4.59	6.33	8.20	10.21	12.38
	Real Exchange Rate[1]	-0.73	-1.48	-2.27	-3.08	-3.93	-4.82	-5.75
GCC	GDP	2.35	4.86	7.54	10.42	13.51	16.85	20.47
	Consumption	1.34	2.71	4.11	5.53	6.97	8.42	9.88
	Investment	5.15	10.79	16.98	23.79	31.34	39.74	49.13
	Employment	1.86	3.84	5.97	8.26	10.73	13.42	16.34
	Exports	2.18	4.51	7.02	9.71	12.62	15.78	19.23

Source: IMF Staff estimates.

[1] An increase in the Real Exchange Rate implies a real depreciation for Yemen.

Table 7: Gains from Higher Competition in GCC Labor and Yemeni Product Markets

		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	1.70	3.50	5.41	7.43	9.58	11.87	14.33
	Consumption	0.96	1.95	2.95	3.97	5.01	6.07	7.13
	Investment	4.40	9.18	14.38	20.05	26.26	33.09	40.65
	Employment	0.96	1.98	3.07	4.22	5.46	6.78	8.21
	Exports	1.33	2.72	4.19	5.73	7.36	9.08	10.91
	Real Exchange Rate[1]	0.25	0.50	0.76	1.04	1.32	1.62	1.93
GCC	GDP	0.89	1.82	2.80	3.83	4.91	6.05	7.25
	Consumption	0.96	1.96	3.01	4.11	5.27	6.50	7.79
	Investment	0.84	1.72	2.64	3.60	4.62	5.69	6.82
	Employment	0.66	1.36	2.08	2.84	3.64	4.49	5.37
	Exports	1.08	2.21	3.40	4.64	5.96	7.35	8.82

Table 8: Gains from Higher Competition in GCC Labor Market

		35%	30%	25%	20%	15%	10%	5%
Yemen	GDP	0.18	0.37	0.56	0.77	0.98	1.21	1.45
	Consumption	0.18	0.37	0.56	0.76	0.98	1.20	1.43
	Investment	0.13	0.26	0.41	0.55	0.71	0.87	1.03
	Employment	-0.04	-0.08	-0.12	-0.17	-0.21	-0.26	-0.31
	Exports	0.33	0.67	1.02	1.39	1.78	2.19	2.61
	Real Exchange Rate[1]	-0.17	-0.34	-0.52	-0.70	-0.90	-1.10	-1.31
GCC	GDP	0.62	1.27	1.95	2.66	3.41	4.20	5.03
	Consumption	0.58	1.18	1.81	2.47	3.16	3.89	4.66
	Investment	0.66	1.34	2.06	2.81	3.60	4.44	5.32
	Employment	0.78	1.59	2.44	3.33	4.27	5.26	6.30
	Exports	0.49	1.01	1.55	2.11	2.70	3.32	3.98

Source: IMF Staff estimates.

[1] An increase in the Real Exchange Rate implies a real depreciation for Yemen.

