

The Impacts of Conflict Risk Reduction on the Armenian Economy*

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Executive Summary

- **We consider here the potential economic impacts of a full normalization of the relationship between Armenia and Turkey.** This would include opening the Armenia-Turkey border and normalization of the political relationship between the two countries. This development might involve a peace settlement with Azerbaijan.
- **Normalization of Armenia's relationships with its neighbors would reduce the external conflict risk that Armenia faces, and this would have several economic impacts.** A fall in external conflict risk would increase investor perceptions of expected profitability on investments in Armenia, and investment by foreign and domestic investors in the Armenian economy would rise. Armenian policy makers might also reduce military spending in response to a fall in external conflict risk.
- **Armenia has one of the highest external conflict risk ratings in the world.** Armenia has been consistently ranked in the top 10% most risky countries of the world during 1999-2005 by a prominent institution that sets external conflict risk ratings. Multinational firms and international investors consult this risk rating, which is based on transparent criteria and done by a private consulting firm.
- **We analyze the impact on foreign direct investment in Armenia and Armenian military spending of a fall in perceived external conflict risk.** We consider a scenario in which Armenia's external conflict risk perception falls from its current high level to the level of the third decile of the most risky countries in the world with regard to external conflict. This is conservative, because external conflict risk will still be significantly above the world average, but it will be lower than that associated with the current "cold war" situation.
- **Such a fall in external conflict risk could increase the stock of inward foreign direct investment (FDI) by roughly 50%, with a resulting increase in the level of real GDP by 3-4%.** Our statistical analysis suggests that FDI is highly sensitive to perceived external conflict risk, and even a relatively small fall in perceived conflict risk produces a significant impact on FDI. Our estimate of the impact on GDP of the increased FDI due to lower external conflict risk is conservative, for two reasons. First, it does not take into account that investment by Armenians in their own economy might increase as well as FDI. Second, it does not take into account that increased levels of FDI are associated with increased productivity due to technological transfers, managerial spillovers, and other factors. We thus regard our estimate as a lower bound to what is likely to happen to GDP as a result of ending the current situation.
- **Normalization of relationships with both Turkey and Azerbaijan is also likely to produce a significant "peace dividend."** If our external conflict risk reduction scenario is driven by normalization of relations with both Turkey and Azerbaijan, we estimate that Armenian military spending will decrease by 0.7% of GDP. This fall would have equaled \$21 million in 2003, and would have enabled the Armenian government to double the size of its family benefits program or very substantially increase its spending on public health, education, or pensions.

I. The Economic Impacts of Border Opening and Relationship Normalization

The closed border between Armenia and Turkey impacts the Armenian economy in several ways. The most well-known and studied of these is the cutting off of transportation routes and the impact of an increased level of transport costs on imports and exports. A recent study suggests that that economic gains from opening the border in this respect will be relatively small.¹ However, there are other important costs that the closed border induces that might be at least as important. The closed border is one manifestation of the lack of a normalized political relationship between Armenia and Turkey. This lack of a normalized relationship is itself related to the lack of a normalized relationship between Armenia and Azerbaijan. The situation between Armenia and Azerbaijan can best be described as a “cold war”, and we will use this term to describe relations between Armenia and Turkey as well, while recognizing that there are important differences in the two pairs of bilateral relationships. The situation that currently exists between these three states has resulted in a relatively high level of risk that an external (inter-state) conflict will break out at some point in the future. This high level of risk has economic impacts on the Armenian economy that are independent of the impact of a closed border on transport costs.

How does being in a “cold war” affect the Armenian economy? First, investors take into account the possibility that a country might become involved in external conflict when making their investment decisions. External conflict will impact the return on their investments. Physical assets related to the investment could be destroyed. The risk of conflict raises the risk of confiscatory taxation by the government to finance a conflict, the risk of significant trade disruption and loss of revenues, and disruption of production operations through loss of labor due to calling up of troops. All of these potential outcomes negatively impact revenues and costs of a business operation and return on investment. The impact of external conflict risk probably lies most heavily on foreign investment into Armenia, although it is certainly possible that the decisions of domestic investors are also affected.

Second, being in a cold war causes a higher level of military expenditures to be made than if Armenia’s relations with its neighbors were normalized and the risk of conflict low. These military expenditures have an opportunity cost. They must be financed by taxing the private sector, and this crowds out investment and consumption. Military expenditures also crowd out spending on other public needs such as health care, education, support to the poor, and infrastructure construction. Armenia must pay for a cold war, and this requires sacrificing public and private investment and consumption.

In this paper, we quantitatively evaluate the impact of normalizing the political relationships between Armenia and its neighbors on investment and military spending. Border opening is but one element and outcome of a broader process of ending Armenia’s “cold war,” and it is the impact of this broader process that we consider here. Ending the cold war will reduce both the reality and perception of the risk of conflict breaking out in future.² We do not argue, of course, that ending the cold war will eliminate the possibility of conflict. Some neighboring states with open borders and fully normalized relationships nonetheless experience tensions that cause some positive probability of conflict breaking out in future. We do argue that ending the cold war will lower conflict risk, and we make a relatively conservative assumption about the degree to which it will do so.

¹ See AEPLAC (2005).

² Because the border was unilaterally closed by Turkey in 1993, it will take a decision by Turkey to open the border. It is reasonable to assume that this can take place only in the context of a process of normalization of relations between the two countries. This might require a settlement to be reached between Armenia and Azerbaijan.

II. Political Risks in Armenia

The risk of external conflict breaking out for a given country is one component of a set of risk factors that can be called political risk. Political risk comprises factors related to the governance of a country and its relations with other countries that can impact the country's economic performance and the business environment for individual firms operating there. There are two approaches that can be taken to measuring the level of the various components comprising political risk.

First, the level of risk can be determined by developing objective measures that determine the risk level or are direct measurements of the risk. To make this concrete, consider establishing the level of external conflict risk that a given country faces. This first approach would involve identifying variables that are related to the chances of the country getting into an external conflict with another country, such as a history of past conflict, status of formal diplomatic relations, having an open or closed border, extent of trade relations, etc. For all possible pairs of countries (called dyads), a conflict status variable is determined, which (for example) takes the value 0 if the pair of countries is in conflict, and 1 if the pair of countries is not in conflict. The conflict status variable can be regressed on the explanatory variables related to the chances of conflict. The results of this regression then show how the probability of countries getting into conflict with each other change with the explanatory variables. This approach has been used extensively by political scientists. Unfortunately, the ability of these estimated relationships to predict the outbreak of conflict is low, and the explanatory factors that have been used to predict conflict risk have relatively little ability to predict the outbreak of conflict.³ This may be due to the fact that the outbreak of conflict is a rare, very low-probability event, even when conditions suggest that the risk is high.

