STUDY OF THE ECONOMIC IMPACT ON THE ARMENIAN ECONOMY FROM RE-OPENING THE TURKISH-ARMENIAN BORDERS. IMPLICATIONS FOR EXTERNAL TRADE

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Abstract: *When talking about re-opening of the Turkish-Armenian border and the need to establish a normal relationship between the two countries, the economic impact of reopening the borders is presented as a main argument. Closed borders between Armenia and the neighbouring countries have a negative impact on the Armenian economy.*

What would happen if the borders between Turkey and Armenia were open, allowing a free trade between Armenia and its largest neighbour? What impact would this change have on employment, incomes, trade, government revenues and expenditures as well as Armenia's economic structure? In order to get a full picture, it is necessary to estimate the economic impact from re-opening the border in the short-term (1 year), medium-term (under 5 years) and long-term (over 5 years).

Using instruments of quantitative analysis we have attempted to evaluate the impact from a re-opening of the borders on foreign trade and other main economic indicators in the short and medium term perspectives. For this reason we have used a Computable General Equilibrium model.

For the short-term we assume that there will not be significant changes in the foreign trade structure. The economy will respond to a certain reduction of transportation costs. Trade volumes by countries will change, but the trade structure will basically remain the same. In the medium-term, more substantial changes are expected in the volume and structure of bilateral trade. As to Armenia's trade with other countries, we expect that transportation costs will continue to fall due to a more efficient use of the Turkish capacities in transportation by sea and land.

To quantify the effects of trade change by countries in the short-run we have used a gravity model developed by AEPLAC. This model and some of the expert's assumptions on certain markets' development capacities were used to quantify the trade turnover in the medium-run.

1. Introduction

Trade relations of our region have an interesting peculiarity. Five countries in the region (Armenia, Georgia, Azerbaijan, Turkey and Iran) have a quite significant external turnover, but the turnover volumes within the region are extremely low. This is one of the unique cases when a regional unit is more active in its trade-liaison with the outside world than within itself. This is definitely conditioned by the existence of a number of conflicts and closed borders, but it also demonstrates that intraregional economic trade relations have a great development potential in case of elimination of these obstacles.

Today, when talking about a re-opening of Turkish-Armenian border and the need to establish a normal relationship between the two countries, the economic efficiency of reopening the borders is presented as a main argument. Closed borders between Armenia and the neighbouring countries have a negative impact on the Armenian economy.

The first indicator that indirectly proves it, is the share of transportation costs in the cost structure of exports and imports. According to the studies conducted by AEPLAC,[1] it comprises 20-25% of the nominal goods value. Cross country comparisons shows that the transportation costs of Armenia today are among the highest in the world. For instance, having a similar share of transportation costs in its foreign trade, Mongolia is ten times more distant from the nearest coast than Armenia. This is quite a serious problem for the economic development of Armenia, in particular for growth in exports and imports.

High transportation costs that are triggered by closed borders affect the industrial structure of Armenia. Today Armenia is forced to export "light" products of high value, i.e. diamonds, precious metals, information technologies, etc.

Given its rather liberal economic system (according to the Heritage Foundation, Armenia is among the top five countries with the indicator of foreign trade liberalization), re-opening of its borders will lead to considerable changes in the industrial structure. This is of great importance in view of developing trade relations with the European Union. In fact, the EU is presently one of the most important trade partners: The EU's share in Armenia's foreign trade in 2004 was 35.7%, and in 2005 – 38.0%.

The perspectives for Armenia's economic development highly depend on trade volumes, and from that point of view a re-opening of the Turkish border is crucial. However, there are some problems on this path that need to be solved.

Firstly, a re-opening of the borders shall directly require that Armenia and Turkey initiate the process of negotiations related to the regulation of economic trade relations, taking into consideration that when voting for Armenia's accession to the World Trade

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[1] *"Transportation costs in Armenia",* AEPLAC Report, 2005.

Organization, Turkey made a reservation by noting that it is not going to apply the WTO rules (i.e. free trade regime) in its economic relations with Armenia.

Based on 2004 data, Armenia's GDP, estimated using purchasing power parity, amounts to 12.9 bln USD, whereas that of Turkey accounts for more than 40 times as much – approximately 556.1 bln USD. During 2005, Armenia exported products worth 950 mln USD, while Turkey exported that of 73.4 bln USD. These indicators show that Armenia cannot be of special trade interest to Turkey.

Definitely, a re-opening of the borders can be attractive for Turkey in terms of transit roads, but only if Armenia also opens the border with Azerbaijan. Certainly, in Turkey's case, the advantage of having a road through Armenia connecting it to Georgia and thus to Azerbaijan can be mentioned as an exception. Nevertheless, we should bear in mind that at present the issue of constructing an alternative railroad connecting Akhalkalak to Kars is included in the agenda of economic development between Turkey and Georgia. This is quite an expensive project, but it can simultaneously solve several problems for Turkey, as a result of which Armenia may appear in absolute isolation.

The only significant and essential ace that Armenia possesses as an argument for the necessity of re-opening the Turkish-Armenian border, is the perspective of regional development of the eastern regions of Turkey. The economic indicators for this region considerably vary from Turkey's average indicators. Thus, based on 2004 data, the GDP per capita in Armenia comprised 4222 USD estimated with purchasing power parity, and in Turkey this indicator comprised 7753 USD. In the eastern regions of Turkey the same indicator is about 5 times lower than the average indicator in Turkey. This means that this region is 5 times less developed than the Turkey average and hence, about 2.5 times less developed than the Armenia in average. Therefore, from the regional perspective, Armenia is ahead of Turkey in regard to Turkey's border region. For this reason the existence of cross-border trade, which is beneficial for Armenia, is also beneficial for our western neighbour, since in that case Turkey will be able to substantially improve the standard of life and to increase the GDP in that region (which is also proved by the interest expressed by governing bodies of eastern regions).

On the other hand, Turkey has serious issues connected with regional imbalance of gross domestic product per capita, which need to be solved. These issues have been raised by the EU. The EU has a "structural fund" from which the member states are provided with funds to cover regional imbalances. According to official estimates, in case of Turkey's accession to the EU and if "structural fund's" allocation mechanism remains unchanged, almost 80% of these funds will have to be allocated to Turkey for development of its eastern regions. The EU itself will also be interested in saving the means of the "structural fund", so that these funds are allocated to the presently underdeveloped European regions. Turkey might not want to miss an opportunity to develop the regions adjacent to Armenia without its own significant financial investments.

But what kind of economic and trade developments may be expected as a result from a re-opening of the Armenian-Turkish border? In order to get a full picture, it is necessary to estimate the economic impact in the short-term (1 year), medium-term (under 5 years) and long-term (over 5 years) perspective.

Using instruments of quantitative analysis we have attempted to evaluate the impact from a re-opening of the borders on foreign trade and other main economic indicators in the short (up to 1 year) and medium term (up to 5 years) perspectives.[2] For this reason we have used a Computable General Equilibrium model, which is widely used among economists. For the short-term, we assume that there will not be significant changes in the foreign trade structure. The economy will respond to a certain reduction in transportation costs. Trade volumes by countries will change, but the trade structure will basically remain the same. In the medium-term, more substantial changes are expected in the volume and structure of bilateral trade. As to Armenia's trade with other countries, we expect that transportation costs will continue to fall due to a more efficient use of the Turkish capacities in transportation by sea and land.

To quantify the effects of trade change by countries in the short-term we have used a gravity model[3] developed by AEPLAC. This model and some of the expert's assumptions on certain markets' development capacities were used to quantify the trade turnover in the medium-term. In particular, we are using, with certain reservations, the World Bank researchers' estimates on the changes in Armenia's foreign trade capacity, and trade flows in the region after a re-opening of the Turkish-Armenian border.

2. Model Setup

There is little research about the potential effects of re-opening of borders with Turkey on the economy of Armenia, though there have always been debates on the topic of interest. Armenia can use only its northern and southern borders for trade. The eastern border leads to Azerbaijan, and the western to Turkey, which was closed off in 1993. The southern border meanwhile is primarily used for trading goods with Iran, which accounted for only about 5.0% of all trade during the last 3 years (4.7% in 2003 and 2005, and 5.2% in 2004). Thus the bulk of the trade passes through the northern border with Georgia. Using this situation, Georgia gains extra profits by charging the freight companies that pass through its territory higher prices.

What would happen if the ground cargo imports and exports were to go through an alternative route, namely passing the Turkish border? These days, even the goods that are imported from Turkey go through Georgian territory. As a result the unit cost of imports from Turkey becomes almost as much as it would cost to bring goods from European Union countries.