Figure 1: Dynamics from Higher Competition in Yemeni Product and Labor Markets

Wage Markup in Yemen Converges Gradually
to the Wage Markup in the GCC
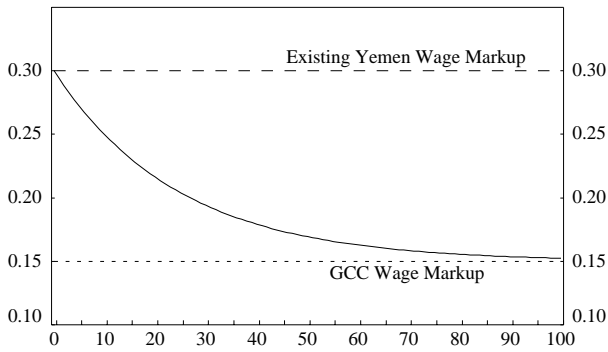
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to the Price Markup in the GCC
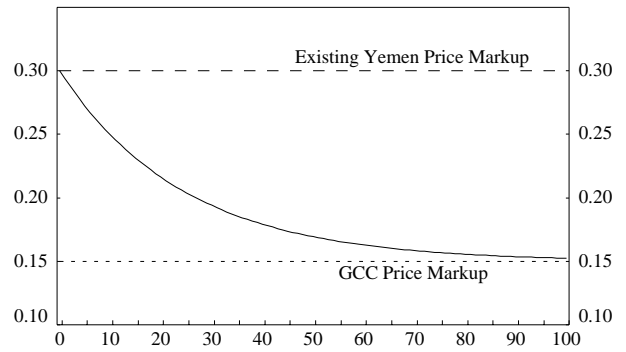
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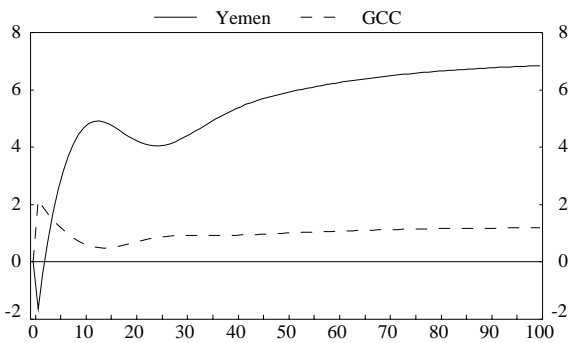