A second approach establishes a risk level through the evaluation of an expert or group of experts familiar with a country and its specific situation and characteristics. These subjective evaluations can be made consistent across countries by using appropriate criteria and methodological approaches. Although they do not use a formal statistical model to relate the level of conflict risk to explanatory factors, experts are using a model implicit in their thinking and taking into account a set of factors that are presumably related to conflict risk. A drawback of the expert evaluation approach is that it is subjective and not necessarily very transparent. However, expert political risk evaluations are used extensively in the international investment world and do presumably influence investment decision-making. This makes them attractive for the purposes of this study, because they may influence investment flows even if the risk assessment is "incorrect."

We use here one of the most well-known expert evaluations of political risk factors, the International Country Risk Guide (ICRG) indicators. We incorporate into our quantitative analysis all of ICRG's political risk variables: the risk of external conflict, internal conflict, government stability, socioeconomic conditions, corruption, the military's involvement in politics, religious institutions' involvement in politics, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. Most or all of these factors are presumably capable of influencing returns to investment and thus the level of investment.⁴ The ICRG measures are also

³ See Beck, King and Zeng (2000) and (2004) for a review of the methodological and data issues, application of a new empirical technique (neural network modeling), and evaluation of the ability to predict conflicts. They argue that neural network modeling gives the highest ability to predict whether a dyad is in a state of conflict or peace. This approach can predict roughly 17% of conflicts that actually took place in historical years (Beck et al 2000, p.32-3).

⁴ It should be noted that an "objective" approach could be taken to develop risk factors for other aspects of political risk besides external conflict risk. Consider, for example, corruption. In addition to ICRG's subjective evaluation of corruption risk, another example of a subjective corruption indicator is Transparency International's well-known corruption perceptions index. These indicators capture the degree to which a country is *perceived* to be corrupt. However, it is presumably possible to establish the degree of corruption objectively by determining how much a typical firm has to spend on corruption-associated payments, and how much corruption reduces returns on investment.

fairly transparent, because detailed descriptions of the factors and criteria that are taken into account when their experts make quantitative evaluations are provided: see appendix A for more detail. The ICRG risk assessments are made by experts working for an American private-sector company. This company provides risk information to most large multinational companies and faces powerful commercial incentives to provide objective, accurate assessments.

ICRG assesses external conflict risk by evaluating the possibility or existence of war, cross-border conflict, and foreign pressures. A value of 0-4 is given for the war, cross-border conflict, and foreign pressures variables, and these values are summed to give an external conflict risk rating that takes on a value between 0-12.

Armenia's Perceived Political Risks in Cross-Country Perspective

Table 2.1 below gives Armenia's rank out of the 140 countries for which ICRG data is available during 1999-2005: the *higher* the rank, the *more* risky Armenia is assessed compared to the other countries. In 2004-5, Armenia was assessed as having high to very high risk in the areas of socioeconomic conditions, corruption, the military's involvement in politics, law and order, democratic accountability, and bureaucracy quality. Most of the risk evaluations have been rather stable over time. The two exceptions to this are government stability and democratic accountability. Perceived government stability risk rose dramatically after the assault on the Armenian parliament in 1999 and then fell substantially as it became clear that the government was stable. Democratic accountability risk was assessed as moderate until 2003 and then rose dramatically.

For the purposes of this study, perhaps the most interesting thing in table 2.1 is that Armenia has consistently been assessed as having one of the highest levels of external conflict risk in the world, ranging between a rank of 6 to 14 out of 140 countries evaluated during 1999-2005.⁵ The average risk level in these years for Armenia was the eighth highest in the world, exceeded only by Somalia, Iraq, Liberia, Lebanon, Ethiopia, Israel, and Democratic Republic of the Congo. Interestingly, Azerbaijan had the ninth highest level in the world, at a value almost exactly equal to that of Armenia. Turkey was assessed as less risky but still ranked 31st out of 140 countries.

We also present as a memo item in table 2.1 the foreign investment and capital flow restriction index that is constructed by the Heritage Foundation. This index takes into account various factors related to openness to foreign investment and ownership and ranges from a value of 1 (least restrictive) to 4 (most restrictive).⁶ Armenia was ranked as extremely restrictive during the period 1996-1999, but was ranked relatively less restrictive 2001-2005, and least restrictive in 2006, when the value fell to 1.

One example of a quantitative measure of corruption along these lines is the estimate of bribery costs as a percentage of revenue that the European Bank for Reconstruction and Development has developed on the basis of firm surveys in transition countries (including Armenia.) The advantages of such quantitative measures are that they measure precise concepts, and they are presumably more objective. The disadvantages are that it is much more expensive to implement a survey than to develop a subjective expert evaluation, and firms might be reluctant to truthfully reveal things such as their true bribe costs.

⁵ Azerbaijan has been assessed at external conflict risk values almost identical to the Armenian values.

⁶ See appendix B for more details on this index.

Table 2.1. Armenia's Rank Out of 140 Countries

	1999	2000	2001	2002	2003	2004	2005
Government Stability	93	14	4	19	44	66	40
Socio-Economic Conditions	26/41	28/43	48/55	60/65	59/65	62	35/44
Investment Profile	17	14/19	29/30	50/55	47/57	49/59	44/55
Internal Conflict	58/61	48/55	20	33/36	35/39	69	38
External Conflict	12/13	11/12	11	14	8	6	7/9
Corruption	14/47	15/46	28/30	21/30	18/32	17/31	16/32
Military in Politics	62/81	61/79	58/59	58	57/58	54/55	53/55
Religion in Politics	48/88	52/93	56/93	60/98	62/99	54/96	54/97
Law and Order	50/51	28/53	32/54	38/57	41/59	41/56	35/56
Ethnic Tensions	70/115	72/117	118	122	122/124	123/125	123/125
Democratic Accountability	58/82	57/81	59/85	61/81	37/38	31/32	34
Bureaucracy Quality	12/38	12/39	12/39	12/38	11/38	11/38	11/40
Foreign investment and ownership restrictions index	4	3	2	2	2	2	2 ^a

Note: when two rank numbers are given, it indicates that Armenia shares the same indicator value with several other countries. The numbers given are the ranks that this group spans.

a : value fell to 1 in 2006.

A Scenario of External Conflict Risk Change

We consider in this study impacts on the Armenian economy if the level of perceived external conflict risk fell significantly. Our working hypothesis is that if the political relationship between Armenia and Turkey is normalized, external conflict risk would fall from its currently high level.⁷ We evaluate the impact of this fall on foreign direct investment and military spending.⁸

The assessed levels of external conflict risk during 1999-2005 have always placed Armenia in the riskiest 10% of the 140 countries evaluated by ICRG. We consider a scenario of the level of Armenian external conflict risk falling to the average level of countries in the 30% most-risky decile. This constitutes a 25% reduction in the level of assessed risk.⁹ We assume that ending the cold war will lower external conflict risk, but that Armenia will still continue to face an above-average risk level by world standards. We thus regard the change that we assume in external conflict risk to be reasonably conservative.¹⁰

⁷ As pointed out earlier, given that Turkey made a unilateral decision to close the border, it must decide to open the border, and this almost certainly requires normalization of relations between the two countries. This might in turn require a peace settlement to be reached between Armenia and Azerbaijan.