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[2] A long-run (e.g. 5 years and more) economic impact of opening the border is not discussed in this report for several reasons. First, it is nearly impossible to model all the important processes in the foreign markets (e.g. Turkey's accession to the EU), which may have a substantial impact on the Armenian economy after opening the border. On the other hand, apart from the trade flow changes in domestic economy, some other important processes are also expected in the long-run. In particular, the opening of the border will encourage both foreign and domestic investors in the long-run. Growing investments and financial flows might contribute to the development of financial sector and advancement of economy. We realise how important are such processes, which might occur after opening the border, for the Armenian economy. However, a long time and another large study are needed for making the reliable long-run estimates and developing a model under the current limitations of statistical data. This report discusses the short- and medium-run impacts of opening the border on the whole economy, assuming that "opening the border" means: a) change in Armenia's trade flows and b) change in Armenia's import and export prices due to the cut in transportation costs.

[3] For details see below - MODEL SETUP

Based on this question we elaborate an hypothesis that the re-opening of borders with Turkey, i.e. direct trading of goods and services with Turkey,[4] would affect both imports and exports in two ways: (a) the share of trade with Turkey will increase, because no detour will be required for importing from and exporting to Turkey, which will definitely make the tradable goods cheaper (medium-term changes), and (b) importing and exporting from other countries will increase as well, since trading companies would gain from lower costs of transportation (short- and medium-term changes).

To analyze what impact the re-opening of border with Turkey would have on the Armenian external trade, two separate empirical models estimating demands for exports and imports are developed.

These models put an emphasis on determinants of trade widely used in the economic literature. That is, the demand on trade depends on the income level of trading countries and relative prices of similar goods in different countries, including costs of importing or exporting of those goods. The basic assumption is that re-opening of borders would have an impact only on transportation costs, at least in the short run. This certainly would expand trade and make the tradable goods cheaper. However, it is very difficult to estimate how changes in transportation costs would affect the prices of tradable goods for each direction of trade. Therefore, we need to introduce a new variable "Transportation costs" along with relative prices and income levels of trading countries.

The best and easiest would be to estimate functions of imports (exports) based on the income level of Armenia (partner country) as well as relative prices between countries and transportation costs on the unit of imports (exports). This would allow one to obtaining a "transportation costs elasticity" of imports/exports. Unfortunately, it is too difficult, not say impossible, to obtain any kind of data on transportation costs by trade destination.

To overcome this obstacle we had to proxy these data. Using data on total cost of imports and exports from BOP data, we weighted them by distances between those countries and Armenia. An intuitive explanation can be implied from the models of imports and exports demand presented below.

(1) $$\log(IMpc)_{it} = g_1 \log(GDPApc)_{it} + g_2 \log(imDistAv_{it} \times TCI_t) + g_3 \log(Dist_i \times TCI_t) + \sum_i b_i \log(RER_{it}) + g_4 REERA_t + c_i + u_{it}$$

(2)
$$\log(EXpc)_{it} = g_1 \log(GDPpc)_{it} + g_2 \log(exDistAv_{it} \times TCE_t) + g_3 \log(Dist_i \times TCE_t) + g_4 \log(RER_{it}) + g_5 REER_t + c_i + u_{it}$$

Where:
- *IMpc* and *EXpc* are per capita merchandise imports from and exports to the country i, (excluding trade in natural gas and diamonds) at the time t;
- *GDPApc* is per capita GDP of Armenia and *GDPpc* is per capita GDP for i country at the time t;

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[4] As noted, a free trade regime between the two countries cannot be guaranteed. To keep the model as clear as possible, we suppose that quota and tariff barriers will not become, at least, stronger.

- *imDistAv* is a trade-weighted distance between Armenia and each of 19 major trading partners[5] whence imports come at the time t and *exDistAv* is the trade-weighted distance between Armenia and each of 19 major trading partners[6] where Armenia exports go at the time t;

- *Dist* is the distance between Armenia and i country;

- *TCI* denotes total cost of imports calculated as the share of cargo transportation and insurance in total imports, given in BOP; and *TCE* is the total cost of exports calculated as the share of cargo transportation and insurance in total exports, given in BOP;

- *RER* is the bilateral real exchange rate at the time t;

- *REERA* and *REER* are real effective exchange rates at the time t for Armenia and i country respectively;

- C_i is the country-specific fixed effect, which is unknown, C_o is the fixed effect for all countries;

- *u* is the idiosyncratic error which is uncorrelated with c_i; i is the cross section identifier; *t* is time index.

The Inclusion of some of the variables into the model is natural, but some need a special interpretation.

First, both models link per capita imports and exports of country *i* to the income level, expressed as per capita GDP. The demand for imports in Armenia depends on household gross earnings, or just overall income level in Armenia. We expect to get a positive relationship here. Meanwhile the amount of exports from Armenia depends on the income level of the country where the merchandise is being exported. The richer the partner country, the more it will import from Armenia. As in case of imports, we expect to have a positive relationship.

The bilateral real exchange rate, *RER*, calculated as the ratio of foreign to domestic prices (based on CPI) expressed in Armenian Drams, is expected to have a negative correlation with imports into Armenia (model 1). If foreign prices go up (or domestic currency depreciates in real terms) domestic consumers tend to replace expensive foreign goods with cheaper domestic ones. Similarly, a lower real exchange rate (i.e. appreciation of domestic currency in real terms) would lower Armenia's exports, by making domestic goods more expensive, and hence unattractive. Therefore, we expect a positive coefficient on RER in model 2.

With regard to the real effective exchange rate, its inclusion in models along with RER has an interesting interpretation. Unlike the bilateral real exchange rate (RER), an increase in the real effective exchange rate (REER) means an appreciation of the Armenian dram, which leads to lower exports and higher imports. Now, when we split up the total exports and imports among cross-sections (i.e. individual partner countries), the effect of REER on exports/imports with an individual country is no

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[5] We use 19 major trade partners (Armenia imports from) since we eliminate the respective partner from the list of major 20 partners for each cross section observation. This is to allow cross section variations of the variable.

[6] We use 19 major trade partners (Armenia exports to) since we eliminate the respective partner from the list of major 20 partners for each cross section observation. This is to allow cross section variations of the variable.

longer unambiguous (given RER is included in the model as well). On one hand a higher REER means lower exports or higher imports for a country. On the other hand, when all countries on average lose (gain) competitiveness because of change in REER, one single country may gain (lose) from it. For illustration, if Iranian products become more expensive with regard to Armenian ones, then Georgian exporters *may* gain from this. However, the REER in both models turned out to be insignificant and therefore was omitted.

Proxies for transportation costs are the last set of variables in both models.

First, as noted above we use data for the transportation costs of export (TCE) and imports (TCI). These are ratios from the BOP of Armenia calculated as the sum of cargo transportation and transportation insurance in terms of total exports or imports. These variables indicate the level of transportation costs in *total* exports and *total* imports for Armenia. Thus, we had to interact these variables with some proxies, which would allow them to vary across countries. The distances between Armenia and a partner country are good such proxies. We have included in both models two components to control for distances - the first one is the distance between Armenia and an individual partner country, and the second is an average distance of Armenia from the remaining 19 trading countries (i.e. with exclusion of that partner and weighted by trade volumes).

However, for the majority of trade routes passing through Georgia, we have included an "extra" cost of transportation (G-cost, which is supposed to be the monopolistic profit of Georgia) in total transportation costs. This simply suggests that the distance between Armenia and an individual partner country used in our models are to be adjusted by some extra kilometres. To put it another way, we added an extra 172.4 km (direct line between 2 capitals - Tbilisi and Yerevan) to the distance between Armenia and an individual partner country with whom the trade crosses the Georgian borders. In the context of our basic assumption on lower transportation costs this means that the G-cost (i.e. these extra 172.4 km) would be eliminated after re-opening of borders.

The last point to make about the "transportation costs" is the correlation of transportation costs and the dependent variable. We think that (a) the distance between Armenia and an individual country interacted with TCE or TCI will have a negative impact on both exports to and imports from that country since the higher the transportation costs, the less the profits and therefore the trade, and (b) average distance with trade partners is positively correlated with a trade with any single country. In other words, if there is a change in the list of main trade partners, and because of that the average distance of Armenia from trade partners increases, the trade with a single country will gain from that, as the country becomes "closer" than before or more attractive in terms of transportation costs.

The data used for estimation of models (1)-(2) were mainly taken from the United Nations Conference on Trade and Development (UNCTAD) web site. Even though there are some deviations of these data from the officially published ones of statistical services of individual countries, they are at least consistent and can be used together. The data cover the period 1999-2003. Data are taken annually primarily because of being smoothed out from seasonal fluctuations. Also high frequency data often have a unit root problem. Since the number of countries in the cross section exceeds the

number of time periods, we expect to have consistent estimates from fixed or random effects panel estimation.[7] The panel of data is balanced for the import demand model, but is unbalanced for the export model, because of missing data on exports to Panama and Luxembourg during 1999-2001. Thus we get total of 100 observations for the first model and 94 for the second.

The different estimation methods are used for the first and second models. We are using fixed effects for the import (or the first) model and random effects for the export (or the second) model. In general, the random effects give more effective estimations than the fixed ones. As Hausman's test has shown, it is advisable to use the fixed effects estimation for the first model and the random effects estimation for the second one.