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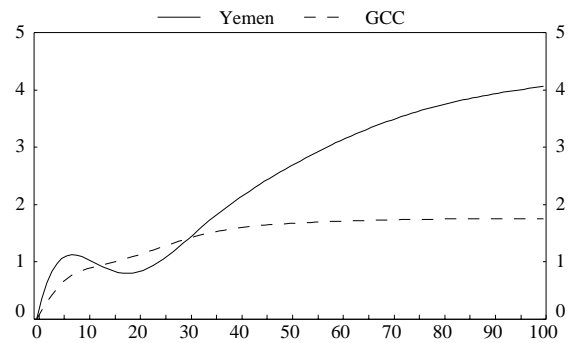
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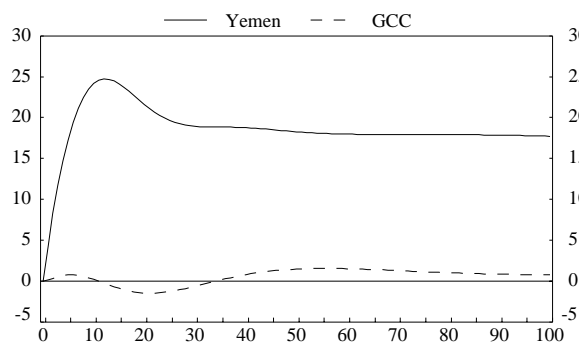
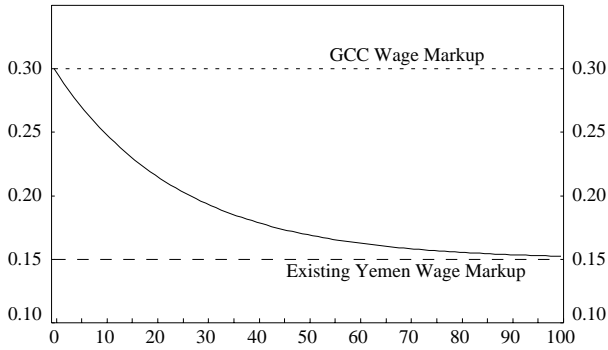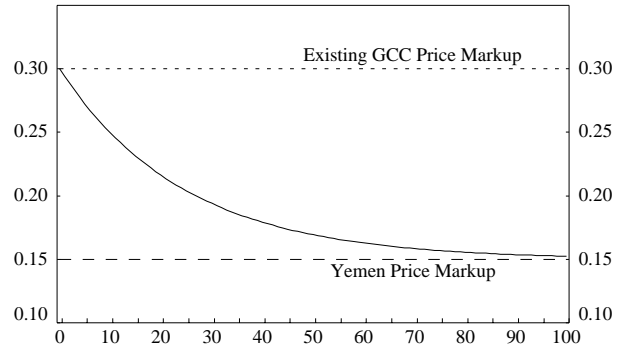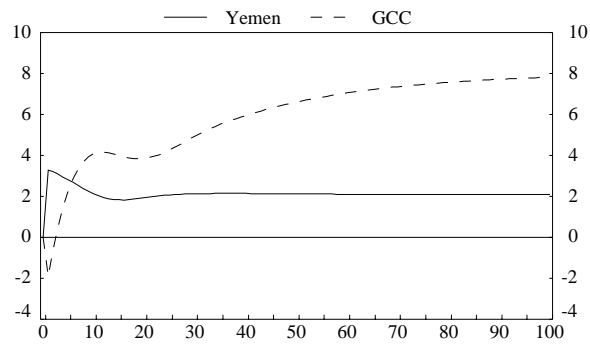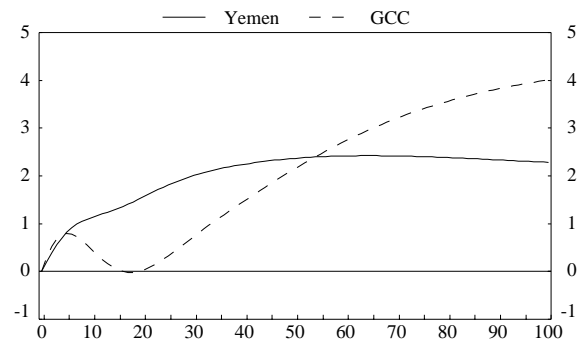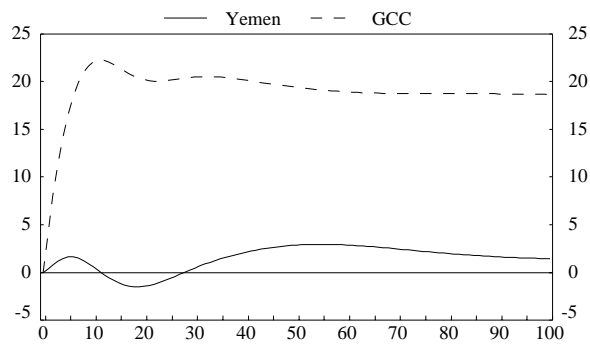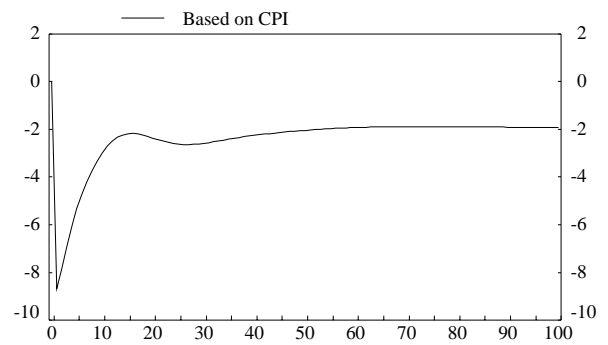