⁸ This is a subset of all economic impacts that would result from such a change. For example, we do not assess the impact on domestic investment, as appropriate statistics are not available.

⁹ A 25% reduction in the level of assessed risk is associated with a 25% increase in the risk score assessed by AIPRG, because risk declines with the value of the risk score in the ICRG methodology.

¹⁰ The impact of ending the cold war on external conflict risk perception could presumably be estimated more precisely in two ways. First, ICRG analysts could determine how this change would affect their risk assessment. Second, we could make a statistical analysis of the determinants of ICRG's external conflict risk assessment. These activities lie beyond the scope of the current study.

III. The Impact of External Conflict Risk Reduction on Foreign Direct Investment

External conflict risk presumably impacts investment in the Armenian economy, both by foreign and domestic investors. Foreign investors face opportunities to invest in assets in many different countries around the world and will weigh relative risks and opportunities in making their investment decisions. Some domestic Armenian investors, particularly those with large amounts of capital, also have the opportunity to invest in foreign assets. A higher degree of perceived external conflict risk raises the risk of actual war and physical asset destruction, confiscatory taxation to finance a conflict, trade disruption, and production disruption. This reduces the expected return to an investment subject to this increased risk, and makes non-Armenian investments relatively more attractive.¹¹

In this study, we will evaluate the impact of external conflict risk on foreign direct investment (FDI). There is an extensive literature on the determinants of the level of FDI flows and stocks. This literature is reviewed in more detail in appendix C (section C.1). Political risk or institutional quality variables are usually significantly positively correlated with foreign direct investment inflows and stocks. One particularly relevant and important recent study is Abadie and Gardeazabal (2005), who evaluate the impact of terrorism risk on the net FDI stock across countries. They establish a theoretical framework to understand the risk of a catastrophic event that could destroy physical capital such as a terrorist attack or war on the decision-making of international investors and find that risk-neutral investors will be highly sensitive to this risk. Their cross-country regression analysis then shows that terrorism risk has a robust, significant negative impact on net FDI stocks. The theoretical framework of Abadie and Gardeazabal also applies to the risk of destruction of physical assets by war, and it can underpin the empirical analysis conducted here.¹²

We run cross-country regressions in which the stock of inward foreign direct investment is related to the size of a country's economy as captured by national income (GDP), the ICRG political risk variables, geographic region dummies, a variable indicating the degree of restriction on foreign investments and capital mobility, dummy variables indicating whether a country is a major fuels exporter or ores and metals exporter, the average latitude of the country, a dummy variable for being landlocked, and the ratio of broad money to GDP. Countries that are major fuels or metals exporters may receive large FDI flows even though political risk is high. Landlocked countries might face higher transport costs and greater risks of transport disruption for exporting their products. The ratio of broad money to GDP is a proxy for the degree of financial market development of a country, which may influence investment decisions. A country's latitude may proxy for climate factors influencing investment decisions.¹³ We do not include variables

¹¹ Brada et al (2005) is the only study that evaluates FDI in Armenia on a cross-country basis. They show that FDI inflows to Armenia were significantly below what could have been expected given the performance of central European transition economies, and they attribute this mainly to greater political risks in former Soviet republics as compared to the central European countries.

¹² As noted earlier, external conflict risk involves more impacts than simply physical destruction of assets. The risks of high taxation to finance a conflict and cut-off of access to markets are also quite important.

¹³ Why do investors make FDI investments in a particular country? A strict economic explanation would involve comparison of expected returns to capital, which are influenced by relative wage rates, relative political risks, and other variables influencing comparative expected returns. However, domestic market size and costs of exporting to foreign markets must also be factored in. If an FDI project is intended to sell to a domestic customer base, then the size of that customer base and its income level will presumably impact returns to investment. These factors can be captured by population size and per-capita income respectively, the product of which is total national income. We include $\ln(\text{GDP})$ in the regressions, but results are robust to including $\ln(\text{population})$ and $\ln(\text{per-capita income})$. If a project is intended to sell to export markets, then transport costs and distance to main markets must also be considered, because these will influence production and sales costs and thus returns. This might be particularly important in the case of Armenia, because the closed border with Turkey has increased transport costs, and this may influence FDI decisions independently of other components of external conflict risk. We do not yet have a measure of

capturing factors specific to the transition of countries of the former Soviet bloc. By the late 1990s-early 2000s, transition in most of these countries was complete, and including transition-specific variables in a cross-country regression for 2003 and 2004 would be inappropriate.¹⁴

We evaluate FDI stocks rather than FDI inflows. FDI stocks represent the accumulation of FDI inflows over a period of time, and the influence of variables such as political risk factors that tend to be stable over long periods of time should be more clearly seen on stocks rather than flows. We also evaluate the gross FDI inflow stock, not the net FDI stock, which equals the FDI inflow stock minus the FDI outflow stock.

There are two ways in which this regression can be specified that have been used in cross-country regression analysis. First, the ratio of FDI stock to GDP can be the dependent variable to be explained:

$$(1) \quad \frac{FDI}{GDP} = \alpha + B * X + \varepsilon,$$

where α is a constant, X is a vector of explanatory variables, and ε is a random error term. Second, the log of FDI can be related to the log of GDP and explanatory variables:

$$(2) \quad \ln(FDI) = \alpha + \beta * \ln(GDP) + B * X + \varepsilon$$

In the cross-country regression literature, both specifications (1) and (2) have been used, and it is not clear *a priori* which one is preferable. Appendix C.3 discusses this issue in more depth, as well as other econometric issues such as endogeneity (appendix C.4). We prefer specification (2) for reasons that are explained in appendix C.3.

The data that we use are described in appendices A (political risk variables) and B (all other variables). We take data from standard international sources, primarily the World Bank's World Development Indicators database. Data on FDI in nominal US dollars are taken from the United Nations' UNCTAD database. FDI and GDP must be in comparable monetary units, and we use measures of GDP converted into US dollars using commercial exchange rates and PPP exchange rates. Regressions are run for both 2003 and 2004 cross-sections. Explanatory variables include a measure of restrictions on foreign investment and ownership in a country; we use this measure as a replacement for the ICRG investment profile variable, because it is specifically targeted to FDI and is a more comprehensive assessment of investment and ownership restrictions. The anticipated sign on this variable is negative, because an increasing value of the index indicates tighter restrictions on foreign investment and ownership.

Regression results are given in table 3.1 below. Regressions (A) and (B) are for the 2003 cross-section of countries, and regressions (C) and (D) are for the 2004 cross-section. Results are robust to whether PPP or commercial exchange rate GDP is an explanatory variable. The elasticity of the FDI inflow stock with respect to GDP is roughly 0.9, less than unity. Results that are robust across the two cross-sections and the two GDP measures are the coefficients on the FDI restrictions index, external conflict risk, law and order risk, bureaucracy quality risk, latitude, and broad money-to-GDP ratio. Coefficients on these variables are statistically significant at the 10% or better level, and they all have the expected sign.¹⁵

distance to main export markets that can be included in the cross-country regressions, and this is an area for future research.