As noted above, the estimation was done using the fixed effects, obtaining the variance matrix by weighted GLS and assuming the presence of general heteroskedasticity. This form of heteroskedasticity is more general than the cross section heteroskedasticity. It allows variances within a cross-section to differ across time. Another peculiarity of the estimation is that we allow coefficients for the bilateral real exchange rate, *RER*, in model (1) to differ for each country, that is - we get cross-section specific coefficients for it. By doing so we accept that we decrease the degrees of freedom of the estimation. However, taking into account the total number of observations in the pool, we do not distort the estimation results much. Unfortunately we cannot go the same way for the second model, since we have an unbalanced panel for it. By doing so we would, and in fact did, get insignificant country specific coefficients for that variable. We are using the random effects for the second model.

Estimation was done using *Eviews*®. The results of the estimation by the procedure described above show that most of the effects are statistically significant and the signs are as expected. In general, all variables seem to be of reasonable and meaningful magnitude. The Unweighted-R^2 is large enough for the models (0.84 in model 1 and 0.87 in model 2), speaking that they represent a good fit.

Using the results of the estimation described above we calibrate our model by "opening the borders" with Turkey. That is we recalculate new values for *imDistAv, exDistAv* and *Dist*, since opening borders will lead to the shortening of the ground transportation route, and plug into the estimated model. In general, we calculate new distances by re-routing the path through Turkey for all countries except Turkey, Iran, the UAE and Georgia. For Iran and the UAE we leave distances unchanged, since the trading takes place directly, not though Georgia. For Turkey, we calculate the distance by direct measurement, rather than via Georgia. For Georgia we hypothetically assume a 2% loss of monopolistic profit. For the rest of the countries, as mentioned above, we reduce the distance from Armenia by 172.4 km.

The results of the calibration show that with the opening of the borders we gain in transportation costs by lowering them by 4.1%. This leads to an increase of 4.7% in imports and 5.9% in exports.

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[7] When appropriate, we are using the Generalized Least Squares (GLS) random effects. To check the systematic differences between the fixed effects' estimations and random ones, we are using Houseman's test.

We make some new assumptions in the medium-term analysis. First, as noted, we assume that the transportation costs will continue to decline in the medium-run, further triggering the overall growth of trade in Armenia. With respect to the trade relations of Armenia with the other countries, except Turkey, we assume that the cut in transportation costs over the next five years, following the opening of the border, is the only factor that can affect the trade flows. As to the trade with Turkey, the Armenian producers will manage to penetrate into the Turkish market over five years. We evaluate the change in the goods turnover between Armenia and Turkey, using the development pattern of Armenia's trade with specific countries in 1992-2003 and taking into account the share of Azerbaijan and Georgia in the regional trade with Turkey.

We expect that the exports to Turkey will increase 17.4 times in the medium-term compared to those in 2003, while imports from Turkey, which are already high, will go up nearly 2.3 times. Moreover, using the above mentioned study by the World Bank, we assume that in the medium term, Armenia is able to produce and export extra electric power at 20% of its current production.[8]

3. Armcge: A General Equilibrium Trade Model For Armenia

The effects that trade and regulation changes have on economic activities are real and can be quantified. Economic evidence indicates that changes in trade flows can have a significant impact not only on the economic activity in any country, but also alter the patterns of regional development. A complete trade model is needed to measure the benefits and the costs of the changes in trade rules between any two countries.

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[8] This study is exceptional by its content and size. It is often referred to when analyzing the possible impact of opening the Turkish-Armenian border. Therefore, we think it makes sense to give some reasons explaining why, in our view the estimates made in this study should be taken with some reservations. The author of this study assumes that some of the Armenian large companies have substantial extra capacities, which can be used more efficiently after the settlement of conflicts in the South Caucasus. As a result of such a settlement, Armenia is believed to reach an up to 350 mln USD export level and have a 30% GDP growth rate (in the short-term, compared to 1999 GDP). When evaluating the extra capacities of the Armenian companies, the author perhaps uses the balance sheet data of companies or their historical data. We think that both approaches are unacceptable for well-known reasons. The reality is that if the Armenian companies were able to meet quickly (or in the short-run) a dramatic increase in construction materials' sector, these "extra" production capacities would already have been used to meet the boosted demand for cement in Armenia and Georgia. On the other hand, it is easy to predict that Armenia would face difficulties in the external markets of construction materials', since Turkey is among the largest players in the region, if not in the world, producing construction materials. Further, it is unrealistic to expect that Turkey would be among the export markets. The same implies to the energy sector. We assume that in practice, it is almost impossible to export in the short-run more electric power than is currently being produced in Armenia (which can be implied from the author's estimates related to electric power export capacity), partly because, as the author points out, this would require massive investments into the Armenian economy. There are also some methodological problems related to the gravity model suggested by the economist Mr. Boldvin, We believe that using this model developed for other countries, it will be difficult to have reliable estimates of the opportunity costs for the volumes trading in the region. Finally, the main problem of this study is that these changes are expected for a short-run if all the conflicts in the region are settled. Such an assumption, in our view, is unrealistic since the conflicts tend to differ in terms of the speed and efficiency of their settlement. Hence, the change in trade flow is desirable to estimate within a single conflict. Nevertheless, we think that this study contains sufficient information and useful analysis, which (after making certain adjustments) can be used in our study for a medium-term modelling of trade.

The purpose of a policy simulation model is to quantify the effects of proposed policy changes. The proper tool to provide the required level of detail and to analyze sweeping changes in trade regulations is a *Computable General Equilibrium* (CGE) model. For this reason we have constructed a CGE model of Armenia (ARMCGE).

CGE model allows high level of detail without sacrificing the efficiency and precision of the results. A researcher obtains a large number of economic indicators for the analysis. Our CGE model describes the economic relationships among Armenia's producers, households, government and the rest of the world. Essentially, there are three stages in construction of the model: model specification, when the relationships among various parameters are set out and the data are gathered, calibration, when all economic indicators are brought to the levels actually observed: and, the experiment stage, when some changes are brought into the model. The third phase is when the effects of any change become visible, but the second phase is equally important as it confirms the model is reflecting the current economic conditions.

The experiment stage of the modelling involves the introduction of the new parameters into the model. For the short term scenario as such parameters we use the estimates of the trade flow change obtained through the gravity model presented in the first part of the given study. They will make possible to simulate the effects of the opening of borders on the Armenian economy. We assume that in the medium term the volume of turnover between Armenia and Turkey will considerably increase. In this paper we also make use of certain estimates of World Bank expert E. Polyakov (with some reservation) with regard to the export potential of Armenia.

3.1 What Is Armcge?

ARMCGE is a comprehensive model of the Armenian economy including trade-related policy changes. ARMCGE is computable general equilibrium (CGE) trade model. As such, it provides a mathematical description of the economic relationships among producers, households, government and the rest of the world. It is general in the sense that it takes all the important markets and flows into account. It is an equilibrium model because it assumes that demand equals supply in every market (goods and services, labour and capital). To achieve equilibrium we allow prices to adjust within the model (i.e. they are endogenous). It is computable because it can be used to generate numeric solutions to concrete policy changes, with the help of a computer. And it is a trade model because it pays particular attention to identifying the effects of changes in trade policy.[9]

The ARMCGE model relies substantially on the models built by the Beacon Hill Institute (BHI) of Boston, Massachusetts.[10] But unlike the models build by the BHI our model pays much more attention to trade experiments.

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[9] For a clear introduction to CGE models, see John B. Shoven and John Whalley, "Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey," *Journal of Economic Literature,* XXII (September, 1984), 1008. Shoven and Whalley have also written a useful book on the practice of CGE modeling entitled *Applying General Equilibrium* (Cambridge: Cambridge University Press, 1992).

[10] http://www.beaconhill.org

We begin by distinguishing between producers and consumers. Consumers/households earn income by supplying labour (wages and salaries) and capital (dividends and interests); they also receive transfer payments such as pensions. They are assumed to maximize their utility, which they do by using their income to buy goods and services, pay taxes and save. Their spending decisions are strongly influenced by the structure of prices they pay; and the amount of labour that they are willing to provide depends to a substantial degree on the wage rates that they receive.

Producers/firms buy inputs (labour, capital and intermediate goods that are produced by other firms) and transform them into outputs. They are assumed to maximize their profits and are likely to change their decisions (about how much to buy or produce) depending on the prices they face for inputs and outputs.

In addition there is a government sector that collects taxes and fees and provides services and transfers. The rest-of-the-world sectors identify the neighbouring countries and most important trade partners of Armenia. The relationships between these components are set out in the circular flow diagram shown in Figure 1 below. The arrows in the diagram represent flows of money (for instance, households purchase goods and services), and flows of goods and services (for instance, households supply their labour to firms). The separate box for government shows the flows of funds to government in the form of taxes, as well as government purchases of goods and services and government hiring of labour and capital.

