

The Growth of China and India: Implications for the Countries in the Middle East and North Africa

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April, 2008

Abstract

The growth of China and India affects the economies in the Middle East and North Africa (MENA) through increases in opportunities for MENA to trade with China and India, increases in third-market export competition, and increases in third-market imports by China and India. The impact of faster growth in China and India on the MENA region is positive for welfare with the overwhelming majority of gains accrued through improvements in MENA region's terms-of-trade associated with increases in world prices of energy products and of some agricultural products. These gains are larger when the likely improvements in the quality and variety of exports from China and India are factored in. Increased competition in third markets reduces the opportunities for MENA countries to expand exports of manufactures, and suggests that exports of manufactures might decline in some cases. The expansion of the energy sector and the contraction of manufacturing and services is a sign of a Dutch disease effect. All MENA countries will face increasing pressures to adjust their domestic and trade policies in order to improve competitiveness and cushion the effects on their non-energy sectors.

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The rapid economic growth of China and India has received enormous and completely justified attention. Winters and Yusuf (2007), who compare growth rates since China's takeoff in 1979 with growth rates during previous large industrializations in the UK and US, conclude that historical growth rates during these growth spurts were much lower, and the nearest parallel to China was the US over the period 1820-70. During this period incomes in the US more than doubled in a single generation. At the current growth rates and life expectancies, incomes in China would rise a hundredfold in a generation.

Even though China is not the dominant force in the world economy, its industrialization has administered an unprecedented shock to the world economy. Winters and Yusuf (2007) find that China's growth spurt stands out as the greatest yet seen in terms of an expanding share of world output.¹ Widely-cited papers by Wilson and Purushothaman (2003) and others have also pointed to the potentially rapid changes in the relative importance of countries associated with the growth of today's major developing economies. Trade linkages, both direct and indirect, are transforming patterns of world trade. Projected future growth in China and India may also have major global implications through increases in demand for natural resources.²

A key feature of the economic growth of China and India has been even more rapid growth in their trade – arguably the strongest and most direct channel through which China's, and more recently India's, growth are affecting other developing countries. China now accounts for 6.5 percent of world exports—substantially more than her share of world GDP at market prices (estimated at 5.0 percent in 2005).³ China's openness is high for a large economy, and reflects partly the fact that as much as a third of the value of exports comes from imported inputs (Winters and Yusuf 2007). With annual growth at 15.1 percent over the period 1995 to 2004, China has been the second

¹ Although Japan, Korea, and Taiwan (China) recorded domestic growth in excess of China's over their "first" 25 years of rapid growth, in absolute terms Korea and Taiwan (China) were tiny when their growth started and even Japan, with an initial 3 percent share of world GDP, was smaller than China (Winters and Yusuf 2007).

² Concerns about pressures on frontier land, oceans and the atmosphere exist even assuming that technical progress will continue to raise output per capita.

³ Source: World Bank DDP system.

largest contributor after the US to world merchandise trade providing almost 9 percent of the increase in world exports, and 8 percent of the increase in world imports.

The purpose of this paper is to analyze the trade implications of the growth of China and India for countries in the MENA region. We begin by examining the nature of the trade linkages between MENA and China and India. Then, we review the available literature on the nature and magnitude of these effects. Then, we consider some projections to 2020 showing the nature of the changes in a world economy heavily influenced by the higher growth rates of large developing countries. Then, we present simulation results showing the implications of higher growth in China and India for the MENA region. Finally, we offer some conclusions.

What the Literature Tells Us

If we hold policy settings constant in both the emerging economies and the rest of the world, the trade impacts of growth in emerging Asia on MENA can usefully be divided into four channels:

- i. Increases in opportunities for MENA to export to emerging Asia
- ii. Increases in opportunities for MENA to import from emerging Asia
- iii. Increases in third-market export competition from emerging Asia, and
- iv. Increases in third-market imports by emerging Asia.

The first two of these interactions unambiguously involve gains to the non-emerging countries, although the first is typically seen politically, as well as economically, as a gain, while the second is frequently seen politically as a loss. The third interaction invariably involves a loss to the non-emerging countries, and is frequently the subject of a great deal of attention and angst. The fourth of these interactions is fundamentally ambiguous in sign. If increased imports by the emerging economies raise the prices of goods that are also imported by MENA, then the effect can be adverse. If, by contrast, the imports of emerging Asia should be goods that substitute for those supplied by MENA, then MENA could expect to gain from increases in the demand for these imports (e.g. increases in demand for oil). Key findings on these channels of effect are considered below with a focus on China and India, whose growth has received the most attention in the literature.

(i) Increases in opportunities to export to emerging markets

The opportunities to export to China and India are expanding extremely rapidly. China in particular has become an important destination for exports of other countries' primary products. In metals and coal, China ranks first, with shares of 15 to 33 percent of world consumption; in energy China ranks second or third after the US (Streifel 2006). India and China are important consumers of agricultural commodities with India leading the world in consumption of sugar and tea, while China in consumption of wheat, rice, palm oil, cotton and rubber. Even more striking is the rate at which China has increased imports of primary products in recent years. According to Streifel (2006) soybean consumption increased 15 percent a year, and soy and palm oil consumption by 20 percent and 25 percent, respectively.

Since 1995 China has accounted for nearly 40 percent of global growth in imports of fuels and minerals. Most of this increase represents a net increase in demand as millions of Chinese consumers, and more recently Indian consumers, have grown richer, and increased their consumption of resource-intensive goods. As pointed out by Shalizi (2007, p137), changes in the energy intensity of growing economies can have a large impact on the demand for energy. The energy intensity of China's economy appears to have declined by two-thirds between 1980 and 2003, while energy intensity in India remained approximately unchanged. An important factor to take into account in analyzing this issue is the reduction in the cost of energy-intensive goods when energy efficiency increases—a factor that blunts the edge of energy-efficiency as an approach to reducing energy consumption. Both the likely path of energy efficiency and its implications for industrial structure and the derived demand for petroleum will clearly be important in assessing the implications for the MENA region.

(ii) Increases in opportunities to import from emerging economies

The growth of China and India has created enormous opportunities for their trading partners to benefit economically from imports of lower-priced and higher quality goods.

While this is frequently seen purely as a political cost, it is a potentially very important source of economic gains. Amiti and Freund (2007) find that the prices of China's exports to the USA fell by 1.6 percent per year between 1997 and 2005. Another notable feature of China's exporting has been technological upgrading. Devlin, Estevadeordal, and Rodríguez-Clare (2006) show how high-technology goods partly have displaced low-tech ones within the set of manufactured exports. This upgrading reflects both imports of more sophisticated products and local improvements in product quality (Branstetter and Lardy 2006).

The expansion of China's and India's trade is quite different from the expansion of developing country exports considered in much of the traditional development literature that focused on the deterioration in the terms of trade associated with expanding exports of primary commodities. China and India's trade growth involves, for instance, two-way trade in manufactures *and* services, which make the recipient countries the beneficiaries of improvements in efficiency in their trading partners (Martin 1993). It also involves fragmentation and global production sharing, where part of the production process is undertaken in one economy, and subsequent stages are undertaken in another (Ando and Kimura 2003; Gaulier, Lemoine and Unal-Kesenci 2004). This makes participants in this process beneficiaries from, rather than victims of, improvements in the competitiveness of their partners. And new trade theory now recognizes that export expansion does not involve just increases in exports of the same products. Rapidly growing economies expand the range of products they export, improve product quality, and export to additional markets as their exports grow (Evenett and Venables 2002; Hummels and Klenow 2005).

In addition, the trade patterns of growing countries tend to be quite dynamic. A large part of the growth of exports from a growing economy tends to be from new products (Hummels and Klenow, 2005). Further, the quality of the goods exported tends to increase substantially as economies grow, increasing the benefit to both the exporting country and its trading partners as shown by Dimaranan, Ianchovichina and Martin (2007). Both of these developments generate direct benefits to the trading partners of the emerging economies. The benefit in the case of improved quality is very clear. Higher quality goods allow importers to meet their needs with a smaller quantity of the good,

and/or to consume more in response to a lower effective price of the good. The benefit from the increase in the number of goods supplied by the emerging market generates a benefit to countries that value an increase in the variety of goods available to them—a phenomenon frequently captured using formulations such as Dixit-Stiglitz preferences (see, for example, Hummels and Klenow, 2005).

Improvements in the quality of goods produced by an emerging market supplier increase the demand for their exports at any given price level, and hence tend to lead to increases in the actual prices received for imports from these suppliers. The result is an improvement in the terms of trade, and in the real incomes, of both the emerging exporter and the importer. How strong this increase is will depend upon the extent of the improvement in quality, on the increase in the number of varieties of products being exported, and on the extent to which importers value increases in the variety of goods imported. If policy settings allow imported inputs to be used in partner countries, improvements in the variety and quality of imported inputs can be a particularly important source of dynamism in the manufacturing sector (Amiti and Konings 2007).