¹⁴ Additionally, some of the Soviet-bloc countries that were very slow to implement transition are not included in the sample used in this paper due to data deficiencies (Tajikistan, Turkmenistan, Uzbekistan.)

¹⁵ The coefficient on latitude in regression (D) is significant at the 11% level. The estimated coefficients on latitude are negative, indicating that the farther a country is from the equator, the less FDI it has. It is not obvious what sign

Additional insight is gained by taking the logs of all of the explanatory variables (except the dummy variables), including the ICRG political risk variables.¹⁶ Coefficients on logs of explanatory variables are elasticities that show the percentage change in the dependent variable when the explanatory variable increases by 1%.¹⁷ Results for a full log-log regression for the 2003 cross-section are shown in regression (E) in table 3.1 below. The coefficient on external conflict risk is the largest elasticity estimated in the regression: FDI inflow stock is more sensitive to external conflict risk than to any other explanatory variable. We present regression (E) not because we believe that it is a good specification: we prefer the specification of regressions (A)-(D). However, it does give insight into the relative responses of FDI to changes in its explanatory variables, and it is interesting to note that the biggest elasticity is with respect to external conflict risk.

The Impact of a Reduction in External Conflict Risk on Foreign Direct Investment

As in the case of military spending, we consider a scenario in which the assessed level of external conflict risk for Armenia falls from its current very high value to the average level of countries in the 30% most-risky decile, which as discussed earlier amounts to a 25% reduction in the level of assessed risk. We assume that ending the cold war will lower external conflict risk, but that Armenia will still continue to face an above-average risk level by world standards.

Before considering the impact of external conflict risk change on FDI, it is useful to evaluate how well Armenia has done in terms of attracting FDI inflows. In 2004, the ratio of the FDI inflow stock to GDP was 33%. This performance is a bit below the world average of 44% but a bit above the world median value of 27%; Armenia ranked number 63 out of 154 countries around the world for which data is available. Figure 3.1 below shows a histogram for ratio values across countries; although performance is slightly above average, there are a significant number of countries that have ratio values higher than 33%. Although Armenia has had one of the most successful growth experiences in the world during 2001-05, FDI inflows have not yet risen to a level that distinguishes Armenia in this regard. This is perhaps even more surprising given that Armenia has a large, wealthy, well-organized diaspora that is an obvious potential source of investment flows. What factors are retarding these inflows? Many analysts would suggest that corruption and lack of the rule of law are important factors. However, the regression results of table 4.1 suggest that external conflict risk also plays an important role. This factor has received much less attention in analysis of the Armenian economy and its post-Soviet performance, but it is a variable that international investors will take into account when making decisions, and Armenia has one of the highest assessed levels of such risk in the world.

Table 3.2 below shows the potential impact on FDI inflow stock if ending the cold war reduces Armenia's external conflict risk by 25%. Results for the 2003 and 2004 cross-sections are calculated separately (regressions (A) and (C) are used for calculations.) For the 2003 and 2004 cross-sections, external conflict risk reduction increases the FDI inflow stock by 42% and 54% respectively. This is a very large impact. The reason why it is so big is revealed by regression (E), the full log-log regression. For the 2003 cross-section, FDI inflow stock has an elasticity of 1.7 with respect to external conflict risk. If risk changes by 25%, then FDI inflow stock changes by $1.7 \times 25\%$, or 43%, which is almost exactly the same as the percentage change predicted by

one would expect on this variable *a priori*. Latitude is significantly correlated with levels of corruption, but corruption is controlled for in these regressions.

¹⁶ The ICRG political risk variables are not dummy variables but vary continuously between 0-12, 0-6, or 0-4. It is therefore legitimate to take the log of these variables.

¹⁷ Coefficients on dummy variables in a log-log regression are semi-elasticities that show the percentage change in the dependent variable if the dummy variable value changes from 0 to 1.

regression (A). We find such a large impact because the cross-country data suggests that FDI inflow stocks are remarkably responsive to perceived levels of external conflict risk.

Economic Impacts of An Increased FDI Stock in Armenia

There are two ways that an increased stock of FDI in Armenia can impact national income and social welfare. First, FDI is a component of the total stock of Armenian fixed capital that is used to produce output, and increasing FDI increases a production input. Second, economists have argued that there are special features of FDI in a developing-country environment that cause FDI inflows to boost productivity.

To determine the magnitude of the first impact on GDP, we use a Cobb-Douglas production function:

$$(5) \quad \text{GDP} = A * K^{\alpha} L^{1-\alpha},$$

where L is labor input into production, K is the total capital stock, A is total factor productivity, and α is capital's share in national income. K equals the sum of the stock of capital owned by foreign investors (FDI) and the stock of capital owned by domestic investors. Growth in GDP due to growth in inputs is:

$$(6) \quad \frac{d\text{GDP}}{\text{GDP}} = \frac{dA}{A} + \alpha \frac{dK}{K} + (1 - \alpha) \frac{dL}{L}$$

To determine the impact of an increase in Armenian FDI, therefore, we need to know only what values dK/K and α have. The macroeconomics literature suggests that in developing countries, α is typically equal to 0.6. The challenge is to determine what dK/K is, because data on the total fixed capital stock of Armenia is not available. We take the approach of setting a range of values for the capital-output ratio, backing out estimates of the value of K, and determining what an increase of \$500 million is in percentage terms for those values of K.¹⁸ The value of capital-output ratios across countries of the world are available for the period 1950-1990 in a World Bank dataset.¹⁹ In 1988, the capital-output ratio for 71 developing countries ranged from 1.4 to 7.1; the average capital-output ratio was 2.8, and 68% of these values clustered between 2.0 and 3.5. We therefore present results for this range of values, with 3.0 being the most likely scenario.²⁰ Table 3.3 summarizes results. The level of GDP is projected to increase from 3-5%, with a most likely value between 3-4%.

We emphasize that external conflict risk reduction might also impact domestic investors' decisions, and investment in fixed capital by Armenian investors could rise as well as FDI. Our result is thus a *lower bound* to potential impact of external conflict risk reduction. We would like to run a cross-country regression in which the dependent variable is the total fixed capital stock, not just the FDI portion of the capital stock. Unfortunately, cross-country data on physical capital stocks in the post-1990 era are not yet available, and this must remain a task for future research.

¹⁸ The FDI inward stock was roughly \$1 billion in Armenia in 2003-04, and the estimated increase resulting from external conflict risk reduction is roughly 50%, or \$500 million.

¹⁹ See Nehru, Vikram, and Ashok Dhareshwar (1993), "A New Database on Physical Capital Stock: Sources, Methodology and Results." *Rivista de Analisis Economico* 8(1): 37-59. This dataset is available on-line from the World Bank.