Figure 1. Circular Flow Diagram
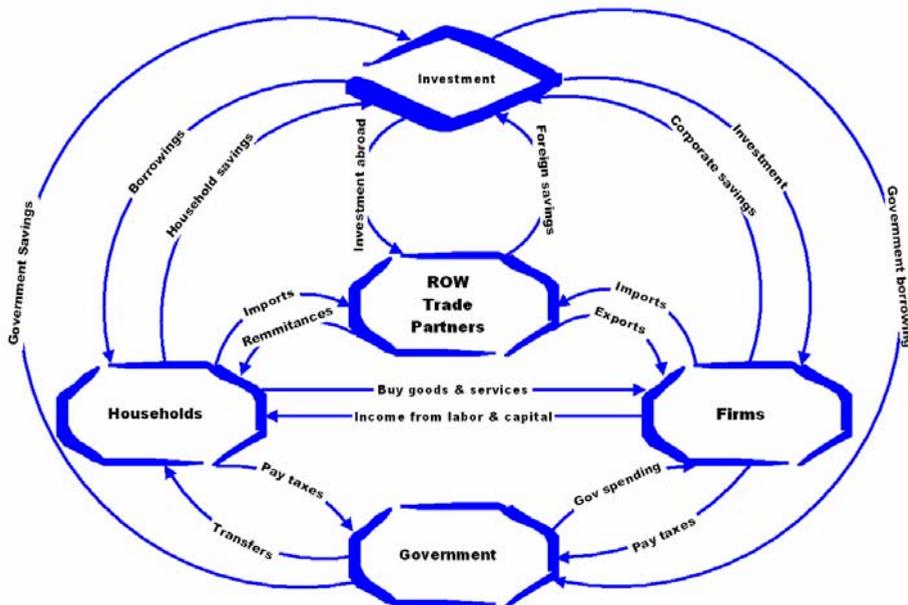
Complex as it may seem, the diagram in Figure 1 is still too simple, because it lumps all households without any differentiation into one group, and all firms into another. To provide further details it is necessary to create *sectors*; ARMCGE has 65 economic sectors. Each sector is an aggregate that groups together segments of the economy. We separate households into five quintile groups and firms into 21 "industrial" sectors (such as agriculture, food processing, communications, education and so on). In addition, we distinguish between 10 types of taxes and 16 categories of government spending. To complete the model there are two factor sectors (labour, capital), an investment sector, two state fund sectors and eight trade sectors that represent the rest of the world, one for each of the neighbouring countries and most important trade partners. The choice of sectors was dictated by the availability of suitably disaggregated data (for households and firms), and the purposes of the model, which is why we provide considerable detail about trade.

Constructing a CGE model

The construction of a CGE model involves several steps. First, we need to organize the data required by the model. We based our model on data for a single year, 2003. Most of the data are organized into a *Social Accounting Matrix* (SAM), which in this case consists of a 65 by 65 matrix that accounts for the main economic and fiscal flows in the state.[11] The model also requires some additional information - for instance, data on employment and on the structure of the income tax - which are put in separate files. And the model requires information on "elasticities"; these are the parameters, typically gleaned from the academic literature or based on the analyst experience, that measure the responsiveness of households to changes in prices and wages, and of firms to changes in input costs and output prices. The economy is assumed to be competitive, and to run at full employment (by which we mean that there is no involuntary unemployment).

Second, the model needs to be specified in detail; the next section of this report sets out the details of the model that we constructed for Armenia, along with some comments explaining the choices made at each step.

The third step is to program the model. For this we used the specialized GAMS (General Algebraic Modelling System) software. In order to make the model easier to use, we also developed an interface in Microsoft Excel. This allows the user to enter trade changes on an Excel spreadsheet, click on a button, and read the key output on the same spreadsheet; the heavy-duty computing occurs in the background.

Before use, the model has to be calibrated. This consists of running the model - i.e. asking it to solve for all the variables in such as way as to both maximize and minimize the state personal income (or gross domestic product) - and then checking that it finds the same optimal solution and that the results correspond with the actual values of the variables in the base year (taken to be 2003 in our case). Once the model reproduces the base year values, it is considered calibrated. Calibration is a non-trivial step, and is

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[11] For a discussion about SAM see Jeffery Round, *Social Accounting Matrices and SAM-based Multiplier Analysis,* The World Bank, available at
http://poverty.worldbank.org/files/14017_chapter14.pdf

essentially a way of checking that the model is working properly, and that it accurately reflects actual economic conditions.

Finally, the model is ready to be used to quantify the effects of changes in trade policy. The procedure is straightforward: specify the additional imports and/or exports estimated exogenously using a trade gravity model, ask the model to find an optimal solution for the new equilibrium constraints, and compare the new results with the baseline ones. At this point it is also possible to test the sensitivity of the results to different assumptions - such as the values of elasticities. We note in passing that ARMCGE is a policy model and not a forecasting model; in other words it is designed to answer "what if?" questions, not to estimate what is likely to occur in coming years.

3.2 The Armcge

Organizing the Data

The starting point in building a CGE model is to determine the degree of detail that is desired and to organize the collected data into the useful format of a Social Accounting Matrix (SAM). The SAM that we developed for Armenia is a 65 by 65 matrix. Each of the 4,225 cells represents the value of a flow from one sector of the economy to another, in 2003 AMD billions - for instance, purchases of business services by the agricultural sector, or labour earnings flowing to middle-income households. Reading along a row one finds the payments received by that sector; reading down a column one sees the payments made by that sector. The SAM is balanced, which means that the sum of the entries in any given row equals the sum of the entries in the corresponding column. Thus, for instance, the revenue received by agriculture must equal spending and investments by that sector, so that all incoming and outgoing funds are completely accounted for.

For ARMCGE, we distinguish 21 industrial sectors, two factors (labour and capital), five household categories, an investment sector, 28 government sectors (10 for taxes, 16 for spending, two government funds) and eight sectors for the rest of the world. In sectoring the economy we sought to strike a balance between providing a high level of detail (especially on the trade and tax side) and keeping the model to a manageable size. In addition there is a more pragmatic consideration, which is that the lack of finely disaggregated data limits the degree of detail that is possible. Data availability also determined some of the choices we made; for instance, it is possible to get a breakdown of households into five quintiles (see below for further details), and while we might have preferred a different set of categories, we were constrained by the nature of the data available. We compiled data from several sources and preferred the most reliable sources first. However, at times, we had to combine and extrapolate data where our sectoral distribution was different from that of data source.

"Industrial" sectors

A full list of the 21 industrial sectors that we used, along with employment in each industry, is shown in Table 1. We used data from National Statistics Service of RA (ARMSTAT, NSS) to separate out the 21 sectors of interest for the input-output table that is an integral part of the SAM.

Table 1. Industrial sectors used in ARMCGE, with employment levels in 2003

Agriculture, Hunting, Forestry, Fishing	274,840
Mining and Quarrying	6,676
Food Products, Beverages and Tobacco	28,851
Textiles, Leather and Their Products	13,140
Wood, Paper; Publishing	6,808
Chemicals, Chemical Products	7,801
Basic Metals and Fabricated Metal Products	11,208
Machinery and Equipment N.E.C.	10,093
Jewellery, Furniture, Other	27,342
Other Not Included above Manufacturing	11,592
Electricity, Gas and Water Supply	35,607
Construction	68,988
Wholesale And Retail Trade	193,612
Hotels And Restaurants	7,789
Transport	44,019
Communications	11,617
Financial Intermediation	4,332
Real Estate Activities	11,031
Education	51,373
Health	36,257
Other Community, Social and Personal Service Activities	35,774

Source: National Statistics Service of RA.
Factor Sectors

We distinguish between two factors, labour and capital (which includes land). Businesses pay wages and salaries to labour, and they generate profits. These are then distributed to household owners as factor income.

Household Sectors

In ARMCGE, households receive wages, capital income and transfers, including remittances from abroad; they use this income to buy goods and services; they pay taxes; and they save. We divided the households into five equal-sized quintiles as shown in Table 2. Expenditure data are available for households in each of these categories, which makes it relatively straightforward to work with this structure. One purpose of this disaggregation of households is to allow one to trace the distributive effect of policy changes; another is to allow different groups to have different levels of sensitivity to labour market conditions.

Table 2.   Gross household incomes by quintiles, 2003

Category of household	Income per household level, AMD p.a.	Gross income 2003, AMD bn
LESS20	<AMD 240,000	51.239
LESS40	AMD 240,000 - 439,999	76.612
LESS60	AMD 440,000 - 659,999	128.884

LESS80	AMD 660,000 - 960,000	209.174
LES100	>AMD 960,000	1,099.813
All Armenia		1,565.722

Investment Sector

There is one investment/savings sector. Households save, both directly out of their cash incomes, and indirectly because they own shares in businesses that save and reinvest profits. The government also saves and invests. Information is available from ARMSTAT on the pattern of gross investment by destination (i.e. how much gross investment went into adding to the stock of capital in agriculture, in mining, and so on). We have constructed measures of the capital stock in each sector; by applying published depreciation rates and adding gross investment, one arrives at the capital stock[12] in the subsequent period. This permits the model to track the expansion of the economy over time. We also produced a matrix, called *Capital Coefficients Matrix* (CCM), which maps investment by destination with investment by source. In other words, it allows one to find out, for instance, how much of the investment destined for agriculture is spent on purchasing goods and services from the construction sector and the transport sector. Thus if investment rises, it is possible to identify which sectors would face an expansion in the demand for their output.