(iii) Third market competition

To the extent that the trade interactions between the emerging economies and other countries involve third-market competition, the countries facing increased competition stand to lose. As found by Freund and Ozden (2006) and by Hanson and Robertson (2006), some industries in some countries can and will lose from increased competition from the Giants. A key question is which countries and which industries will face the most serious competition? And where will the largest opportunities be found?

Lederman, Olarreaga and Perry (2006) report that aggregate gains have been accompanied by some pain as some industries, firms, and sub-regions have been negatively affected by the rapid growth of the two Asian economies. Some of their background studies found this to be the case, for example, in industrial and electrical machinery, electronics, furniture, textiles, and transport equipment, mainly in Mexico and to some extent in Central American countries. Most of the deterioration in the position of LAC exports in third markets relative to China's and India's has to do more with

domestic supply-side conditions than with lower demand for LAC products due to China and India's increase in market shares.

However, as noted in Dimaranan, Ianchovichina and Martin (2008), the trade impacts of emerging economies today are very different from those that have typically been analyzed when considering the impacts of growth in primary-producing developing countries. In the traditional literature on the "fallacy of composition", a rapidly-growing developing country was typically a supplier of a raw agricultural or mineral commodity produced by other developing countries. Although this literature was subsequently extended to take into account the rapid growth in exports of manufactures from developing countries (Athukorala, 1993; Sarkar and Singer, 1993), it continued to focus only on third-market export competition from developing countries to third markets, in which only negative impacts from the growth of other developing countries' exports are feasible. If, for instance, Viet Nam or Indonesia should grow by expanding exports of coffee or cocoa (or socks), then the traditional exporters of these goods could expect to lose from increased competition in third markets. The only research question is how large these effects might be.

The answer to this question depends a great deal on the extent to which the emerging exporters' pattern of exports overlaps with MENA's. This cannot be done using standard assumptions about countries' product mixes. As shown in Dimaranan, Ianchovichina and Martin (2007), the export patterns of the largest of these emerging countries—China and India—have been quite different, with India relying much more heavily than China on exports of services. Even within merchandise trade, their export patterns have been radically different at the six-digit level of the Harmonized System, with only one product – refined petroleum –appearing on the two countries' top-25 list of products, which accounted for 58.4 percent of India's merchandise exports and 38.4 percent of China's. A notable feature of China's list is the prominence of computer and electronic equipment products under Chapters 84 and 85. These two chapters (which also include non-electronic equipment) alone accounted for almost 42 percent of China's exports in 2004, up from 16 percent in 1994. In India, three HS products under Chapter 71 (diamonds and jewelry) and refined petroleum under Chapter 27 likewise accounted for 28 percent of total exports. This difference in export patterns reduces the risk of a

collision in which the exports of China, India and other developing countries are all simultaneously depressed.

A key determinant of the distributional implications of global competition is the extent to which countries' baskets of goods overlap. Traditional trade models where comparative advantage follows from countries' relative endowments suggest that extremely labor-abundant countries like China and India will manufacture and export labor-intensive goods, while skill- and capital-abundant developed countries will specialize in skill- and capital-intensive products. According to these models, developed economies have little reason to be concerned by the emergence of China and India as global economic powers. However, under this model, other labor-abundant developing economies may have much to lose as expansion of exports of existing products (the intensive margin) drives down the price of these goods in world markets.

Complicating the analysis is the fact that, while both China and India are more labor-abundant than developed economies, relative factor endowments and income levels vary substantially across regions within these economies. Many of China's coastal areas are in a different category than the much more labor-abundant inland provinces. This heterogeneity can influence the range of goods China produces and exports, and therefore helps explain the disproportionate similarity of China's export bundle with that of the developed countries (Schott, 2007). India's large number of skilled workers also implies that there may be a lot more competition between India and developed economies than suggested by its relative endowment shares.

Much can be learned by examining China's and India's trading patterns. Although it turns out that both have been quite successful in expanding their exports and imports, they have done this in very different ways (Dimaranan, Ianchovichina and Martin 2007). Although China's and India's merchandise exports are dominated by manufactures (World Bank 2003), the composition of these manufactures and the approach to their production differs considerably. While their shares of manufactured intermediate inputs in non-fuel imports in 2004 were very similar, their shares of imports of parts and components differed sharply as might be expected given China's much greater role in global production sharing. In 2004, imports of parts and components accounted for 31 percent of China's merchandise imports, as against only 12 percent in India.

On the export side, the two countries differ substantially in the importance of final goods in their exports (Dimaranan, Ianchovichina and Martin 2007). Broadly, China has relied primarily on exports of final manufactured products, frequently as part of an East Asian production sharing network. In 2004, 61 percent of China's non-fuel exports were classified as final goods, compared to 40 percent of India's. Within manufactures, China has relied heavily on exports of finished goods, while India has focused much more on exports of intermediate inputs. India's exports are frequently of capital- and skill-intensive goods, while China has emphasized exports of labor-intensive goods — although these are increasingly sophisticated (Rodrik 2006).

Recent research suggests that China's export bundle overlaps with that of developed countries much more substantially than one would expect given either its level of development or its size, and this similarity has increased with time (Schott 2007). China's rank in terms of the similarity of its export bundle with the OECD jumped from nineteen in 1972 to four in 2001. No other country's growth in product penetration comes close to the increase observed for China. Quality differences between Chinese and developed countries' exports however suggest that competition between China and the developed world may not be as direct as suggested by the overlap of their export baskets.

Another striking difference between China and India is in the importance of services relative to merchandise exports. India's share of commercial services in total goods and services exports has been much higher than China's, not just since the rapid expansion of exports of computing services around 2000, but for the entire period since 1992 during which comparable estimates are available. The share of services in India's exports, at around 20 percent, began over twice as high as China's. This share declined in India until the late 1990s, when it again began to rise sharply. Since 2000, services have accounted for over a quarter of India's exports, while the share of services in China's exports has declined to under 10 percent of total exports—although China's exports of services have been growing rapidly in absolute terms. However, both countries still have relatively small world shares (1.8 percent and 2.8 percent of world services exports, respectively) and services trade alone is unlikely to transform the Indian economic performance (Winters and Yusuf 2007).

Finally, China's export growth has been accompanied by tremendous growth in product variety. While China was present in 9 percent of all manufacturing product categories in 1972, it was present in 70 percent of categories by 2001 (Schott 2007). This growth at the extensive margin is an important factor, which we take into account when evaluating the implications of rapid growth in China and India on the rest of the world.

An important concern for MENA and other countries will be the extent to which the Giants, especially China, move up market into their "product space". India and China have demonstrated its ability to upgrade their performance in specific sectors. This issue is explored by Dimaranan, Ianchovichina and Martin (2007) by examining the potential implications of different types of growth in China and India. They find that adjustment pressures in particular sectors are likely to be much greater if growth is driven by technical change that is biased towards particular sectors than if it is driven by broad-based and relatively neutral technical change.

(iv) Expanding third market's imports by the Giants

The rapid growth of imports by the Giants is likely to change the prices of many goods of interest to MENA countries, even if these goods are not traded directly. The sign of these effects is ambiguous, because it depends on the relationship between the mix of these products and those exported by MENA. Particular areas where price changes seem likely are in agricultural commodities and natural resources, and particularly energy products (see Dimaranan, Ianchovichina and Martin, 2007). The relationship between the growth of output in emerging countries and the prices of these goods is likely to be different from that of manufactures and services.

For manufactures and services, we would expect a decline in price relative to factor prices (in actual, rather than effective, prices). Productivity growth, or more efficient use of factors, in the emerging economies is raising their output, and hence putting downward pressure on their prices.

Energy and mineral products are different in that their supply is constrained by a fixed factor, energy resources. As incomes rise, the demand for energy grows strongly, and this tends to push up the price of energy products relative to factor prices. In our

experiment, this effect is muted, but not completely offset, by the increase in the productivity of energy production itself assumed in the analysis.

For agricultural goods, there are several competing influences on prices. The first is the technological change effect described above for manufactures and services, which tends to lower prices. A second is the presence of a fixed factor, land, in agricultural production, which tends to raise prices because world income demand for these goods has risen, just as in the case of energy products. A third factor is the well-known Engel effect – that demand for agricultural products, and particularly basic foods, tends to rise more slowly than income. A fourth factor that can be important in influencing agricultural prices is the Rybczynski effect—if growth is associated with increases in the capital-labor ratio, it will tend to reduce agricultural output and raise agricultural prices.

Dimaranan, Ianchovichina and Martin (2007) find that higher growth in the Giants implies increases in output of farm and forestry products in other countries and in output of energy, mineral and other resource-based products in countries endowed with natural resources. As the Giants achieve major gains in their market shares in manufacturing, most other countries experience declines in manufacturing output relative to base, especially in clothing and electronics, which are sensitive to increased competition from the labor-intensive Giants. Therefore, even if the Giants’ success is generally good news for other economies, there are adjustment costs that will be borne by different stakeholders within those countries.