²⁰ AEPLAC (2005) assumes a capital-output ratio for Armenia of 1.5, although they note that "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." (footnote 29 at bottom of p.35) The 2003 World Bank figures are not referenced.

We also do not take into account the possibility that an increased inflow of FDI will lead to faster productivity growth. Foreign-owned capital might be used more efficiently than domestically-owned capital. The presence of foreign-owned firms may provide spillover impacts to domestically-owned firms through increased competition in the product and labor markets, demonstration of new management techniques and efficiency-enhancing practices, etc. There has been considerable research of this issue.²¹ There is considerable empirical evidence that increased FDI inflows are associated with more rapid productivity growth. The (temporary) increase in economic growth associated with the increase in FDI stock that we have identified here is thus likely to be magnified by positive productivity spillovers, and the impact on GDP that we have estimated is therefore quite conservative, as it does not capture these productivity impacts.

We conclude this section by noting that the FDI inflow stock responds significantly to variables other than external conflict risk, in particular law and order, bureaucracy quality, and the M2-GDP ratio. Armenia's perceived risk with respect to law and order is "high," and with respect to bureaucracy quality as "very high." Armenia also had the ninth lowest ratio of broad money to GDP out of 150 countries for which data was available in 2004. Improvement in these areas will also presumably have significant impacts on attracting FDI to Armenia.

²¹ A bibliography of key papers on FDI's impact on growth is available at <http://rru.worldbank.org/PapersLinks/Impact-Foreign-Direct-Investment/>. One useful summary of the literature on the determinants of FDI and its impact on growth is Lim (2001). Many studies do find evidence of positive spillovers and a growth impact. Borensztein et al (1998) find that higher FDI inflows were associated with faster real GDP growth in 69 developing countries during 1970-90. Campos and Nauro (2002) find that FDI inflows have a positive impact on real growth in transition countries during 1990-98.

Table 3.1

	(A)	(B)	(C)	(D)	(E)
Cross-section year	2003	2003	2004	2004	2003
Number of observations	123	121	122	121	113
Constant	-1.57 (-1.01)	-2.98 (-1.72)*	-1.94 (-1.18)	-2.27 (-1.25)	-1.83 (-0.77)
Log of GDP valued at commercial exchange rate US\$	0.91 (16.67)***	-	0.89 (15.37)***	-	0.90 (16.70)***
Log of GDP valued at PPP US\$	-	0.92 (15.14)***	-	0.88 (14.26)***	-
FDI Restrictions Index	-0.35 (-3.07)***	-0.42 (-3.35)***	-0.33 (-2.75)***	-0.40 (-3.29)***	-1.10 (-4.31)***
External conflict risk	0.18 (2.31)**	0.15 (1.72)*	0.23 (2.54)***	0.17 (1.89)*	1.67 (2.07)**
Internal conflict risk	-0.01 (-0.16)	0.00 (0.03)	-0.08 (-0.82)	-0.06 (-0.61)	-0.71 (-1.07)
Government stability risk	0.05 (0.72)	0.07 (1.01)	0.11 (1.47)	0.08 (1.11)	0.92 (1.59)
Socio-economic risk	-0.11 (-1.74)*	-0.07 (-0.98)	-0.12 (-1.74)*	-0.08 (-1.13)	-0.76 (-2.43)**
Military in politics risk	-0.17 (-2.43)**	-0.14 (-1.83)*	-0.11 (-1.34)	-0.08 (-0.98)	-0.45 (1.92)*
Corruption risk	-0.07 (-0.61)	0.03 (0.22)	-0.02 (-0.20)	0.05 (0.39)	-0.35 (-1.14)
Religion in politics risk	0.17 (2.13)**	0.13 (1.57)	0.10 (1.18)	0.10 (1.14)	0.74 (2.30)**
Law and order risk	0.25 (2.70)***	0.21 (2.17)**	0.29 (2.64)***	0.29 (2.60)***	0.75 (2.83)***
Ethnic tensions risk	0.03 (0.45)	0.05 (0.68)	-0.02 (-0.32)	-0.01 (-0.17)	0.01 (0.05)
Democratic accountability risk	-0.09 (-1.27)	-0.04 (-0.58)	-0.09 (-1.22)	-0.09 (-1.09)	-0.27 (-1.15)
Bureaucracy quality risk	0.33 (2.28)**	0.37 (2.43)**	0.26 (1.71)*	0.26 (1.66)*	0.38 (1.17)
Africa dummy	-0.79 (-1.01)	-0.87 (-1.04)	-0.74 (-0.91)	-1.03 (-1.23)	-0.99 (-1.32)
Asia dummy	-0.97 (-1.40)	-1.31 (-1.78)*	-0.78 (-1.08)	-1.20 (-1.62)*	-1.01 (-1.49)
Latin America dummy	-0.33 (-0.42)	-0.37 (-0.44)	0.07 (0.09)	-0.13 (-0.16)	-0.26 (-0.35)
Eastern Europe dummy	0.20 (0.29)	0.01 (0.01)	0.44 (0.60)	0.11 (0.15)	-0.24 (-0.35)
Western Europe dummy	0.08 (0.12)	0.07 (0.11)	0.17 (0.25)	0.18 (0.26)	-0.19 (-0.29)
Middle East dummy	-1.12 (-1.55)	-1.41 (-1.83)*	-1.08 (-1.40)	-1.50 (-1.89)*	-1.12 (-1.57)
Fuels exporter dummy	0.46 (1.60)	0.92 (2.99)***	0.10 (0.34)	0.63 (2.08)**	0.31 (1.01)
Ores and metals exporter dummy	0.35 (0.94)	0.35 (0.88)	0.27 (0.70)	0.28 (0.70)	0.49 (1.29)
Latitude	-0.02 (-2.38)*	-0.02 (-2.07)**	-0.02 (-1.80)*	-0.02 (-1.57)	-0.22 (-1.63)*
Landlocked dummy	-0.05 (-0.22)	-0.12 (-0.51)	0.01 (0.04)	-0.14 (-0.59)	-0.14 (-0.60)
M2-GDP ratio	0.54 (1.99)**	0.80 (2.72)***	0.74 (2.52)***	0.96 (3.14)***	0.38 (1.82)*
R-squared	0.89	0.87	0.88	0.87	0.89
Adjusted R-squared	0.86	0.84	0.85	0.84	0.86

*T-statistics in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively.*

Figure 3.1

Histogram: Ratio of FDI Inflow Stock to GDP (2004)
(three outliers > 200% excluded)