Government Sectors

ARMCGE was designed primarily to analyze the effects of major changes in the trade, but also in the structure of state taxes, and so we have paid particular attention to providing sufficient detail for government transactions. The sectoring is summarized below in Table 3.

Table 3. Government Sectors

Armenia Government Receipts		
AMSSTX	Social Security	Receives payments from employers and households; pays out transfers to the Social Security Fund.

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[12] On the basis of figures published by NSS we have calculated that the ratio of capital stock to GDP in Armenia in 1990 was about 4.7. In 1993 this ratio already amounted to 2.9. Since 1994 there has been no estimations of capital stock in Armenia. According to most of experts a considerable decline in capital stock was recorded in 1994 and subsequent years when several capital intensive enterprises were privatized. Taking into consideration these processes and the necessity of revaluation of fixed assets because of hyperinflation at the beginning of last decade we made attempts to estimate the level of capital stock in Armenia for 2003. According to our estimates the ratio of capital stock to GDP is approximately 1.5. We realize that this might be lower than the real level of capital stock and that there can be measurement errors. It becomes obvious when we compare it with the relevant indicators of other countries. According to the figures made public by World Bank and our estimates, the average of stock capital of approximately 90 countries in 2003 was nearly three times as more than GDPs of those countries.

AMPITX	Personal income tax	Receives payments from households, which are put into the State Budget.
AMCITX	Corporation income tax	Receives payments from corporations and channels them to the State Budget.
AMVATX	Armenia's value-added tax	Revenues go into Armenia's State Budget.
AMEXTX	Armenia's excise tax	Revenues go into Armenia's State Budget.
AMDUTY	Armenia's customs duties	Revenues go into Armenia's State Budget.
AMOTTX	Armenia's other taxes	Minor taxes. Revenues go into Armenia's State Budget.
AMPRTX	Armenia's property tax	Revenues go into Armenia's State Budget.
AMSTDU	Armenia's state duty (land tax)	Revenues go into Armenia's State Budget.
AMFEES	Armenia's fees, licenses, permits	Revenues go into Armenia's State Budget.
Armenia Government Funds		
AMGENF	Armenia's State Budget	An accounting device. Revenues are channelled into this fund before being distributed to other uses.
AMSSSF	Armenia's social security fund	Social Security tax revenue is channelled into this fund before being distributed among households via the internal social security sector.
Armenia Government Expenditure		
AMGGSP	Armenia's general government spending	Spending on maintenance of the government apparatus.
AMDEFF	Armenia's spending on defence	National defence.
AMPBSF	Armenia's state spending on public safety	Public safety and fire department spending.
AMEDUC	Armenia's state spending on education	Mainly purchases of goods and services and labour in the education sector.
AMHELT	Armenia's state spending on health & welfare	Buys some services; transfers funds to local health spending fund.
AMSSSA	Armenia's Social Security Administration	Serves as an instrument for provision of social security services.
AMCULT	Armenia's state spending on culture and sport	Accounts for Armenia's government expenditure on sports, culture and religion.

AMUTIL	Armenia's public utility state spending	State spending on the functioning of the housing and communal facilities.
AMENRG	Armenia's government energy spending	State spending on maintenance of the fuel and energy complex.
AMAGRI	Armenia's state spending on agriculture	Buys goods and services from sectors that ensure acceptable functioning of agricultural sector, forestry and fishing.
AMINDU	Armenia's industrial, mining, construction and environment state spending	Spending on maintenance of state-owned industrial enterprises.
AMTRAN	Armenia's state spending on transport	Mainly buys engineering services and construction.
AMOTHS	Armenia's other state spending	Miscellaneous spending by the state on labour, goods and services.
AMNONC	Non-classified state spending	Mainly a government lending/borrowing device. Makes a significant transfer to the local level.
AMLOCL	Armenia's local budget spending	Specific government spending on the local level.
AMSSAI	Internal Social Security spending	Transfers social security payments to households.

The Armenian government collects revenue from taxes on value-added (VAT), customs duties, the income tax, excises on alcohol, petrol and tobacco and property taxes. It also collects a variety of fees. Taxes and fees are an important part of the model as they ensure adequate funding of government programs. Taxes are also sensitive to trade changes as some of them depend on the volume of trade. The relative importance of these sources of revenue is clear from Table 4, which summarizes state receipts in FY2003.

Table 4. Armenia revenue by source, FY 2003

	AMD billion
Value Added Tax	107.768
Corporation Income Tax	17.627
Personal Income Tax	16.780
Excise tax	39.104
Property tax	6.069
Customs duty	10.723
Other taxes	20.202
State duty	14.659
Other state incomes	9.102
Social security tax	44.711

Source: ARMSTAT, Armenian government

All of the collections from these taxes and fees are deemed to go into one of the two funds, the State Budget or the social security fund, whence they flow to different categories of spending.

In the model, the government of Armenia pays directly for some education, mainly the secondary school system. It also spends on public safety and transportation and general administration, mostly salaries for state workers. A major category of spending is health and welfare. All remaining state spending is gathered into a residual category.

Rest of the World

Since our CGE model is focused especially on the trade policy, we have included eight trade sectors with main current and potential trade partners: EU, former CIS countries (excluding Russia, Georgia and Azerbaijan), Russia, Georgia, Iran, Turkey, Azerbaijan and a sector for the rest of the world (TRAOTH). Such trade sectoring is used to highlight trade changes with Armenia's neighbours and important trading partners and leave the room for possible experiments with them. Information on flows between Armenia and the rest of the world are provided by various sources, like ARMSTAT and IFS, but they constitute an area where considerable professional judgment was required.

3.3 The Effects Of Trade Changes In Armenia

Armenia's long-running conflict with Azerbaijan is keeping the eastern borders closed. Turkey's decision to close its eastern borders with Armenia in 1993, along with the economic embargo against Armenia, left the country boxed from east and west. The only trade occurs through Georgia and Iran, or with the added cost of air transportation.

There are still Turkish and Russian goods making it into the country but through third-countries, like Georgia, or via air with added transportation costs. Due to political instability in Georgia the borders with Russia are getting closed making it even harder for Armenia to trade with the rest of the world.

While there is little hope, at least for now, of opening to trade with Azerbaijan, there are increasing negotiations to open the border with Turkey.

The full potential of trade liberalization cannot be realized instantly and Armenia will need time to adjust its production cycles to the changed external demand. At the same time it will need additional resources and quite significant structural reforms to feed any potential this export growth.

For this reason we present the results of two simulations that, we believe, reflect short-term and mid-term effects from the opening of the border with Turkey. The econometric model estimates will be used to assess the short-term influence on the economy and the mentioned estimates will be used to model mid-term effects. The reason for this is that we believe that a significant increase in production of electricity can be achieved in the medium term (by 20% of its current level) and the residue can be exported to Turkey. At the same time relatively small changes in trade flows in other industries will be immediately observed due to lower transportation costs and simplified export and import procedures for Armenian and Turkish goods. We also

assume that there will be no immediate impact on trade in services. The model will produce changes in service industries depending on structural changes in the economy.

We will consider the effects of a general increase in trade with current partners, as well as with Turkey, while keeping the Azerbaijan borders closed. The increase in imports and exports is estimated exogenously of the CGE model and fed into ARMCGE. Then the CGE model is re-estimated to find the new equilibrium state with the new trade levels.

3.3.1. Short-term scenario

For the short-term scenario the changes in trade pattern are estimated by using our own gravity model, developed especially for this simulation. The additional assumption we introduce into this model is that the exports/imports ratio with Turkey for Armenia will equal the average exports/imports ratio with other countries. We make this assumption because of the unrealistically low current volume of Armenian exports to Turkey.

We enter the hypothetical trade changes into ARMCGE, and compare the new results with the baseline situation, to produce our estimate of the effects of the trade increase. Our results show that the trade change would help employment in the country and increase household disposable income.

We now turn to the more detailed results. The first point to note is that the increase in trade leads to an increase in real GDP of 0.67%. The real wage rate goes up by 0.28%. This increase, combined with the increase in employment, leaves workers better off; the wage rate increase occurs in addition to the newly created 1,573 jobs.

Also consider the effect on real disposable income, which is earnings plus transfer payments (such as pensions) less taxes paid, adjusted for any change that occurs in the price level. Total real disposable income in Armenia would increase by 0.55%, while per capita real disposable income would also rise by 0.50%.