Methodological Approaches

A number of approaches can be used to address questions about the Giants’ growth and ask how it impacts on world trade. Some like DfID (2005) and Jenkins and Edwards (2006) focus mainly on the bilateral trade links, but strong spillover effects are likely if countries compete in the same third markets, even if there is no direct bilateral trade between them. A second set of studies on the topic, including Lall and Weiss (2004), Goldstein *et al.* (2006) and Stevens and Kennan (2006), consider global markets and compare the trade patterns of China with those of their countries of interest. They argue that countries with export patterns similar to China’s are likely to suffer losses as China

grows, whereas those whose exports match China's imports are likely to receive a boost. Although informative, this approach ignores the two-way trade that is prevalent in trade in manufactures and services, and the possibility of gains from this trade even in cases where net trade patterns are similar.

A third group of studies uses case studies of particular industries or sectors to analyze developments in particular industries or markets. This approach can be extremely illuminating, although it does not readily lend itself to adding up to an overall picture. Yusuf, Nabeshima, and Perkins (2007), using an approach drawing on the new economic geography, consider the future pattern of manufacturing production and exports to be likely central to development in both countries. Although services will be important to India, they do not consider them presaging a completely new development model; and China's appetite for primary imports seems bound to continue growing.

Yusuf *et al.* (2007) believe that these features will combine to favor certain mid-tech and high-tech sectors including autos, electronics, and domestic appliances – and in the future, pharmaceuticals and engineering. Given rapid growth of skilled labor it is possible for China to become a major force in some sophisticated sectors. Competing demand for skills in public service, general management and education could delay the emergence of such technological leadership for some time. The second driver implies the continuation of low-skilled, labor-intensive manufacturing, but this is most likely to take place inland where large numbers of farm workers could be trained for industrial work. Although India has had export success in textiles and clothing, is a growing force in pharmaceuticals, and shows potential in steel, white goods, and electronics, it does not appear that there will be a strong likelihood of “disruptive” exporting occurring.

A fourth group of studies examine the trade linkages between China and India and their target countries, some key impacts, and the policy responses needed to best adapt to the growth of the emerging giants. Broadman (2007) is an excellent example of this type of study. It finds, for instance, that the share of Asia in the exports of sub-Saharan Africa has risen from 14 percent in 2000 to 27 percent today. This study also highlights the importance of the barriers to trade—in both Africa and Asia—that prevent both Africa and emerging Asia from taking greater advantage of the potential synergies between them.

In addition, this study uses the gravity model to investigate the resistances to trade between China, India and Africa.

A recent survey paper by Abdel-Khalik and Korayem (2007) focuses on the linkages between China and the Middle-East. This study notes the very rapid growth of the Chinese economy and China's international trade and investment, and of its trade linkages with the Middle East region. An important part of this paper is its discussion of the implications of policy reforms in China, and particularly the massive reforms associated with China's accession to the WTO.

A fifth group of studies, including Dimaranan, Ianchovichina and Martin (2007) and McDonald, Robinson and Thierfelder (2007), address these problems by employing computable general equilibrium models. These models ensure consistency while including important industry detail – each region's exports of particular goods equal total imports of these goods into other regions (less shipping costs); global investment equals the sum of regional savings; regional output determines regional income; global supply and demand for individual goods balance; and in each country/region demand for a factor equals its supply. These accounting relationships and the behavioral linkages in the model constrain the outcomes in important ways not found in partial equilibrium analyses—increased exports from one country must be accommodated by increased imports by other countries; broad-based increases in productivity that raise competitiveness also raise factor prices and help offset the original increase in competitiveness.

Dimaranan, Ianchovichina and Martin (2007) study the impact of accelerated growth via productivity improvements in the Giants on the background of global economic growth till 2020 using a scenario consistent with the World Bank's "central projections". They find three broad effects on other countries: (i) countries' exports face fiercer competition because the Giants' costs fall; (ii) their imports from the Giants become cheaper; (iii) and they benefit from aggregate demand increases in the Giants and elsewhere as real incomes increase in response to efficiency improvements.⁴ The balance of these forces varies from country to country, but because most countries import significant amounts from the Giants and all get a share of the increase in demand, most

⁴ The findings of McDonald, Robinson and Thierfelder (2007) are consistent with these conclusions.

countries gain overall, except some countries in Southeast Asia, rest of South Asia, and from the developed world, the EU. In the EU the rise in the price of energy causes consumption of energy, already heavily taxed in Europe, to decline further. This more than explains the loss of \$7.3bn in allocative efficiency—enough to outweigh the \$3bn gain from the terms-of-trade improvement and to create an overall welfare loss.

Chinese exports to other markets increase, while exports of other countries – especially manufactured products decline. The MENA region as a whole increases exports to China and India across the board, but loses market share in the EU and other markets. MENA appears to have an opportunity to strengthen its trade ties with China and India. In the absence of policy measures to boost competitiveness however overall exports from the MENA region are expected to decline by 1.5% relative to base in 2020 (Dimaranan, Ianchovichina and Martin 2007). The message of this work is that many MENA countries will have to find ways of improving competitiveness.⁵

This short survey of the burgeoning literature on the growth of China and India reveals a number of key issues in assessing the likely implications of the Giants’ growth for MENA. One is to examine the structure of MENA’s trade and its complementarity or competitiveness with the Giants. Another is to examine the nature of the direct and indirect trade links between them—in order to assess the extent to which gains from expanded bilateral trade can offset losses from competition in third markets. The implications of the growth of China and India for the prices of resources, and particularly energy and mineral resources, are likely to require particular examination. A key objective is to help identify key policy responses—both to take advantage of the opportunities created by the growth of China and India, and to avoid potential disruptions.

Methodology and Simulation Design

To analyze the consequences of higher growth in China and India on MENA, we use a modified version of the standard GTAP model.⁶ This model emphasizes the constraints

⁵ According to an update of a study by Yeats and Ng (2000), many Arab countries lost international competitiveness in the mid- to late-90s.

⁶ This applied general equilibrium model is documented comprehensively in Hertel (1997) and in the GTAP Data Base documentation (Dimaranan 2006).

imposed on economies by their overall resource endowments, and takes into account the role of intersectoral factor mobility and overall resource constraints in determining sectoral output supply. Product differentiation between imported and domestic goods and among imports from different regions allow for two-way trade in each product category, depending on the ease of substitution between products from different regions. Factor inputs of land, capital, skilled and unskilled labor, and in some sectors a natural resource factor, are included in the analysis. The model includes the explicit treatment of international trade and transport margins, a “global” bank designed to mediate between world savings and investment, and a relatively sophisticated consumer demand system designed to capture differential price and income responsiveness across countries.

The constant returns to scale version of the GTAP model was adjusted to incorporate China’s duty exemptions—which have been a key reason for the rapid integration of China into global production networks—and to allow for much deeper integration by India into global production sharing than has been the case in the past. This was done assuming large-scale liberalization of the non-agricultural sector in India and the introduction of an effective system of duty exemptions for inputs used in the production of exports in India. Duty exemptions were incorporated in the GTAP model and data base following the methodology developed by Ianchovichina (2004). This duty exemption model allows for two separate activities in each industry. Production of exports is represented as an activity for which imported intermediate inputs are available duty-free. Production for the domestic market uses the same technology, but requires payment of duties on intermediate inputs. Firms engaging in production for either the domestic market or the export market purchase both imported and domestic intermediate inputs which are imperfect substitutes following the Armington structure. Ianchovichina (2004) documents the approach used to introduce duty exemptions into the GTAP model and shows that failing to account for duty exemptions introduces bias in trade liberalization outcomes in countries with such a system.

The 57 sectors of the GTAP 7p3 Data Base were aggregated into 26 sectors based on their importance in China, India and the MENA region. The 93 regions in this database included too much disaggregation of regions outside the MENA region and insufficient disaggregation within the MENA region. We retained all of the low and

middle income countries identified within the MENA region, that is Egypt, Iran, Tunisia and Morocco. Five countries—Algeria, Israel, Jordan Lebanon, Syria—were separated out of the two artificial GTAP regions representing the remainder of the MENA region: the rest of North Africa (XNF) and the rest of West Asia (XWS). The separation was based on the internal structure of these regions updated using three external sets of data: the bilateral trade and tariff data from MAcMaps; data on the composition of GDP with respect to agriculture, industrial production and services in the World Development Indicators database; and data on imports and exports of services from the WDI database.