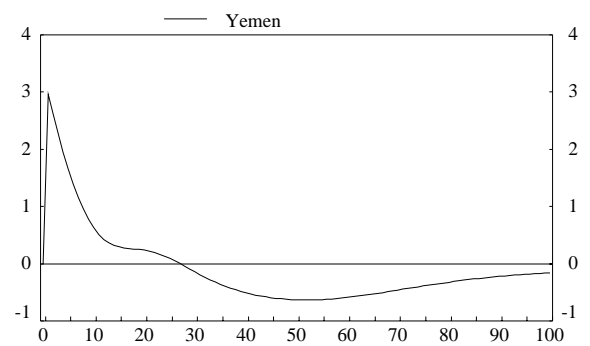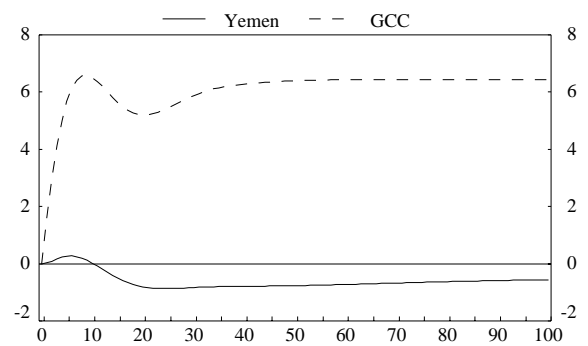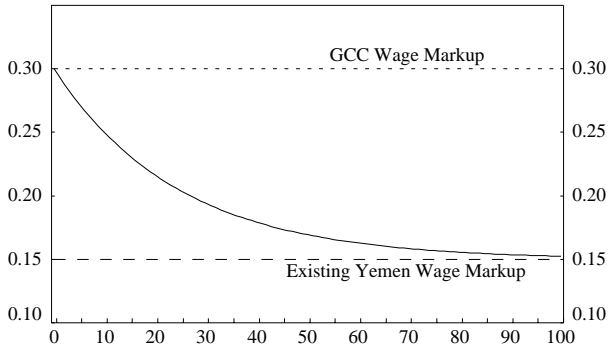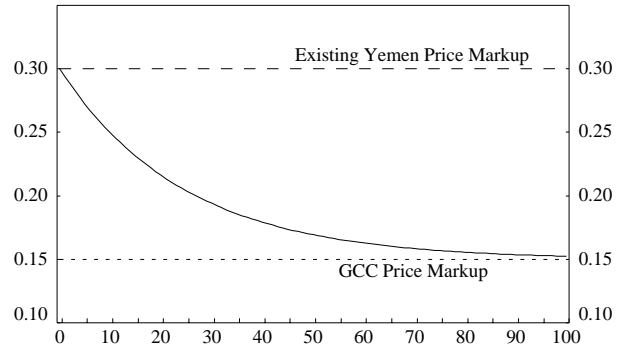Real Exchange Rate
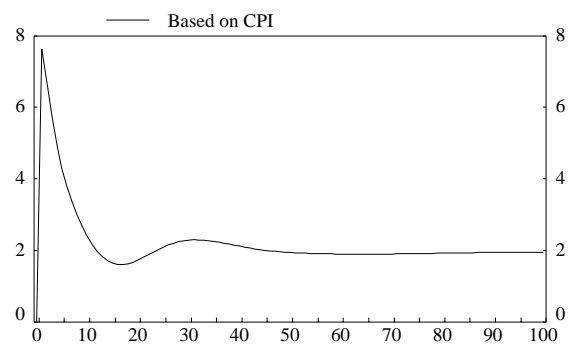
Real Aggregate Trade Balance/GDP*100
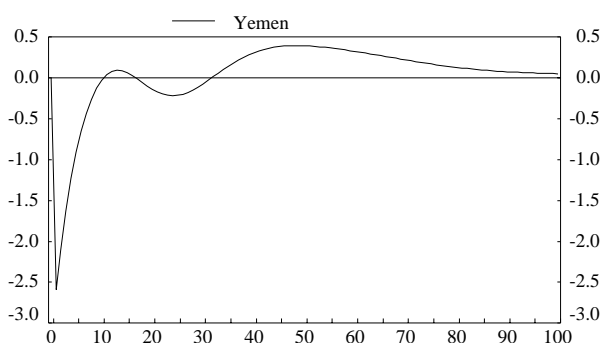
Employment
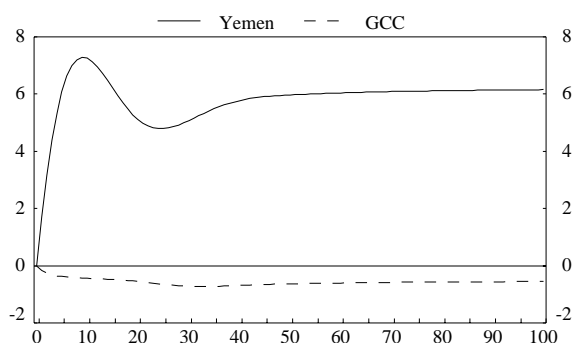
Figure 2: Dynamics from Higher Competition in GCC Product and Labor Markets