There is evidence of increased investment brought by increased domestic supply. Investment would rise by 0.27% (nominal). The government is cashing in on this increase in economic activity, mainly by additional custom duties and value-added tax. The extra government revenue is 3.4 AMD billions, or about 1.16% of current tax revenues.

ARMCGE allows one to look at the effects of the trade change in even more detail. In our opinion a sampling of interesting results is shown in Table 5.[13]

Along with some positive results that have been discussed above we observe decreases in economic activity for some domestic industries. For instance, jobs will be lost in machinery and equipment, wood, paper, mining, chemical and some other industries. The model predicts an increase in imports for all industrial sectors.

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[13] For more detailed results see Annex 1.

Table 5. Short-Term and Medium-Term Impacts of Re-Opening of Borders on Economy*

	Simulation Results of Trade Flow Increase In Armenia, *Change ("+" Growth, "-" Downturn/Decline)*	
	Short-term scenario *(up to 1 year)*	Mid-term scenario *(up to 5 years cumulated)*
Real Gross Domestic Product, bn AMD	10.65	43.00
Real GDP, %	0.67%	2.70%
Employment (person)	1.573	4,808
Employment, %	0.14%	0.43%
Total real exports, %	5.23%	17.73%
Total real imports, %	4.71%	12.95%
Domestic private consumption, real, %	0.58%	1.02%
Consumption Price Index, %	0.03%	0.68%
Gross real wage rate, %	0.28%	0.91%
Gross real investments, %	0.27%	0.59%
State Budget revenues, real, %	1.16%	3.46%
Disposable income, real, %	0.55%	1.79%
Disposable Income per capita, real, %	0.50%	1.62%

* This simulation is based only on the changes in transportation costs and trade flows resulting from the opening of the border.

3.3.2. Mid-term scenario

We introduce some new assumptions in our medium-term analysis. First, as noted above, we expect that transportation costs will continue to decline triggering the growth in trade. Further, trade turnover between Turkey and Armenia will substantially increase, especially as regards the exports to Turkey, considering their currently negligible rate. When quantifying the increase in trade with Turkey in the medium-run, we used the World Bank researcher Polyakov's estimates,[14] according to which Armenia has large excess capacity in electricity production. At the same time, Turkey, which is directly affected by the change in trade rules, suffers from electricity shortages. We see a gradual increase in electric power production in Armenia in the medium term. Most, if not all, of this increase will be consumed by Turkey.[15] We conservatively assume that the growth will be 20% of the current production of

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[14] See E. Polyakov, "Changing Trade Patters after Conflict Resolution in South Caucasus", 2000, World Bank

[15] The aforementioned researcher (Polyakov) assumes that some of the large companies in Armenia have substantial excess capacities, which can be used more efficiently if political conflicts in the South Caucasus are settled. This might result in a significant growth in exports and GDP.

electricity. These new hypothetical changes are once again entered into ARMCGE model. Expected mid-term changes in basic indicators are presented in Table 5.[16]

Armenia will likely to reap substantial economic benefits in the mid-term if the border with Turkey is open again. It should be noted though that our estimates differ quite considerably from the growth estimates proposed by some other authors. In addition, our model allows us to conclude that besides positive general effects some industries might be hurt.

Our mid-term analysis predicts high growth rate in real GDP, wages, personal income and budget revenue. Real GDP exceptionally in case of the opening of borders will go up by 2.7% (cumulative[17]) in the course of five years, real wages will see an increase of 0.91%,. State Budget revenues will rise by almost 3.5% (real). An increase in consumer prices is also worth to note. Inflation is expected to reach 0.7%. Disposable income will increase by 1.79% in total and by 1.62% in per capita terms.

Especially noticeable is an increase in exports. They will increase by almost 17.7%. Relatively low general effects of exports can be partially explained by quite substantial 13% import increase produced by the model. On the other side we believe that in the medium term it is difficult to expect a drastic growth in the technology investment. Therefore, a certain portion of foreign demand growth will be met at the expense of domestic consumption. The domestic consumption will grow in terms by 1.02%.

We believe that the model rather realistically does not demonstrate high degree of flexibility to the proposed changes and significant GDP increases can be achieved only if there are deep structural changes in the economy. The opening of the border with Turkey is not likely to resolve the lingering current account deficit problem. The model predicts a relatively low increase in investment activity of 0.59% (real).[18]

Increased trade volume will generate additional budget revenues. Specifically VAT revenues will constitute about 50% of all additional State Budget revenues caused by the trade changes.

In the mid-term scenario we continue to see some of the trends observed in the short-term scenario. Some industries will suffer. Particularly hit will be transportation, chemicals, wholesale and retail trade, mining, and textiles industries, as well as agriculture. Most of the job losses are linked to these sectors. At the same time, the utilities sector, which includes the production of electricity, will see a considerable job increase.

Textiles, mining and chemicals will experience the most significant relative decreases in net investment. The utilities sector will be a winner in this case again.

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[16] For more detailed results see Annex 1.

[17] In the mid-term run the expected changes of all the variables are cumulative.

[18] It is not unlikely that comparatively small scales of import increase can be conditioned by our estimation of capital stock for Armenia. As it has already been mentioned since 1993 NSS has not calculated the capital stock and we had to have the estimation of capital stock (pessimistic). We accept that the underestimation of capital stock in our model can mean that a relatively high production can be obtained from relatively low investments.

From the standpoint of export the fields of retail and wholesale trade and financial intermediation will see minor decrease. The export in other industries will increase. All importing industries will experience increased volumes. The biggest gainers here will be the exporters of textiles, wood, paper and non-classified manufacturing industries.

4. Conclusions

Closed borders between Armenia and its neighbouring countries have a negative impact on the Armenian economy. It is not argued that a re-opening of the borders (especially with Turkey) will bring many benefits to Armenian economy.

The main problem for the economy which can be solved, is the high transportation costs for exports from Armenia and also imports to Armenia. The transportation costs for Armenia today are among the highest in the world, as cross country comparisons show. This is quite a serious problem for the economic development of Armenia, in particular for growth of exports and imports.

Having a rather liberal economic system, re-opening of the borders will lead to considerable changes in the industrial structure of Armenia. This is of great importance in view of developing trade relations with the EU.

But what kind of economic and trade developments may be expected as a result of re-opening the Armenian-Turkish border?

Obviously, Armenia cannot expect serious improvements in the short-term. A re-opening of the border does not imply an imminent massive trade turnover. Trade relations are an inertial process: they periodically need reformulation, new trade contracts and market analyses, which cannot be achieved within one year. In this case, the only change that can be expected is the reduction of transportation costs, not only because Armenia will start using Turkey's roads, but also because Georgian transportation companies, faced by competition, will be forced to reduce the charges for their services.

Moreover, the Mediterranean seaports are of greater interest for Armenia than those of the Black Sea. The Black Sea ports do not allow the use of ocean container vessels. This is the reason that,the cost of freight forwarding from Poti to Marseille is 700-800 USD per container, and from Beirut to Marseille 100 USD, since in the latter case ocean ships are used that have a large capacity, and therefore a low cargo transportation cost price. As a result of a re-opening of the Turkish-Armenian borders, Georgia will be forced to reduce its charges for freight forwarding services, and Armenia will also get the opportunity to use the Mediterranean ports, which will lead to considerable savings.

Armenia cannot expect to attract large investments in the short-term after re-opening the border, which would allow Armenia to expand its domestic production and meet an increase in external demand. Therefore, an anticipated increase in exports will be achieved to some extent, due to a fall in domestic consumption.

In the medium-term, Armenia will manage to set relevant mechanisms for entering the EU market via Turkey with a broader commodity list. The current turnover volumes

with Turkey will rise to some extent, considering the fact that the turnover will now be realized without an «intermediary" - Georgia - in this case. As a result, the prices for Turkish goods in the domestic market will considerably decrease. At the same time, the Armenian exporters will have a wider opportunity to study the Turkish market capacities without an intermediary. In the medium term, we also expect that transportation costs will continue to fall. In a five-year perspective, we do not expect serious structural changes and large investments that would allow Armenia to respond appropriately to drastic changes in the external demand.

In the long-term, it is obvious that the Armenian and Turkish markets will become interconnected. Armenian producers will have to start competing with Turkish producers, which in the long-run will contribute to the modernization of Armenian enterprises. Armenian producers will have every opportunity to effectively enter the Turkish markets. This means that there is a possibility of changes in the export structure in favour of "heavy" commodities (for example, construction materials, chemicals etc.) Exports of electrical power would also be facilitated.

We discussed only two scenarios. One could outline a different scenario for changes in trade in the long term following a re-opening of the border. For example, with an active economic policy supporting export oriented industries, foreign investors on one hand and the involvement of Turkey in the EU on the other hand, Armenia may end up on a significantly different path of development. And the results of simulations can significantly differ in the long run.