We began the disaggregation process with the domestic input-output structure based on the input-output structure of the relevant GTAP region. The remainder of the data was fitted through an optimization program (Conopt3) that attempted to fill in each data field so that the structure of the GDP resembled the broad structure of the original economy while the total value of GDP and the value of trade in each commodity equaled the observed values. The structure of internal taxes in the original MENA regions was also imposed on the newly separated regions. The constructed regions correctly reflect the size and the composition of their respective GDP's and their trade flows including applied tariff rates—all essential properties for any trade-related policy study. The resulting database includes eight MENA low- and middle-income countries—Algeria, Egypt, Iran, Jordan, Lebanon, Morocco, Syria, and Tunisia, plus a composite energy-rich MENA region (i.e. other MENA) that includes the Gulf Cooperation Council countries, Iraq, Libya and Yemen.

To examine the implications of more rapid growth in China and India on the Middle East, we needed first to take account of some of the major reforms that are transforming India's trade structure, in particular liberalization of non-agricultural tariffs, the introduction of free-trade zones that remove the burden of tariffs on intermediate inputs used in the production of exports, and improvements in infrastructure needed to support trade. Then, we undertake a baseline projection to 2020, to provide a benchmark against which the effects of higher growth rates of output might be assessed (See Appendix Table 1). This baseline allows us to take account of the much higher expected rates of growth in many developing countries, including China and India, than in the

mature industrial economies, and a consequent greater impact of future changes in outcomes in developing countries.

Finally, we examine the implications of higher-than-projected growth in India and China in order to assess the direct implications of growth in China and India on the MENA region. To analyze the pure effects of higher growth in China and India, we assumed that growth rates in each region were 2 percentage points per year higher than under the baseline. For comparability with Dimaranan, Ianchovichina and Martin (2006), we considered accelerated growth over a fifteen year baseline which resulted in output levels 34.6 percent higher in each region than under the baseline scenario.⁷ Consistent with Kaldor's (1957) stylized facts of economic growth, we increased also the stock of human and physical capital in line with the overall output increase in these two growing economies.

Recent empirical evidence (see, in particular Hummels and Klenow (2005)) suggests that economic growth of the type considered increases both the quality and the variety of the goods exported by the growing economy. Building on Hummels and Klenow (2005), the quality of goods exported was represented using a variable, λ , representing the number of effective units of a good obtained from each actual, physical unit of that good.⁸ It has a counterpart in the popular iceberg specification for international transport costs, but is much more general in allowing the additional units of effective output to arise from a wide range of sources than changes in transport costs. Where purchasers have utility or demand functions that value gains in variety, the effective price of goods will decline as the variety of goods supplied increases. We show that when the elasticity of substitution σ is 7.5,⁹ the effective price declines corresponding to the cumulative increases in China's and India's real GDP growth in the high-growth scenario relative to the baseline are 9.1 percent. We implement the impact of this effect as a 9.1 percent product-quality-augmenting technical change on imports by other countries of goods from China and India, respectively.

⁷ We allowed economy-wide productivity growth to adjust to maintain the targeted increase in the rate of economic growth.

⁸ The model results in an effective price, P^* , given by $P^* = \left[N \cdot (P / \lambda)^{(1-\sigma)} \right]^{1/(1-\sigma)}$, where P is the actual price of individual commodity exports, N is the number of varieties, λ is product quality and σ is the elasticity of substitution between varieties.

⁹ This is the mid-range value considered in Hummels and Klenow (2005).

The macroeconomic closure of the simulation model assumes a constant level of employment, perfect mobility of skilled and unskilled labor between sectors but none between regions. Because we look at long-run trends, we have doubled the elasticity of substitution between imported goods from different sources and between composite imported and domestic goods from the values used in the GTAP-6 database. In all simulations the trade balances as shares of GDP were fixed for China and India to avoid potentially important changes in welfare resulting from changes in financial inflows from abroad when growth rates in these countries change substantially.¹⁰

Results

The effects on key variables of higher growth in China and India, and higher growth with and without increased variety and quality of exports are presented in Table 1. These impacts are presented for real incomes (welfare); for export volumes; and for terms-of-trade effects using the standard estimate of the welfare impacts of terms of trade changes that does not take into account second-best welfare effects. For each variable, the effect depends upon whether the income increases in China and India result in intensive-margin growth of the same exports (“Growth”), or whether export growth is accompanied by expansion in the range of products exported, and improvements in their quality (“Growth, Variety and Quality”). Increases in real income presented are percentage changes in equivalent variation where equivalent variation is measured in 2004 dollars. Export expansion is presented using percentage changes in the volume of exports. The terms-of-trade effects are presented in 2004 dollar terms.

¹⁰ Financial inflows to other countries not experiencing differential growth shocks are much less likely to change substantially and hence create misleading indicators of welfare changes.

**Table 1. Impacts of Improved Growth and Quality Exports in China and India
(relative to base, 2020)**

	Growth		Growth & quality		Exports %		Terms of trade \$m	
	EV \$m	EV %	EV \$m	EV %	Growth	Growth & quality	Growth	Growth & quality
Australia/NZ	5127	0.5	8317	0.8	1.2	2.6	5092	7762
China	1033330	28.9	1111113	31.1	33.3	60.9	-55960	22879
Japan	-1177	0.0	6653	0.1	3.1	5.5	2116	6321
Republic of Korea	4750	0.4	11586	1.0	3.5	5.7	-112	4310
Hong Kong/Taiwan	2553	0.4	9350	1.3	1.4	3.2	2959	9578
Indonesia	1178	0.3	2007	0.4	0.2	0.6	1125	1622
Malaysia	2669	1.2	5323	2.4	-0.7	-0.6	2118	3399
The Philippines	-472	-0.3	-191	-0.1	0.6	1.0	-415	-186
Singapore	-247	-0.1	1878	1.0	1.8	3.2	476	2361
Thailand	409	0.1	2050	0.4	1.2	2.4	121	1268
Vietnam	565	0.7	928	1.1	-0.5	-0.9	615	1157
Rest of SE Asia	450	1.9	599	2.5	-1.4	-1.9	442	583
India	393012	30.5	413951	32.2	41.4	68.8	-14628	6270
Rest of South Asia	-757	-0.2	71	0.0	1.0	2.1	-536	493
Canada	3068	0.3	4670	0.4	-0.7	-0.9	3252	4144
USA	-595	0.0	17531	0.1	1.4	3.2	4605	21171
Mexico	1802	0.2	5231	0.5	0.9	2.7	94	724
Argentina & Brazil	2043	0.2	3804	0.3	0.8	1.4	2149	3186
R.of Latin America	3414	0.5	5102	0.7	-0.1	0.4	3248	4374
EU 25 plus EFTA	-6186	0.0	12990	0.1	0.2	0.2	6771	21523
Fmer Soviet Union	8385	0.8	10970	1.0	0.4	1.2	7889	9878
Sub-Saharan Africa	5996	0.8	8891	1.2	0.0	0.7	4932	7619
Rest of World	-1094	-0.1	-315	0.0	1.0	1.2	-502	1174
Israel	3397	1.1	3846	1.2	-1.8	-2.0	2610	3114
Other MENA	16347	3.0	20013	3.7	-1.6	-1.0	15343	18733
Iran	2460	0.9	3239	1.2	0.2	1.7	2119	2856
Egypt	363	0.3	596	0.5	0.2	0.6	297	543
Morocco	50	0.1	196	0.3	1.7	1.6	-18	144
Tunisia	-57	-0.1	-58	-0.1	-0.5	-1.5	-31	33
Algeria	2871	1.3	3206	1.5	-0.5	-0.6	2435	2695
Jordan	864	1.2	1067	1.5	-12.4	-14.6	261	454
Lebanon	206	0.3	258	0.3	10.3	11.2	277	390
Syria	493	0.5	651	0.6	2.2	2.8	241	461
MENA	23593	1.5	29168	1.9	-0.9	-0.4	20923	26309
World	1485215	2.7	1675523	3.0	4.7	8.8	0	171033

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Table 1 presents key results for a range of economies, with emphasis on the MENA region, and for the world, in order to put country responses into context. The welfare changes are largest for China and India, which benefit directly from their own growth. The gains for other countries are generally relatively small in the absence of quality and variety improvements on exports from China and India. High-income countries gain, except for the European Union and Japan, which lose in the growth-only

scenario despite terms-of-trade gains because the interaction of existing distortions and price changes lead to allocative efficiency losses.

Many countries benefit from improved terms-of-trade for their products as China increases its imports from the rest of the world by 28.5 percent and India by 35.2 percent. Some middle and low income countries such as Thailand, the Philippines, as well as other countries in South Asia, are projected to lose as competition with China and India in third markets negatively affects their terms-of-trade.

The improvement in the welfare of the MENA region as a whole, and in all MENA countries except Tunisia is *not* associated with increases in export volumes, except in specific cases such as Lebanon. Oil exporting countries such as those in the other MENA region experience large increases in welfare because of higher energy prices, and are able to increase their consumption at any given volume of exports, reducing their ability to export. Exporters of manufactures, such as Lebanon, suffer from increased competition and lower prices for their exports of manufactures.