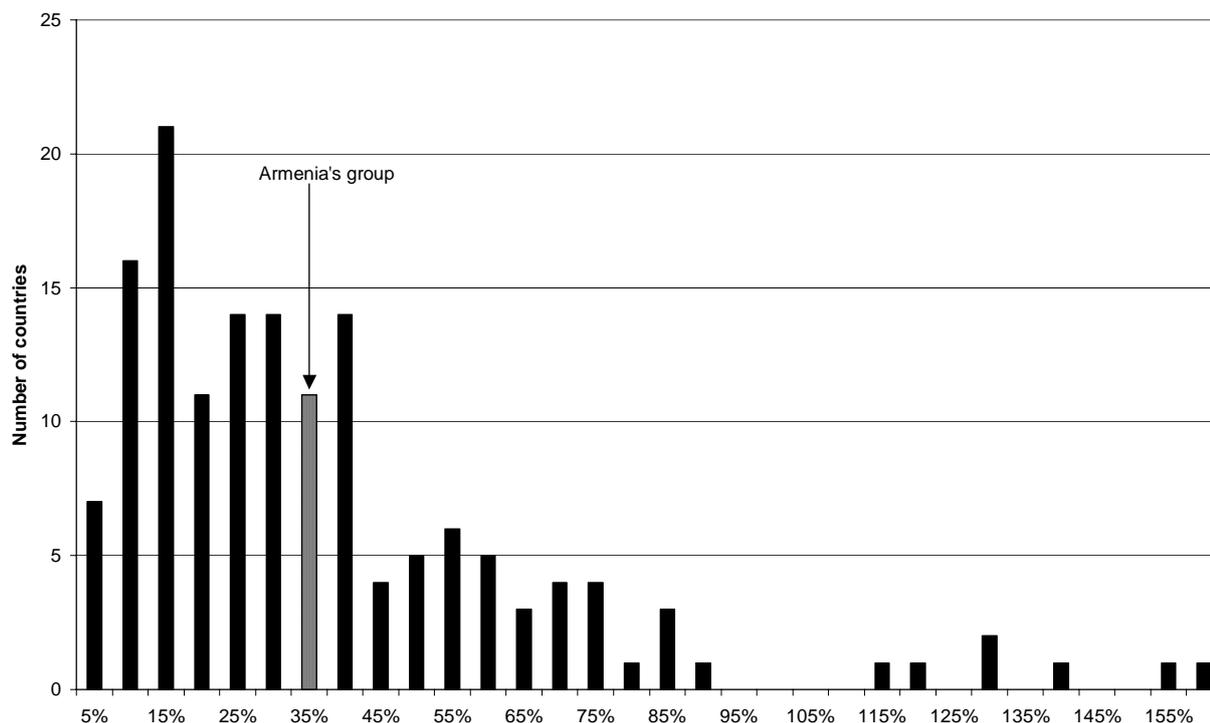


Table 3.2

2003 Armenian FDI inflow stock in million US dollars:	
Actual	\$1,024 m
Estimate using actual level of external conflict risk in 2003	\$673 m
Estimate using lowered level of external conflict risk	\$953 m
% increase in FDI inflow stock due to conflict risk reduction	42%
2004 Armenian FDI inflow stock in million US dollars:	
Actual	\$1,004 m
Estimated using actual level of external conflict risk in 2003	\$718 m
Estimated using lowered level of external conflict risk	\$1,104 m
% increase in FDI inflow stock due to conflict risk reduction	54%

Table 3.3. The Impact of a 50% Increase in FDI Inward Stock on GDP

Capital-output ratio (K/GDP)	Implied value of K (billion USD)	% increase in K due to \$500m increase in FDI	% increase in GDP ^a
2.0	6.0	8%	5.0%
2.5	7.5	7%	4.0%
3.0	9.0	6%	3.3%
3.5	10.5	5%	2.9%

a : assuming a share of K in GDP of 0.6

IV. Military Spending and External Conflict Risk Reduction – Will There Be a “Peace Dividend”?

Spending on the military should increase with the degree of external conflict risk that a country faces. Military spending is a cost to the economy, because it crowds out private-sector consumption and investment and public-sector investment in education, health, and/or infrastructure. In this section, we first review evidence on military spending in the Caucasus region to evaluate whether a regional military competition is present. We then do statistical analysis to explain what determines the level of military spending in different countries, and we evaluate to what extent the lowering of external conflict risk faced by Armenia would promote lower military spending.

Is There a Military Competition in the Caucasus?

Given the tensions between states in the Caucasus region, it would be natural to expect that the level of military spending is unusually high by international standards. We examine here official data on military spending as recorded by the World Bank and the Stockholm International Peace Research Institute (SIPRI), both of whom make use of official national statistics on military spending.²² Table 4.1 and figures 4.1 and 4.2 below show that Armenian military spending in 2003 US dollar terms was roughly constant during 1997-2002 and rose during 2003-05, but has been stable in recent years as a percentage of GDP. Azerbaijani military spending rose rather steadily during 1996-2004 and then quite sharply in 2005, although it also has been stable as a percentage of GDP. Georgian military spending fell in the late 1990s, rose significantly during 2001-04, and then grew sharply in 2005. Georgia has had the smallest military burden in this group, although this changed dramatically in 2005.

Although Armenia’s military spending was exceeded by that of Azerbaijan during 1996-2005, it was a greater burden on the Armenian economy. Armenian military spending absorbed a higher percentage of national income, and military personnel were a higher percentage of the labor force. In 2003, Armenia was in the top 25% of countries of the world in terms of the share of national income spent on the military, and in the top 10% in terms of the share of military personnel in the labor force. Importantly, the share of military spending in total central government budgetary expenditures was quite high in Armenia during 2003-04. In 2003, Armenia was in the top 25% of the countries of the world in terms of the share of military in total government expenditures.

The overall impression given by these data is that military spending in this region was rising in the early 2000s, but its burden on the region’s economies was not, because GDP was growing at least as rapidly. However, the levels of military spending and personnel as a percentage of the size of the economy were high by world standards, particularly in the case of Armenia. Although a fierce military competition in the Caucasus is not yet in evidence, the potential for it clearly exists. Even if one does not break out, the burden of actual spending in recent years is high by world standards, and a reduction in this burden will benefit the private sector and other areas of budget expenditures and their beneficiaries. If reducing external conflict risk reduces the need for military expenditures, then we can expect that normalization of relationships between Armenia and its neighbors will yield a “peace dividend.” Not only will it help prevent the outbreak of a fierce military rivalry, it will also help reduce an existing burden.