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ANNEX 1. The Detailed Results of Short and Medium Term simulations

Table A. The detailed effects of trade changes in Armenia in the short term run, FY 2003

Explanation	Units	TODAY	CHANGE
Labour and Employment			
Country population	m	3,066,000	3,067,556
Households	m	789,355	789,762
Working households	m	584,122	584,949
Non-working households	m	205,233	204,814
Employment, out of which:	m	1,111,584	1,113,157
Private sector	m	898,740	900,730
Public sector	m	212,844	212,427
Population, 1st quintile	m	735,840	736,138
Population, 2nd quintile	m	674,520	674,846
Population, 3rd quintile	m	613,200	613,521
Population, 4th quintile	m	551,880	552,217
Population, 5th quintile	m	490,560	490,835
Total households, 1st quintile	m	157,871	157,935
Total households, 2nd quintile	m	157,871	157,947
Total households, 3rd quintile	m	157,871	157,954
Total households, 4th quintile	m	157,871	157,967
Total households, 5th quintile	m	157,871	157,959
Working households, 1st quintile	m	78,935	79,025
Working households, 2nd quintile	m	102,616	102,771
Working households, 3rd quintile	m	118,403	118,580
Working households, 4th quintile	m	134,190	134,415
Working households, 5th quintile	m	149,978	150,158
Income and Output			
Labour earnings, nominal	AMD bn	769.304	771.622
Capital earnings, nominal	AMD bn	633.367	640.105
Nominal Gross Domestic Product	AMD bn	1,593.507	1,604.676
Nominal GDP per capita	AMD '000	519.735	523.112
Personal income	AMD bn	1,474.102	1,483.136
Real disposable income	AMD bn	1,443.810	1,452.245
Real disposable income, 1st quintile	AMD bn	50.054	50.471
Real disposable income, 2nd quintile	AMD bn	71.285	71.828
Real disposable income, 3rd quintile	AMD bn	121.182	122.080
Real disposable income, 4th quintile	AMD bn	196.466	197.852
Real disposable income, 5th quintile	AMD bn	1,004.823	1,010.014
Real disposable income/capita, overall	AMD '000	470.910	473.421
Real disposable income/capita, 1st quintile	AMD '000	68.023	68.562
Real disposable income/capita, 2nd quintile	AMD '000	105.683	106.436
Real disposable income/capita, 3rd quintile	AMD '000	197.622	198.982
Real disposable income/capita, 4th quintile	AMD '000	355.994	358.287
Real disposable income/capita, 5th quintile	AMD '000	2,048.318	2,057.748
Government Revenue and Taxation			
VAT tax	AMD bn	107.768	109.441

CIT tax	AMD bn	17.627	17.810
PIT tax	AMD bn	16.780	16.893
Excise tax	AMD bn	39.104	39.352
Property tax	AMD bn	6.069	6.082
Customs duty	AMD bn	10.723	11.586
Other taxes	AMD bn	20.202	20.322
State duty	AMD bn	14.659	14.709
Other state incomes	AMD bn	9.102	9.125
Social security tax	AMD bn	44.711	44.840
Armenia's State Budget	AMD bn	310.997	314.259
Armenia's social security fund	AMD bn	56.244	56.372
Investment, Wages, Prices, and Trade			
Net investment	AMD bn	385.015	386.192
Capital stock	AMD bn	2,358.853	2,360.030
Wage rate index	Index	100.000	100.310
Rate of return on capital index	Index	100.000	100.903
Domestic demand	AMD bn	2,939.452	2,956.616
Intermediate demand	AMD bn	1,235.981	1,240.211
Private consumption	AMD bn	1,367.281	1,375.677
Government purchases	AMD bn	131.468	134.637
Investment demand	AMD bn	362.150	364.153
Imports	AMD bn	816.282	855.039
Exports	AMD bn	516.121	534.267
CPI for households, 1st quintile	Index	1.000	1.0003
CPI for households, 2nd quintile	Index	1.000	1.0007
CPI for households, 3rd quintile	Index	1.000	1.0007
CPI for households, 4th quintile	Index	1.000	1.0005
CPI for households, 5th quintile	Index	1.000	1.0002
Employment by sector			
Agriculture, hunting, forestry, fishing	jobs	274,840	275,799
Food products, beverages and tobacco	jobs	28,850	29,511
Textiles, leather and their products	jobs	13,140	13,072
Wood, paper; publishing	jobs	6,808	6,338
Chemicals, chemical products	jobs	7,801	7,023
Wholesale and retail trade	jobs	193,612	195,960
Hotels and restaurants	jobs	7,789	7,801
Education	jobs	51,372	51,630
Health	jobs	36,256	36,512
Other manufacturing industries	jobs	11,591	10,647
Other community, social activities	jobs	35,774	35,836
Basic metals and fabricated metal products	jobs	11,207	11,233
Jewellery, furniture, other	jobs	27,342	29,258
Real estate activities	jobs	11,030	11,112
Transport	jobs	44,018	44,160
Communications	jobs	11,617	11,712
Financial intermediation	jobs	4,331	4,429
Construction	jobs	68,988	69,325
Mining and quarrying	jobs	6,676	6,019
Electricity, gas and water supply	jobs	35,606	35,702

Machinery and equipment n.e.c.	jobs	10,092	8,652
Net investment by sector			
Agriculture, hunting, forestry, fishing	AMD bn	38.471	38.623
Food products, beverages and tobacco	AMD bn	8.049	8.174
Textiles, leather and their products	AMD bn	3.666	3.661
Wood, paper; publishing	AMD bn	1.899	1.823
Chemicals, chemical products	AMD bn	2.176	2.047
Wholesale and retail trade	AMD bn	20.178	20.300
Hotels and restaurants	AMD bn	0.300	0.300
Education	AMD bn	20.754	20.855
Health	AMD bn	9.742	9.802
Other manufacturing industries	AMD bn	7.628	7.262
Other community, social activities	AMD bn	15.743	15.789
Basic metals and fabricated metal products	AMD bn	3.127	3.137
Jewellery, furniture, other	AMD bn	3.234	3.374
Real estate activities	AMD bn	138.015	138.884
Transport	AMD bn	46.809	46.987
Communications	AMD bn	34.939	35.176
Financial intermediation	AMD bn	1.867	1.896
Construction	AMD bn	9.579	9.625
Mining and quarrying	AMD bn	2.822	2.657
Electricity, gas and water supply	AMD bn	13.202	13.248
Machinery and equipment n.e.c.	AMD bn	2.816	2.572
Exports by sector			
Agriculture, hunting, forestry, fishing	AMD bn	4.911	5.317
Food products, beverages and tobacco	AMD bn	41.855	48.095
Textiles, leather and their products	AMD bn	16.296	17.474
Wood, paper; publishing	AMD bn	1.597	1.673
Chemicals, chemical products	AMD bn	6.757	7.180
Wholesale and retail trade	AMD bn	2.740	2.774
Hotels and restaurants	AMD bn	23.653	23.946
Education	AMD bn	2.446	2.474
Health	AMD bn	0.817	0.828
Other manufacturing industries	AMD bn	19.210	20.711
Other community, social activities	AMD bn	3.224	3.263
Basic metals and fabricated metal products	AMD bn	52.219	55.917
Jewellery, furniture, other	AMD bn	203.596	211.620
Real estate activities	AMD bn	13.316	13.476
Transport	AMD bn	46.283	46.911
Communications	AMD bn	13.578	13.727
Financial intermediation	AMD bn	8.109	8.161
Construction	AMD bn	4.718	4.788
Mining and quarrying	AMD bn	22.735	24.598
Electricity, gas and water supply	AMD bn	6.353	6.459
Machinery and equipment n.e.c.	AMD bn	21.710	23.869
Imports by sector			
Agriculture, hunting, forestry, fishing	AMD bn	52.363	55.178
Food products, beverages and tobacco	AMD bn	60.608	64.424
Textiles, leather and their products	AMD bn	19.193	20.767

Wood, paper; publishing	AMD bn	14.378	15.384
Chemicals, chemical products	AMD bn	55.350	57.974
Wholesale and retail trade	AMD bn	2.525	2.571
Hotels and restaurants	AMD bn	22.846	23.234
Education	AMD bn	0.908	0.923
Health	AMD bn	1.646	1.674
Other manufacturing industries	AMD bn	123.450	128.661
Other community, social activities	AMD bn	3.657	3.711
Basic metals and fabricated metal products	AMD bn	44.680	48.069
Jewellery, furniture, other	AMD bn	19.109	20.297
Real estate activities	AMD bn	5.328	5.427
Transport	AMD bn	94.100	96.246
Communications	AMD bn	11.148	11.399
Financial intermediation	AMD bn	15.461	16.221
Construction	AMD bn	1.864	1.890
Mining and quarrying	AMD bn	151.166	158.467
Electricity, gas and water supply	AMD bn	-	-
Machinery and equipment n.e.c.	AMD bn	116.501	122.521