Given its sizable exports of energy products and the larger increase in energy prices than in prices of other goods (Table 2), it is perhaps not surprising that the other MENA region and the MENA region as a whole benefit from the strongest terms-of-trade gains under both experiments (in money terms) (Table 1). The welfare gain of the energy exporters in the MENA region is exceeded only by the welfare gains of the Giants (Table 1).

Since the world price effects in Table 2 are important determinants of the regional terms-of-trade and welfare changes it is useful to understand all contributing factors behind them. These include effects on three separate groups of goods and services: (i) manufactures and services; (ii) energy; and (iii) agricultural products.

For manufactures and services, we would expect a decline in price relative to the composite price of factors¹¹ (in actual, rather than effective, prices). World output has increased for any given level of factor use, and the price of the augmented factors used in production has risen relative to the price of commodities.

Energy products are different in that their supply is constrained by a fixed factor, energy resources, which are assumed to be fixed, although energy output can be

¹¹ This is the numeraire in the model.

augmented by applying additional capital and labor. As incomes rise, the demand for energy grows strongly, and this tends to push up the price of energy products relative to factor prices. In our experiment, this effect is muted, but not completely offset, by the increase in the productivity of energy production itself assumed in the analysis.

For agricultural goods, there are several competing influences on prices in the long-run. The first is the technological change effect described above for manufactures and services, which tends to lower prices. A second is the presence of a fixed factor, land, in agricultural production, which tends to raise prices, just as in the case of energy products. A third is the well-known Engel effect—that demand for agricultural products, and particularly basic foods, tends to rise more slowly than income. A fourth factor that can be important in influencing agricultural prices is the Rybczynski effect—if growth is associated with increases in the capital-labor ratio, it will tend to reduce agricultural output and raise agricultural prices.

The increase in world prices of a number of key agricultural products appears to be a consequence of a transfer of resources out of labor-intensive agriculture associated with the rise in the endowment of capital and human capital in China and India. This result is not pre-ordained. In the baseline simulations used to project the model to 2020, the prices of agricultural goods rose, rather than fell, but in the growth experiment reported in (Dimaranan, Ianchovichina and Martin 2007) the prices of agricultural products fell because the stocks of capital and human capital remained constant. The resulting capital deepening drew resources out of labor-intensive agriculture in these countries through Rybczynski effects, contributing to the increase in world prices of agricultural products (see Martin and Warr (1993) and Gehlhar, Hertel and Martin (1994) for a discussion of this channel). While many MENA countries are net food importers, and hence potentially adversely impacted by increases in food prices, these disadvantages are strongly outweighed for the energy exporters by the increase in the prices of energy products and the declines in the prices of imported manufactures.

Table 2. Implications of higher growth in China and India for world commodity prices

	Growth	Growth & Quality
	%	%
Rice	1.05	1.71
Wheat	3.16	3.4
Grains	2.58	2.85
Vegetables and fruits	2.08	2.25
Oils and fats	-0.21	-0.7
Sugar	-0.67	-1.29
Plant-based fibers	3.41	3.55
Others crops	1.24	1.15
Livestock and meat	-0.27	-0.8
Dairy	-0.78	-1.44
Other processed foods	-0.82	-1.4
Energy	5.52	4.89
Textiles	-1.15	-1.1
Wearing Apparel	-1.9	-0.97
Leather	-1.36	-1.11
Wood Products	-1.54	-2.03
Minerals	-1.42	-1.31
Chemicals	-1.17	-1.59
Metals	-1.89	-1.87
Vehicles	-1.76	-2.46
Machinery and Equipment	-2.28	-2.22
Electronics	-2.66	-2.71
Other manufactures	-3.63	-1.12
Trade and transport	-1.37	-1.7
Communications	-2.13	-2.42
Other services	-1.66	-2.24
All	-1.24	-1.45

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Adding improvements in the variety and quality of exports from China and India to the high growth scenario increases the welfare gains to the world economy from US\$1.49 billion to US\$ 1.68 billion (Table 1). In this case, the volumes of exports from China and India grow by 61 and 69 percent, respectively, with positive terms-of-trade effects in all regions other than the Philippines.¹² Most countries benefit since they can import higher volumes from these two countries at lower effective prices and also

¹² In the model with product-quality-augmenting technical change, since the price of relevance to the importer is the effective price which may fall when quality and variety increase, and the price relevant to the producer is the actual price which rises when quality and variety increase, it is possible for the terms-of-trade to improve for both importer and exporter.

experience greater demand for their exports from China and India. The biggest beneficiaries are, of course, China and India, whose estimated welfare gains increase by 31 percent and 32 percent, respectively. The volume of trade between China and India increases more than does either's trade with the rest of the world, deepening the trade links between the two Asian giants.

Losses in terms of export volumes for many MENA countries, including Tunisia, Algeria, Jordan and countries in other MENA (Table 1), suggest that the effect from increased opportunities to export to emerging Asia is dominated by the effects from increases in third-market export competition from emerging Asia and increased domestic demand resulting from the terms-of-trade improvement. MENA is likely to play a smaller role in exporting manufactured goods and services as a result of higher growth in China and India (Figure 1). But the boost to China's and India's manufacturing industries has positive spillover effects via increased demand for intermediate inputs including minerals, energy, and farm-based natural resources. Indeed, exports of energy products increase the most, followed by increases in exports of farm products, and minerals (Figure 1).

The aggregate results however hide differences at the country level. The rise in mineral exports is due to strong export growth of minerals from Egypt, Iran and other MENA countries (Figure 2). Strong export growth of metal products from countries in the rest of MENA region is offset by a decline in exports of metal products from other MENA countries (Figure 2). Morocco and Tunisia may expand exports of mineral and chemicals (Figure 2).

Exports of manufactures are hit hard in all countries; and for industries in some countries these effects could be substantial (Figure 3), but the declines are much smaller for industry outputs (Appendix table 3). Improved growth of exports from China implies an expansion of its textile industry and a contraction of the textile in all MENA countries except Tunisia (Figure 3). The projected growth of China's apparel industry means sharp contraction of apparel production elsewhere including in all MENA countries (Figure 3). Similarly, large declines are expected for machinery and equipment, electronics and other manufactures. Algeria is expected to suffer the most significant contractions in the largest number of manufacturing sectors.

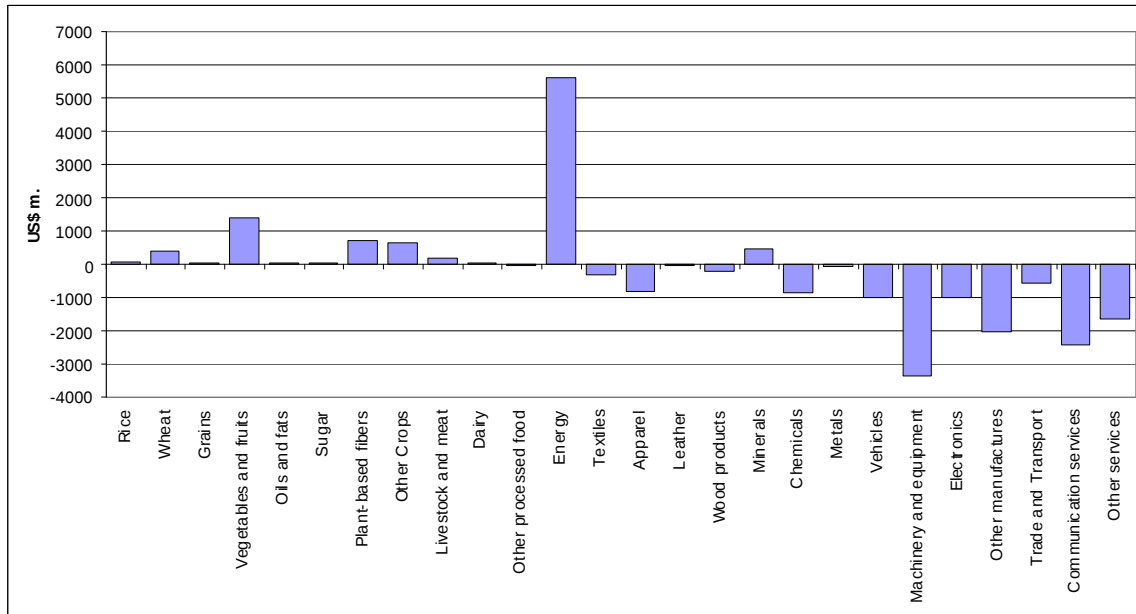
The expansion of the energy sector and the contraction of manufacturing and services is a sign of a Dutch disease effect. All MENA countries will face increasing pressures to adjust their domestic and trade policies in order to increase competitiveness and cushion the effects on their non-energy sectors.¹³ The challenges will be great given that the few export sectors enjoying dynamic export growth have increased in capital intensity, thus creating fewer jobs (see Yeats and Ng, 2000).