²² Some part of military spending in these countries may be made off-budget or is recorded in other budgetary line items. It is not known to what degree these practices affect the military statistics of these three countries. Some analysts have claimed that Armenia retains an edge over its neighbors with respect to armored vehicles and artillery due to its special military relationship with Russia and off-budget practices (http://www.jamestown.org/edm/article.php?article_id=2370465)

Table 4.1. Military Indicators for Caucasus States

	2000	2001	2002	2003	2004	2005	Rank in 2003
Armenia							
Military expenditure (mil. 2003 USD)	69.3	67.3	66.5	76.6	80.2	98.5	-
-as % of GDP	3.6%	3.1%	2.7%	2.7%	2.6%	2.7%	35 ^A
-as % of budget	na	Na	na	16.6%	15.5%	na	16 ^B
Military personnel	42,300	43,000	45,600	45,600	49,000	na	-
-as % of labor force	3.3%	3.3%	3.5%	3.5%	3.8%	na	18 ^C
Azerbaijan							
Military expenditure (mil. 2003 USD)	105	114	126	138	141	213	-
-as % of GDP	2.1%	2.0%	2.0%	1.9%	1.7%	2.1%	60 ^A
-as % of budget	na	Na	na	na	na	na	-
Military personnel	87,100	87,100	87,100	81,500	81,000	na	-
-as % of labor force	2.4%	2.3%	2.3%	2.1%	2.0%	na	37 ^C
Georgia							
Military expenditure (mil. 2003 USD)	20.1	25.5	36.4	42.6	59.5	146.0	-
-as % of GDP	0.6%	0.7%	1.0%	1.1%	1.4%	3.2%	106 ^A
-as % of budget	5.3%	6.8%	8.9%	10.0%	9.4%	na	21 ^B
Military personnel	33,400	28,500	29,200	29,200	22,000	na	-
-as % of labor force	1.4%	1.2%	1.2%	1.2%	1.0%	na	72 ^C

Source: World Bank, Development Indicators Database; SIPRI (military expenditure in 2003 USD). Italics indicate preliminary estimate.

A : out of 135 countries; B : out of 74 countries; C : out of 163 countries.

Figure 3.1
Military Expenditures
(million constant 2003 US\$)

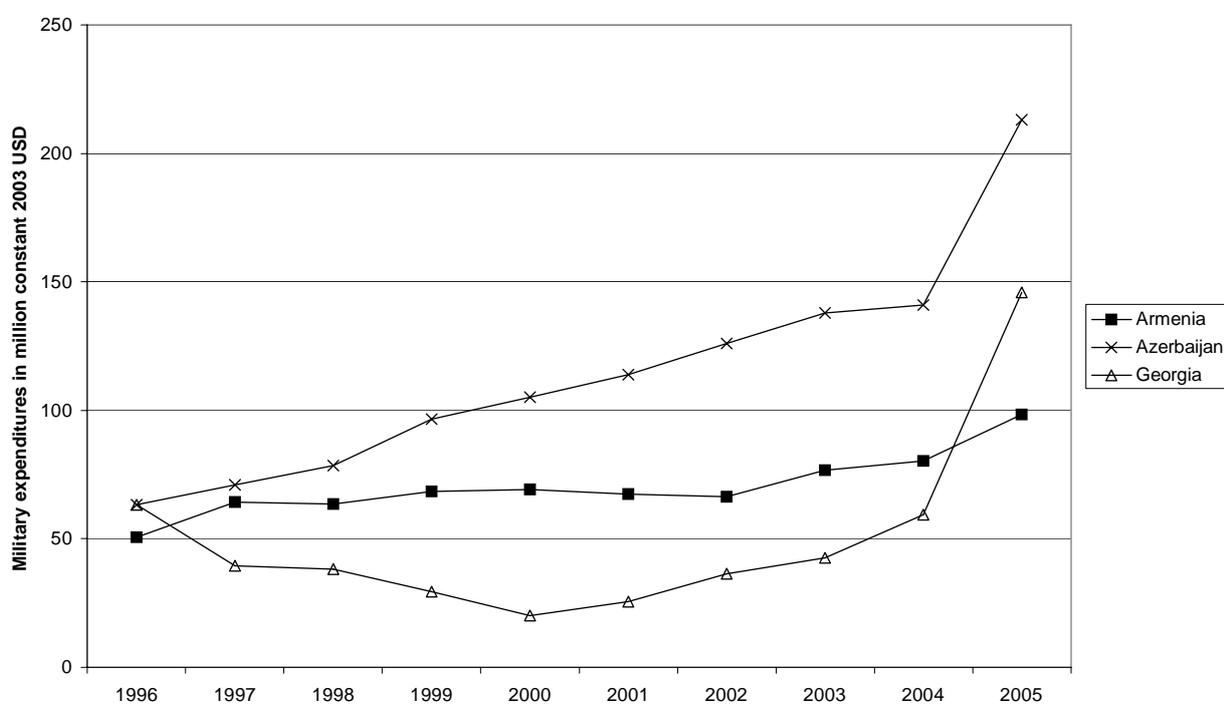
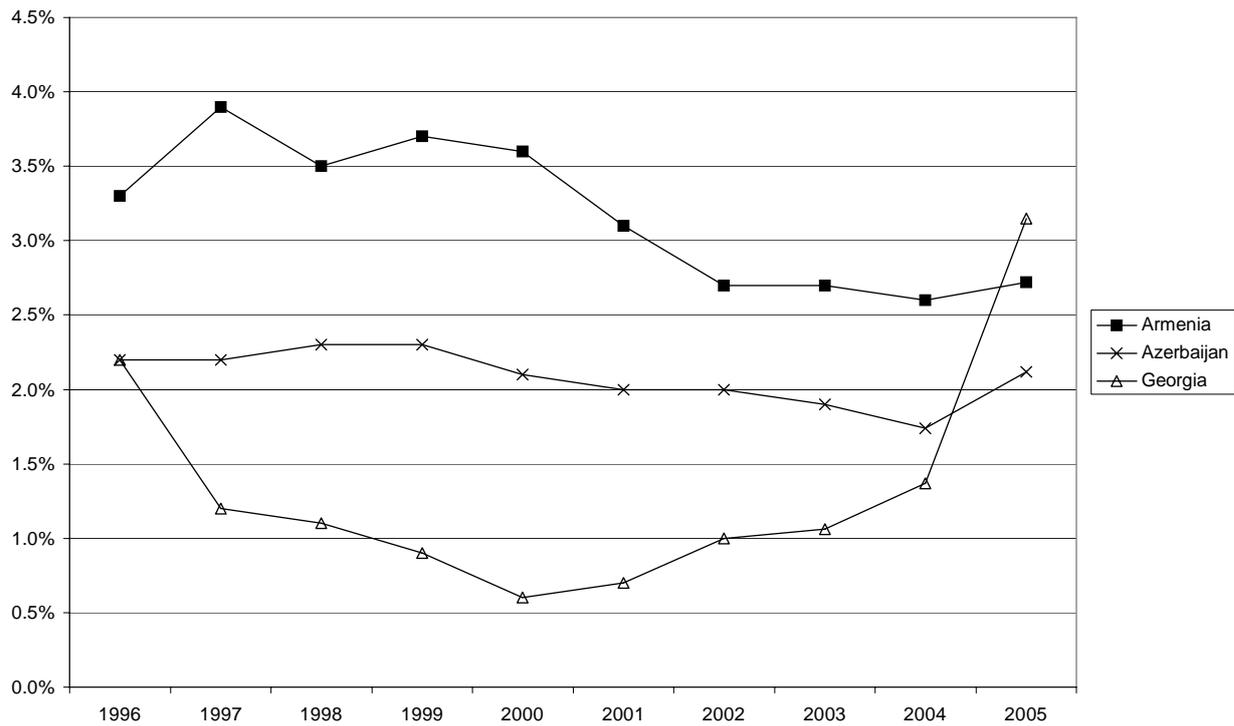