Wage Markup in the GCC Converges Gradually to the Wage Markup in Yemen

Price Markup in the GCC Converges Gradually to the Price Markup in Yemen

Real GDP (Percent Deviation from Baseline)

Consumption (Percent Deviation from Baseline)

Investment (Percent Deviation from Baseline)

Real Exchange Rate

Real Aggregate Trade Balance/GDP*100

Employment

Figure 3: Dynamics from Higher Competition in GCC Labor and Yemeni Product Markets

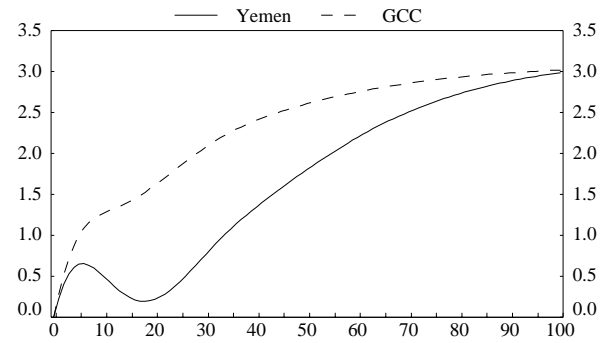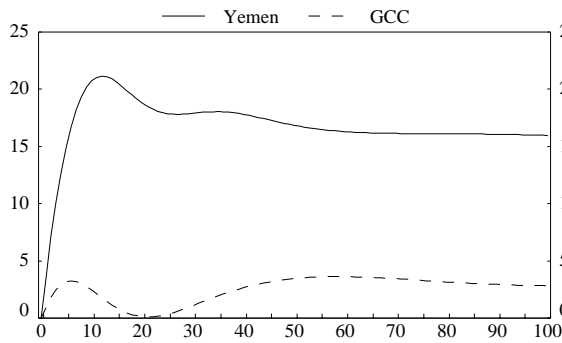Wage Markup in the GCC Converges Gradually to the Wage Markup in Yemen

Price Markup in the Yemen Converges Gradually to the Price Markup in the GCC
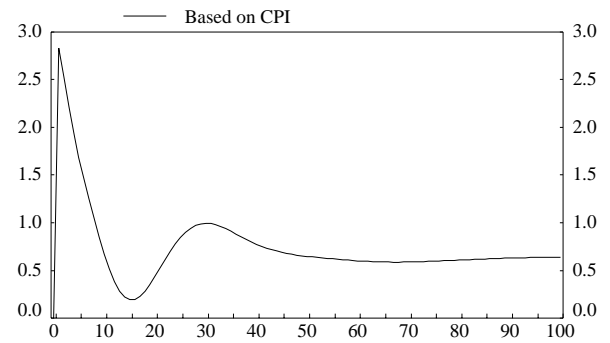
Real GDP (Percent Deviation from Baseline)
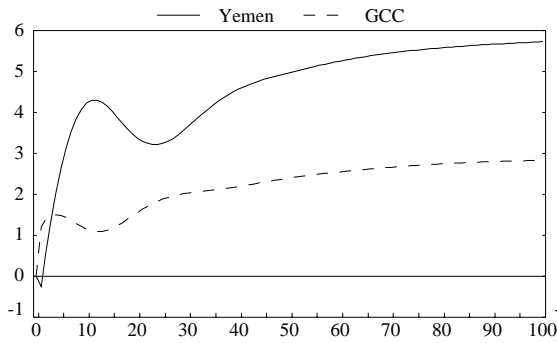
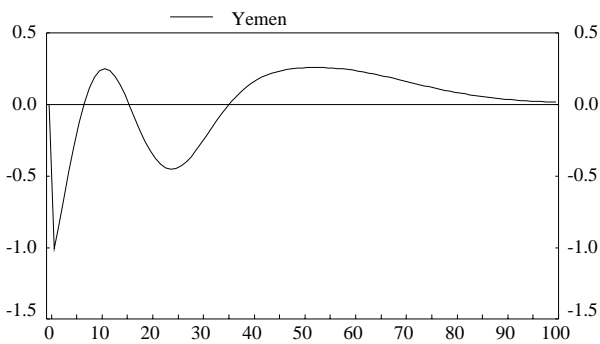Consumption (Percent Deviation from Baseline)
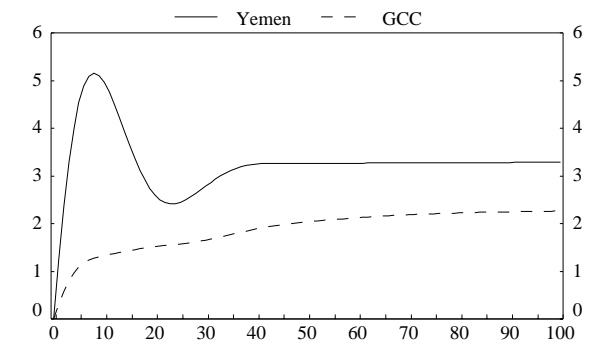
Investment (Percent Deviation from Baseline)

Real Exchange Rate

Real Aggregate Trade Balance/GDP*100

Employment

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