When improvements in product quality and variety are taken into account, the reductions in the effective prices of imports from China and India reduce MENA's estimated export losses, and the larger reduction in the effective price of imports from China and India turn the trade losses into gains, amplifies the terms of trade effects, and respectively, the welfare gain to the MENA region (Table 1). The trade gains stem from new opportunities to increase exports of certain crops, vegetables and fruits, minerals, metals and trade and transport services (Figure 4).¹⁴

¹³ Detailed results by commodity and country for exports and output changes due to high growth in China and India are available in Appendix tables 2 and 3.

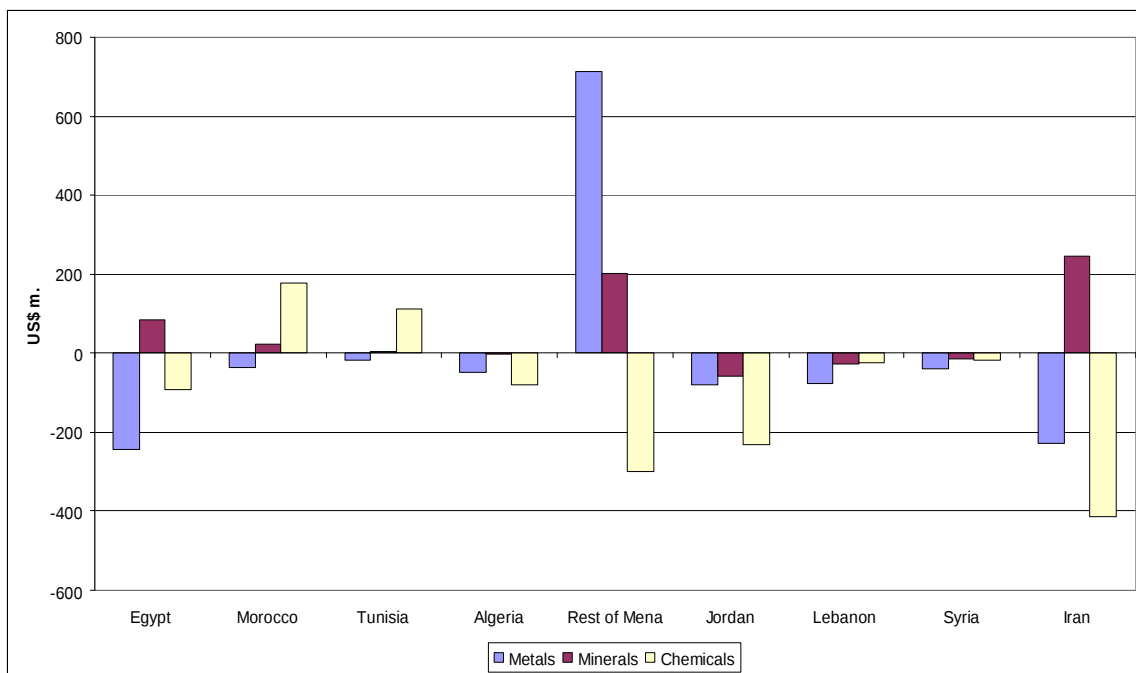
¹⁴ Detailed results by commodity and country for exports and output changes due to high growth and quality in China and India are available in Appendix tables 4 and 5.

Figure 1. Change in MENA's volume of exports due to high growth in China and India (relative to baseline)



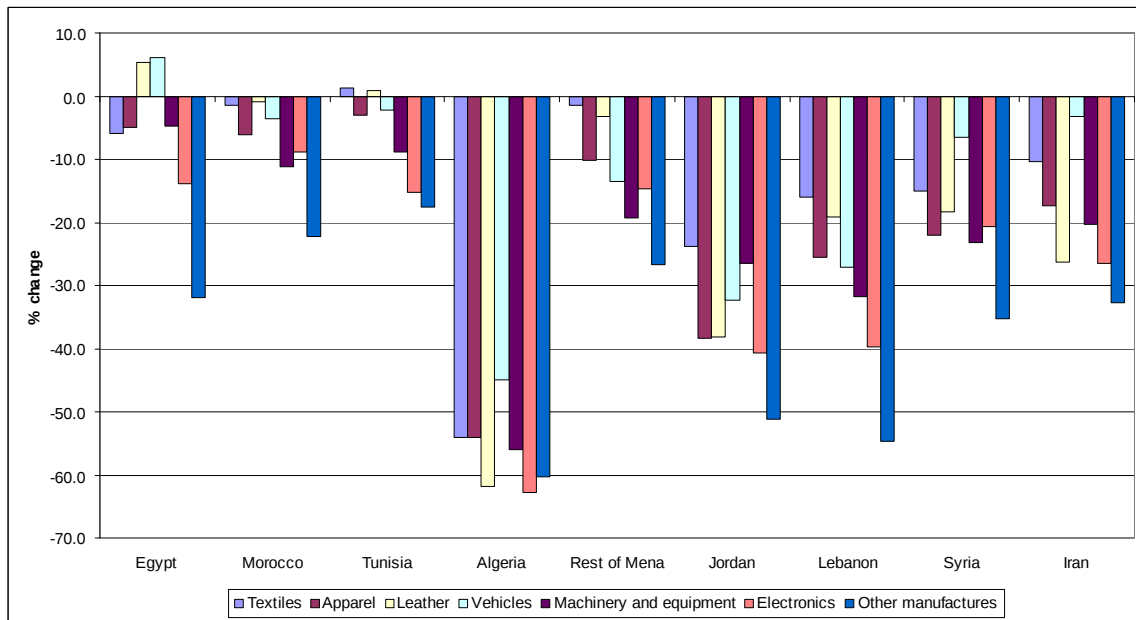
Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Figure 2. Changes in volume of resource-based manufactured exports due to high growth in China and India (relative to baseline)



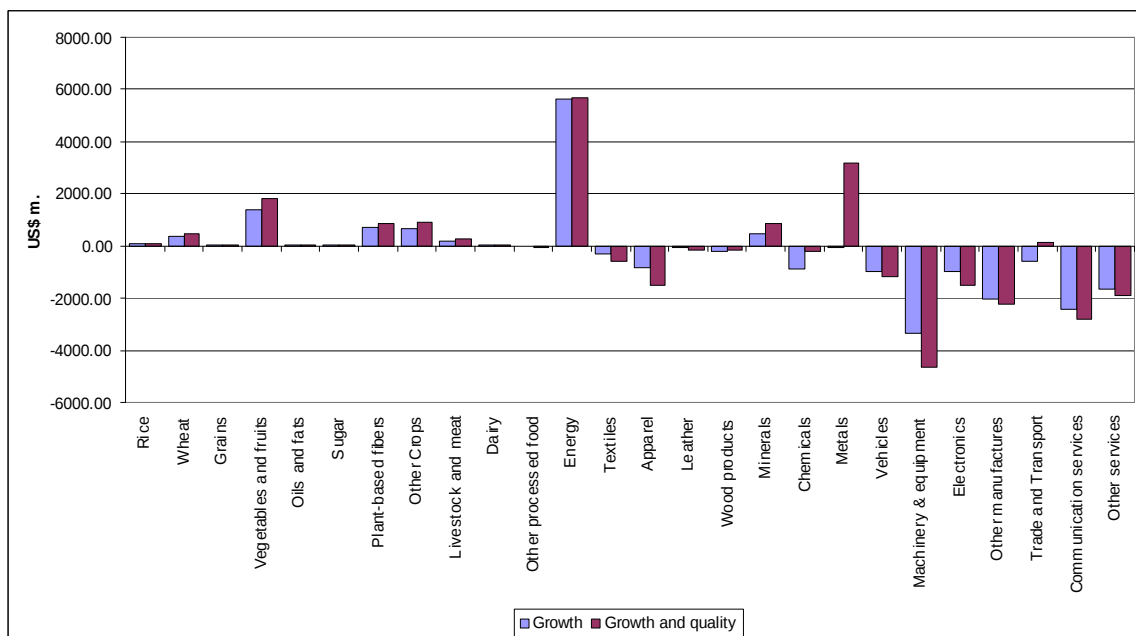
Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Figure 3. Changes in manufactured exports due to high growth in China and India (percentage changes relative to baseline)



Source: Authors' simulations with GTAP-DD (Ianchovichina 2004).

Figure 4. Changes in export volumes under different assumptions of growth (relative to baseline)



Source: Authors' simulations with GTAP-DD (Ianchovichina 2004).

Conclusion

The key issue for our analysis is the extent to and channels through which higher-than-expected rates of growth in China and India affect the MENA region. In our survey of the literature, we noted that there are four broad channels through which the growth of China and India might be expected to impact on the MENA region:

- i. Increases in opportunities for MENA to export to China and India
- ii. Increases in opportunities for MENA to import from China and India
- iii. Increases in third-market export competition, and
- iv. Increases in third-market imports by emerging Asia.