Table B. The detailed effects of mid-term trade changes in Armenia, FY 2003

Explanation	Units	TODAY	CHANGE
Labour and Employment			
State population	m	3,066,000	3,071,072
Households	m	789,355	790,710
Working households	m	584,122	586,648
Non-working households	m	205,233	204,062
Employment, out of which:	m	1,111,584	1,116,392
Private employment	m	898,740	905,534
Government employment	m	212,844	210,858
State population, 1st quintile	m	735,840	736,686
State population, 2nd quintile	m	674,520	675,436
State population, 3rd quintile	m	613,200	614,178
State population, 4th quintile	m	551,880	553,084
State population, 5th quintile	m	490,560	491,690
Total households, 1st quintile	m	157,871	158,052
Total households, 2nd quintile	m	157,871	158,085
Total households, 3rd quintile	m	157,871	158,123
Total households, 4th quintile	m	157,871	158,215
Total households, 5th quintile	m	157,871	158,235
Working households, 1st quintile	m	78,935	79,230
Working households, 2nd quintile	m	102,616	103,100
Working households, 3rd quintile	m	118,403	118,936
Working households, 4th quintile	m	134,190	134,877
Working households, 5th quintile	m	149,978	150,505
Income and Output			
Labour earnings, nominal	AMD bn	769.304	793.848
Capital earnings, nominal	AMD bn	633.368	655.700
Nominal Gross Domestic Product	AMD bn	1,593.507	1,647,710

Nominal GDP per capita	AMD '000	519.735	536,526
Personal income	AMD bn	1,474.102	1,520,755
Real disposable income	AMD bn	1,443.810	1,479,692
Real disposable income, 1st quintile	AMD bn	50.054	51,227
Real disposable income, 2nd quintile	AMD bn	71.285	72,787
Real disposable income, 3rd quintile	AMD bn	121.182	123,947
Real disposable income, 4th quintile	AMD bn	196.466	201,696
Real disposable income, 5th quintile	AMD bn	1,004.823	1,030,035
Real disposable income/capita, overall	AMD '000	470,910	481,816
Real disposable income/capita, 1st quintile	AMD '000	68,023	69,537
Real disposable income/capita, 2nd quintile	AMD '000	105,683	107,764
Real disposable income/capita, 3rd quintile	AMD '000	197.622	201,810
Real disposable income/capita, 4th quintile	AMD '000	355,994	364,675
Real disposable income/capita, 5th quintile	AMD '000	2,048,318	2,094,887
Government Revenue and Taxation			
Armenia's VAT tax	AMD bn	107.768	113,382
Armenia's CIT tax	AMD bn	17.627	18,217
Armenia's PIT tax	AMD bn	16.780	17,364
Armenia's excise tax	AMD bn	39.104	40.000
Armenia's property tax	AMD bn	6.069	6,566
Armenia's customs duty	AMD bn	10.723	12.337
Armenia's other taxes	AMD bn	20.202	20.694
Armenia's state duty	AMD bn	14.659	14.870
Armenia's other state incomes	AMD bn	9.102	9.616
Armenia's social security tax	AMD bn	44.711	46.063
Armenia's State Budget	AMD bn	310.997	321.065
Armenia's social security fund	AMD bn	56.244	57.595
Investment, Wages, Prices, and Trade			
Net investment	AMD bn	385.015	389.931
Capital stock	AMD bn	2,358.853	2,363.769
Wage rate index	Index	100.000	101.597
Rate of return on capital index	Index	100.000	103.275
Domestic demand	AMD bn	2,939.452	2,983.858
Intermediate demand	AMD bn	1,235.981	1,247.924
Private consumption	AMD bn	1,367.281	1,390.617
Government purchases	AMD bn	131.468	140.900
Investment demand	AMD bn	362.150	363.826
Imports	AMD bn	816.282	928.325
Exports	AMD bn	516.121	611.791
CPI for households, 1st quintile	Index	1.00	1.0068
CPI for households, 2nd quintile	Index	1.00	1.0080
CPI for households, 3rd quintile	Index	1.00	1.0083
CPI for households, 4th quintile	Index	1.00	1.0078
CPI for households, 5th quintile	Index	1.00	1.0065
Employment by sector			
Agriculture, hunting, forestry, fishing	jobs	274,840	274,350
Food products, beverages and tobacco	jobs	28,850	29,175
Textiles, leather and their products	jobs	13,140	14,039
Wood, paper; publishing	jobs	6,808	5,042
Chemicals, chemical products	jobs	7,801	5,127

Wholesale and retail trade	jobs	193,612	194,974
Hotels and restaurants	jobs	7,789	7,365
Education	jobs	51,372	51,727
Health	jobs	36,256	36,696
Other manufacturing industries	jobs	11,591	13,434
Other community, social activities	jobs	35,774	35,657
Basic metals and fabricated metal products	jobs	11,207	10,284
Jewellery, furniture, other	jobs	27,342	29,336
Real estate activities	jobs	11,030	11,115
Transport	jobs	44,018	42,105
Communication	jobs	11,617	11,609
Financial intermediation	jobs	4,331	4,476
Construction	jobs	68,988	69,528
Mining and quarrying	jobs	6,676	5,297
Electricity, gas and water supply	jobs	35,606	46,431
Machinery and equipment n.e.c.	jobs	10,092	7,769
Net investment by sector			
Agriculture, hunting, forestry, fishing	AMD bn	38.471	38.797
Food products, beverages and tobacco	AMD bn	8.049	8.181
Textiles, leather and their products	AMD bn	3.666	3.851
Wood, paper; publishing	AMD bn	1.899	1.601
Chemicals, chemical products	AMD bn	2.176	1.708
Wholesale and retail trade	AMD bn	20.178	20.456
Hotels and restaurants	AMD bn	0.300	0.292
Education	AMD bn	20.754	21.039
Health	AMD bn	9.742	9.907
Other manufacturing industries	AMD bn	7.628	8.414
Other community, social activities	AMD bn	15.743	15.862
Basic metals and fabricated metal products	AMD bn	3.127	2.998
Jewellery, furniture, other	AMD bn	3.234	3.406
Real estate activities	AMD bn	138.015	139.973
Transport	AMD bn	46.809	46.013
Communications	AMD bn	34.939	35.258
Financial intermediation	AMD bn	1.867	1.923
Construction	AMD bn	9.579	9.716
Mining and quarrying	AMD bn	2.822	2.479
Electricity, gas and water supply	AMD bn	13.202	15.629
Machinery and equipment n.e.c.	AMD bn	2.816	2.430
Exports by sector			
Agriculture, hunting, forestry, fishing	AMD bn	4.911	5.353
Food products, beverages and tobacco	AMD bn	41.855	47.816
Textiles, leather and their products	AMD bn	16.296	22.895
Wood, paper; publishing	AMD bn	1.597	1.976
Chemicals, chemical products	AMD bn	6.757	7.496
Wholesale and retail trade	AMD bn	2.740	2.726
Hotels and restaurants	AMD bn	23.653	23.796
Education	AMD bn	2.446	2.453
Health	AMD bn	0.817	0.820
Other manufacturing industries	AMD bn	19.210	43.956
Other community, social activities	AMD bn	3.224	3.252

Basic metals and fabricated metal products	AMD bn	52.219	58.676
Jewellery, furniture, other	AMD bn	203.596	212.751
Real estate activities	AMD bn	13.316	13.356
Transport	AMD bn	46.283	46.859
Communications	AMD bn	13.578	13.616
Financial intermediation	AMD bn	8.109	8.048
Construction	AMD bn	4.718	4.730
Mining and quarrying	AMD bn	22.735	25.455
Electricity, gas and water supply	AMD bn	6.353	37.626
Machinery and equipment n.e.c.	AMD bn	21.710	28.137
Imports by sector			
Agriculture, hunting, forestry, fishing	AMD bn	52.362	59.5586
Food products, beverages and tobacco	AMD bn	60.608	69.954
Textiles, leather and their products	AMD bn	19.193	25.235
Wood, paper; publishing	AMD bn	14.378	17.662
Chemicals, chemical products	AMD bn	55.350	63.271
Wholesale and retail trade	AMD bn	2.525	2.746
Hotels and restaurants	AMD bn	22.846	23.829
Education	AMD bn	0.908	0.979
Health	AMD bn	1.646	1.774
Other manufacturing industries	AMD bn	123.450	143.627
Other community, social activities	AMD bn	3.657	3.930
Basic metals and fabricated metal products	AMD bn	44.680	52.704
Jewellery, furniture, other	AMD bn	19.109	21.645
Real estate activities	AMD bn	5.328	5.751
Transport	AMD bn	94.100	103.710
Communications	AMD bn	11.148	12.245
Financial intermediation	AMD bn	15.461	18.219
Construction	AMD bn	1.864	2.006
Mining and quarrying	AMD bn	151.166	167.637
Electricity, gas and water supply	AMD bn	-	-
Machinery and equipment n.e.c.	AMD bn	116.501	131.817