In this study, we began with a representation of the world in 2004. We then projected it forward by 15 years, to take into account the rapidly-increasing importance of China and India in the world economy. We also took into account liberalization and reductions in trading costs that increased India's interaction with the world economy. For our analysis, we used a special version of the Global Trade Analysis Project (GTAP) model designed to allow for extensive export-oriented manufacturing where exporters have access to intermediate inputs duty-free in China and India. In addition to examining the consequences of high export growth from China and India, we considered a scenario under which the quality and variety of exports from these countries improve as they grow.

We then considered the impact of growth in China and India that exceeded the projected growth rate by 2 percentage points per year or 34.6 percent over the 15 year projection period. This growth was assumed to be associated with the same percentage increases in capital and human capital as a result of higher savings and investment in China and India. The MENA region benefited substantially from this increase, with real incomes rising by \$US 24 billion at 2004 prices when growth alone was considered. When we took into account improvements in the quality of exports from China and India, the gains to the MENA region were \$29 billion.

We found that this increase in growth rates increased exports from and imports to the MENA countries from China and India. The overwhelming majority of the gains (\$21 billion and \$26 billion under the two scenarios) accrued through improvements in the MENA region's terms-of-trade. These terms-of-trade gains were associated with

increases in world prices of energy products and of some agricultural products. The increment to growth that we considered raised energy prices by over five percent, while the prices of manufactured goods and services declined by between one and three percent. The prices of most agricultural products increased, partly because of increased demand fueled by increasing incomes in China and India, and partly by labor moving out of agriculture in China and India into more capital and skill-intensive activities.

Overall exports from the MENA region declined slightly in volume terms. Exports of energy products and of a few agricultural products increased, while exports of most manufactures and services declined. These effects were the result of increased competition in third markets and increased domestic demand resulting from the terms-of-trade improvements associated with the growth of China and India. Some countries, such as Algeria and Jordan saw relatively large reductions in their manufactured exports, while others, such as the other MENA grouping, saw increases in their exports of resource-based exports such as metals and minerals.

The results of this study are clearly mixed for the MENA region. The improvements in the region's terms-of-trade provide worthwhile income gains. These gains are larger when the likely improvements in the quality and variety of exports from China and India are factored in. Against that, increased competition in third markets reduces the opportunities for MENA countries to expand exports of manufactures, and suggests that exports of manufactures might decline in some cases. Finally, the expansion of the energy sector and the contraction of manufacturing and services is a sign of a Dutch disease effect. All MENA countries will face increasing pressures to adjust their domestic and trade policies in order to increase competitiveness and cushion the effects on their non-energy sectors.

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Appendix

Appendix Table 1. Baseline growth rates (annual percentage changes)

	Population	Unsklab	Sklab	Capital	GDP
Australia and New Zealand	0.7	1.6	0.6	3.8	3.4
China	0.6	0.8	3.9	8.5	6.6
Japan	-0.2	0.2	-0.7	2.5	1.6
Korea	0.3	2.0	5.8	4.9	4.7
Hong Kong and Taiwan	0.3	0.6	2.9	4.9	4.3
Indonesia	1.1	2.7	6.5	4.7	5.2
Malaysia	1.4	-1.4	3.9	5.8	5.6
Philippine	1.5	1.8	4.5	3.4	3.5
Singapore	0.8	0.6	1.1	5.3	4.9
Thailand	0.5	0.1	3.2	3.9	4.6
Vietnam	1.1	1.4	1.9	6.0	5.4
Other South East Asia	1.0	1.3	4.2	3.7	3.1
India	1.1	1.6	4.0	6.1	5.5
Other South Asia	1.7	2.1	3.6	5.1	5.0
Canada	0.4	1.6	0.9	3.2	2.6
USA	0.7	1.5	0.8	3.9	3.2
Mexico	1.4	2.7	4.6	3.3	3.8
Argentina and Brazil	1.0	0.9	3.6	3.1	3.6
Other Latin America	1.4	1.6	3.9	3.4	3.3
European Union	0.0	0.4	0.1	2.6	2.3
Former Soviet Union	-0.1	0.3	0.7	3.6	3.2
Sub-Saharan Africa	1.9	2.6	3.3	3.1	3.5
Israel	1.2	0.8	1.3	3.5	3.7
Rest of World	0.8	0.8	2.5	3.0	4.1
Other MENA	1.9	2.0	3.1	3.6	3.7
Iran	1.4	1.5	4.2	6.7	5.0
Egypt	1.4	1.7	2.2	3.6	4.7
Morocco	1.3	2.0	2.5	4.4	3.9
Tunisia	1.2	1.9	4.5	4.6	4.6
Algeria	1.5	2.2	4.2	2.5	2.7
Jordan	2.0	2.6	3.1	4.5	4.5
Lebanon	1.0	1.4	1.9	2.8	3.1
Syria	1.8	2.8	4.4	2.6	4.4

Source: World Bank and Center for Global Trade Analysis (GTAP).

Appendix table 2. Changes in exports due to high growth in China and India (percentage changes relative to baseline)

	Egypt	Morocco	Tunisia	Algeria	Other MENA	Jordan	Lebanon	Syria	Iran
Rice	10.0	21.5	25.8	8.0	10.3	-20.0	1.6	1.8	10.2
Wheat	36.7	65.5	82.3	26.3	33.8	6.3	28.1	31.7	58.0
Grains	18.2	26.6	16.0	22.2	0.6	-14.2	6.6	10.7	19.4
Vegetables and fruits	7.4	9.9	22.8	-21.6	23.9	-13.3	12.0	6.8	39.4
Oils and fats	-0.2	0.1	1.8	-39.5	3.4	-22.8	-9.1	-6.8	1.6
Sugar	-2.0	1.2	11.2	-45.2	0.3	-25.6	-9.6	-6.8	47.8
Plant-based fibers	43.8	31.7	13.8	2.9	24.9	-12.0	20.7	44.7	18.9
Other Crops	5.0	24.7	9.6	-32.1	25.9	10.8	17.0	5.5	25.8
Livestock and meat	16.7	21.1	37.0	-45.6	9.8	-6.4	2.9	0.0	6.9
Dairy	15.1	8.6	18.0	-40.1	1.5	-19.3	-3.7	-2.3	6.0
Other processed food	-0.5	-0.7	3.7	-33.9	-0.3	-17.0	-4.3	0.2	-2.2
Energy	14.7	31.2	6.9	0.7	1.0	7.4	26.1	4.4	5.6
Textiles	-5.8	-1.4	1.2	-54.0	-1.4	-23.8	-16.0	-15.1	-10.4
Apparel	-4.9	-6.2	-3.1	-54.1	-10.2	-38.4	-25.6	-22.0	-17.3
Leather	5.3	-0.8	0.8	-61.9	-3.2	-38.2	-19.2	-18.3	-26.3
Wood products	-1.6	-3.3	-0.5	-45.4	-3.9	-31.7	-15.6	-9.5	-6.2
Minerals	4.5	1.5	1.3	-16.5	3.5	-11.6	-8.2	-13.9	12.6
Chemicals	-7.8	5.8	5.4	-53.2	-0.9	-30.9	-51.1	-25.4	-9.9
Metals	-10.6	-4.7	-4.4	-57.6	4.2	-35.4	-36.5	-18.6	-3.6
Vehicles	6.2	-3.6	-2.3	-44.9	-13.5	-32.3	-27.0	-6.4	-3.3
Machinery & equipment	-4.8	-11.1	-8.8	-55.9	-19.4	-26.5	-31.8	-23.2	-20.2
Electronics	-13.9	-8.8	-15.2	-62.9	-14.6	-40.7	-39.7	-20.7	-26.5
Other manufactures	-31.9	-22.3	-17.6	-60.4	-26.7	-51.3	-54.7	-35.3	-32.7
Trade and Transport	-0.9	2.0	2.0	-37.0	-1.3	-20.8	-9.2	-4.3	-5.8
Communication services	-2.5	-4.9	-1.5	-39.8	-10.7	-19.5	-7.7	-5.4	-7.0
Other services	-4.1	-2.8	-0.1	-31.3	-11.4	-17.7	-1.6	0.6	-5.3

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Appendix table 3. Changes in output due to high growth in China and India (percentage changes relative to baseline)

	Egypt	Morocco	Tunisia	Algeria	Other MENA	Jordan	Lebanon	Syria	Iran
Rice	2.0	-0.3	4.1	1.5	6.6	0.6	-1.2	0.2	0.5
Wheat	4.6	3.9	4.6	-5.7	10.0	0.6	-0.5	0.6	1.0
Grains	0.9	1.0	3.6	1.9	1.3	1.1	-0.7	0.7	0.5
Vegetables and fruits	0.7	3.0	1.4	0.2	10.0	0.5	-0.1	0.3	2.8
Oils and fats	-0.1	0.4	1.8	0.8	3.2	-1.5	-0.8	0.0	-0.9
Sugar	-0.4	-0.2	0.7	-9.6	0.3	0.8	-1.2	-0.7	4.1
Plant-based fibers	10.5	2.0	3.1	-2.0	24.4	-0.4	1.2	43.7	0.4
Other Crops	2.6	6.7	3.9	-9.7	25.4	-0.3	0.1	0.3	1.6
Livestock and meat	0.8	-0.2	0.0	-4.1	0.4	1.9	-0.4	0.4	0.1
Dairy	0.5	0.0	0.0	-14.0	0.5	-0.7	-0.8	0.3	0.5
Other processed food	-0.2	-0.3	0.5	-0.5	0.4	-1.2	-0.9	0.2	0.2
Energy	2.0	14.6	1.9	0.6	0.8	2.2	2.9	0.2	1.7
Textiles	-1.8	-2.4	-0.3	-20.4	0.5	-22.9	-2.5	-2.2	-6.4
Apparel	-1.2	-4.7	-2.9	1.0	-7.7	-23.2	-3.1	-0.6	-3.8
Leather	0.9	-0.6	0.4	-10.5	-2.4	-1.5	-0.1	-1.1	-9.1
Wood products	-0.4	-1.1	-0.3	-2.7	0.0	-0.4	0.1	-0.1	-2.8
Minerals	0.9	0.3	0.4	-1.8	2.9	-0.2	-1.2	-0.6	1.2
Chemicals	-3.6	1.5	2.8	-15.9	-1.2	-10.8	-5.7	-3.2	-7.7
Metals	-5.1	-4.5	-2.9	-12.4	2.3	-4.1	-9.2	-2.7	-4.5
Vehicles	0.8	-1.4	-1.8	-23.0	-13.5	-0.1	-5.7	0.2	-2.1
Machinery and equipment	-5.0	-7.6	-8.3	-26.8	-16.3	-5.2	-8.7	-14.2	-8.8
Electronics	-3.2	-8.5	-8.8	-2.4	-13.8	-11.1	-0.1	-1.6	-5.4
Other manufactures	-9.0	-5.6	-10.5	-0.2	-21.4	-0.8	-2.8	-0.7	-5.0
Trade and Transport	-0.3	0.0	-0.3	0.3	-0.2	0.6	-1.2	0.1	-0.5
Communication services	-1.0	-2.0	-0.4	0.7	-4.8	0.4	0.4	0.4	-0.1
Other services	-0.3	-0.1	0.0	1.2	1.6	1.3	0.1	0.2	0.4

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Appendix table 4. Changes in exports due to high growth, quality and variety improvements in China and India (percentage changes relative to baseline)

	Egypt	Morocco	Tunisia	Algeria	Other MENA	Jordan	Lebanon	Syria	Iran
Rice	9.0	39.0	42.9	13.0	11.9	-22.2	3.3	1.9	14.8
Wheat	49.9	86.3	112.4	37.0	42.0	17.0	46.8	43.4	73.7
Grains	23.1	34.3	20.7	25.9	0.6	-15.5	9.5	15.3	24.8
Vegetables and fruits	9.8	12.8	30.6	-18.9	31.1	-14.2	16.1	9.3	52.4
Oils and fats	0.1	0.5	3.1	-38.2	4.4	-23.7	-4.5	-6.3	1.6
Sugar	-1.7	2.8	17.8	-46.1	-0.6	-27.0	-5.7	-4.5	86.4
Plant-based fibers	49.7	37.0	15.1	6.9	29.1	-15.8	27.7	59.7	19.0
Other Crops	7.4	34.7	11.8	-28.1	35.8	27.3	29.5	9.8	36.5
Livestock and meat	25.5	33.5	57.6	-45.0	13.2	0.6	16.0	3.5	8.8
Dairy	24.6	14.3	30.7	-39.8	1.9	-19.4	2.4	2.1	11.3
Other processed food	-0.5	-0.6	5.3	-34.8	-1.6	-19.2	-2.3	1.7	-2.9
Energy	15.0	31.8	7.0	0.7	1.0	7.1	27.8	4.9	5.7
Textiles	-10.2	-4.2	-2.3	-57.8	-2.2	-27.7	-22.3	-21.7	-18.2
Apparel	-11.4	-12.0	-9.1	-59.3	-11.6	-45.9	-33.3	-32.0	-31.6
Leather	12.6	-8.2	-3.4	-65.5	-3.5	-44.4	-23.7	-29.8	-32.5
Wood products	1.9	-3.3	0.6	-46.5	-2.4	-35.6	-14.9	-10.7	-2.4
Minerals	8.2	1.8	0.8	-15.1	6.0	-8.7	-7.6	-16.5	22.5
Chemicals	-9.0	8.6	7.2	-56.5	0.5	-35.6	-54.3	-28.9	-6.5
Metals	-11.9	-3.8	-5.6	-59.6	19.8	-38.4	-38.2	-22.7	5.4
Vehicles	17.6	-4.8	-2.2	-47.0	-17.3	-37.0	-28.3	-3.1	-1.2
Machinery & equipment	-8.0	-16.9	-12.9	-60.7	-26.3	-33.4	-38.9	-31.0	-29.4
Electronics	-29.7	-11.9	-31.1	-71.4	-21.7	-55.4	-53.7	-35.8	-45.4
Other manufactures	-38.9	-29.3	-22.4	-65.1	-29.1	-60.0	-60.4	-44.6	-42.9
Trade and Transport	0.6	5.1	5.7	-37.3	0.1	-22.8	-8.1	-4.5	-5.0
Communication services	-1.8	-3.6	1.2	-40.7	-13.3	-21.8	-6.8	-6.1	-7.2
Other services	-2.8	-1.5	2.8	-32.0	-14.5	-20.6	-0.9	-0.2	-5.9

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).

Appendix table 5. Changes in output due to high growth, quality and variety improvement in China and India (percentage changes relative to baseline)

	Egypt	Morocco	Tunisia	Algeria	Other MENA	Jordan	Lebanon	Syria	Iran
Rice	2.0	-0.3	4.1	1.5	6.6	0.6	-1.2	0.2	0.5
Wheat	4.6	3.9	4.6	-5.7	10.0	0.6	-0.5	0.6	1.0
Grains	0.9	1.0	3.6	1.9	1.3	1.1	-0.7	0.7	0.5
Vegetables and fruits	0.7	3.0	1.4	0.2	10.0	0.5	-0.1	0.3	2.8
Oils and fats	-0.1	0.4	1.8	0.8	3.2	-1.5	-0.8	0.0	-0.9
Sugar	-0.4	-0.2	0.7	-9.6	0.3	0.8	-1.2	-0.7	4.1
Plant-based fibers	10.5	2.0	3.1	-2.0	24.4	-0.4	1.2	43.7	0.4
Other Crops	2.6	6.7	3.9	-9.7	25.4	-0.3	0.1	0.3	1.6
Livestock and meat	0.8	-0.2	0.0	-4.1	0.4	1.9	-0.4	0.4	0.1
Dairy	0.5	0.0	0.0	-14.0	0.5	-0.7	-0.8	0.3	0.5
Other processed food	-0.2	-0.3	0.5	-0.5	0.4	-1.2	-0.9	0.2	0.2
Energy	2.0	14.6	1.9	0.6	0.8	2.2	2.9	0.2	1.7
Textiles	-1.8	-2.4	-0.3	-20.4	0.5	-22.9	-2.5	-2.2	-6.4
Apparel	-1.2	-4.7	-2.9	1.0	-7.7	-23.2	-3.1	-0.6	-3.8
Leather	0.9	-0.6	0.4	-10.5	-2.4	-1.5	-0.1	-1.1	-9.1
Wood products	-0.4	-1.1	-0.3	-2.7	0.0	-0.4	0.1	-0.1	-2.8
Minerals	0.9	0.3	0.4	-1.8	2.9	-0.2	-1.2	-0.6	1.2
Chemicals	-3.6	1.5	2.8	-15.9	-1.2	-10.8	-5.7	-3.2	-7.7
Metals	-5.1	-4.5	-2.9	-12.4	2.3	-4.1	-9.2	-2.7	-4.5
Vehicles	0.8	-1.4	-1.8	-23.0	-13.5	-0.1	-5.7	0.2	-2.1
Machinery and equipment	-5.0	-7.6	-8.3	-26.8	-16.3	-5.2	-8.7	-14.2	-8.8
Electronics	-3.2	-8.5	-8.8	-2.4	-13.8	-11.1	-0.1	-1.6	-5.4
Other manufactures	-9.0	-5.6	-10.5	-0.2	-21.4	-0.8	-2.8	-0.7	-5.0
Trade and Transport	-0.3	0.0	-0.3	0.3	-0.2	0.6	-1.2	0.1	-0.5
Communication services	-1.0	-2.0	-0.4	0.7	-4.8	0.4	0.4	0.4	-0.1
Other services	-0.3	-0.1	0.0	1.2	1.6	1.3	0.1	0.2	0.4

Source: Authors' simulations with GTAP-DD (Ianchovichina, 2004).