Figure 3.2
Military Expenditure as % of GDP



A Quantitative Estimate of a “Peace Dividend” for Armenia

The size of a “peace dividend” that might result from reducing external conflict risk can be estimated by analyzing the determinants of military expenditure. The literature on demand for military expenditures and the theoretical and econometric issues involved are reviewed in Smith (1995). Demand for military expenditures can be derived from an optimizing framework in which a government maximizes social welfare that includes security as an argument. Because security is not directly observable, variables that parameterize the security environment such as military force size of allies and hostile neighbors/potential enemies are typically included in the framework. Derived demand functions for military spending resulting from this approach typically include as explanatory variables the relative price of military goods and services, national income, and variables related to the security environment.²³

We explain in this study the level of military spending across countries using the explanatory variables national income (GDP), the ICRG political risk variables, geographic region dummies, and a variable indicating whether a country has conscription or not.²⁴ We do not include the relative price of military goods and services, as no cross-country data is available.²⁵

²³ There are important theoretical and econometric issues involved in using the “rational actor” approach to modeling military expenditures and estimating cross-country regressions based on derived demand functions. Smith (1995) provides a review of these issues. Deger and Sen (1995) provide a review of analyzing military expenditure in developing countries in particular.

²⁴ Including geographic region dummies is a standard practice in cross-country regressions. A dummy variable for conscription is included because a country that has conscription might have lower military monetary costs than a country that relies upon an all-volunteer military, because personnel costs will be higher in the latter. However, there are extra administrative costs associated with running a volunteer military, and it is not clear that a volunteer military is necessarily more expensive (see Mulligan and Shleifer (2005) for an extensive analysis of conscription vs. volunteer militaries.)

²⁵ We also do not include data on military spending of allies and potential enemies. The external conflict risk variable that we include in the regression captures the probability that conflict could break out. Variables such as military spending of allies and potential enemies help determine the probability of victory conditional on conflict breaking out.

There are three ways in which this regression can be specified that have been used in cross-country regression analysis. First, the specification traditionally used in the demand for military expenditures literature is the linear expenditure share:

$$(1) \quad M = \alpha + \beta * GDP + B * X + \varepsilon,$$

where M is military spending, α is a constant, β is a linear coefficient on GDP, X is a vector of other explanatory variables, and ε is a random error term. This linear function results from assuming that a government maximizes a Stone-Geary welfare function with consumption and security as arguments.²⁶ Second, the ratio of military spending to GDP can be the dependent variable to be explained:

$$(2) \quad \frac{M}{GDP} = \alpha + B * X + \varepsilon,$$

Third, the log of military spending can be related to the log of GDP and explanatory variables:

$$(3) \quad \ln(M) = \alpha + \beta * \ln(GDP) + B * X + \varepsilon$$

In the general cross-country regression literature, specifications (2) and (3) have been used, and it is not clear *a priori* which one is preferable. Appendix C.3 discusses this issue further. We prefer specification (3) for reasons that are explained in appendix C.3.

The data that we use are described in appendices A (political risk variables) and B (all other variables). We take data from standard international sources, primarily the World Bank's World Development Indicators database. Military spending and GDP must be in comparable monetary units. The Stockholm International Peace Research Institute (SIPRI) provides data on military spending in US dollars at 2003 prices.²⁷ We regress military spending in 2003 in US dollars on GDP converted into US dollars using commercial exchange rates. A sample of 116 countries is used. Our approach in this study in all cross-country regressions is to include as many countries as possible in the regressions. Countries are excluded only if data for a dependent or independent variable is not available. We do not analyze military spending in 2004 or 2005 due to missing observations and lack of GDP data in 2003 prices in those years. We also present results for the same regression but with GDP converted into US dollars using PPP exchange rates.²⁸

Table 4.2 below presents results. Both regressions show that the coefficient on the log of GDP is highly significant and slightly greater than unity: the elasticity of military spending with respect to national income is greater than one, and military spending is a luxury good.²⁹ Of the political risk variables, only the external conflict risk variable has an estimated coefficient that is statistically

A model could be developed that incorporates these two probabilities and is used to derive a demand equation, and this could be estimated on cross-country data. We leave this as a task for future research.

²⁶ See Smith (1995), pp.71-4.

²⁷ SIPRI converts military spending in nominal local currency units into US dollars at 2003 prices using commercial exchange rates and consumer price deflators. Data on military spending are regarded as being subject to potentially significant inaccuracies, as governments sometimes intentionally distort figures for political purposes, and even in the absence of such distortion there is no general agreement on how to treat dual-use items, conscripts, and other expenditure categories. Smith (1995), pp.78-80 provides a good discussion of these issues.

²⁸ The cross-country regression literature gives little if any guidance on whether GDP valued into US dollars using commercial or PPP exchange rates should be used on the right-hand side. We present results for both cases.

²⁹ The regression would ideally include a term capturing the relative price of military goods and services across countries. Data on an aggregate price for military expenditures comparable across countries are unfortunately generally not available. The conscription dummy variable does proxy for one component of this price, but more research effort is needed in this area.

significant. This coefficient has a negative sign, which indicates that as the external conflict risk measure increases (and perceived external conflict risk falls), military spending falls, which is what one would intuitively expect. Interestingly, the coefficient on the military-in-politics risk variable is not statistically significant. The coefficient on the conscription dummy variable is statistically insignificant, suggesting that the use of conscription does not have any impact on military spending. The only significant region dummy variable coefficient is the Middle East. Comparison of regression (A) and (B) results show that estimated coefficients are robust to whether GDP is valued at commercial or PPP exchange rates.

The Impact of a Reduction in External Conflict Risk on Military Spending

The significant coefficient on external conflict risk enables us to assess what military spending in Armenia might be if political relations between Armenia and its neighbors are normalized. We emphasize that for an impact on military spending to take place, this will in all likelihood require a peace settlement with Azerbaijan, because Armenian military spending is aimed primarily at providing security in case of a conflict with Azerbaijan. In the event that Armenia normalizes relations only with Turkey but a cold war with Azerbaijan continues, it is unclear that this would have any impact on Armenian military spending. It might, because the possibility of future conflict with Azerbaijan will diminish if relations with Turkey are normalized. However, negotiating a peace settlement with Azerbaijan and normalizing relations with both neighbors can *a priori* be expected to have a more significant impact on Armenian decisions regarding military spending.

We again consider the scenario of Armenia moving from its current assessed risk level to the average level of the 30%-most-risky decile of countries (a 25% reduction in the level of perceived risk.) There are two key assumptions implicit in this experiment. First, external conflict risk as evaluated by ICRG must reflect the level of risk perceived by decision-makers in Armenia. Given the way that ICRG constructs the external conflict risk variable, this assumption is plausible.³⁰ Second, as already noted, risk reduction must involve a reduction in the likelihood of future conflict with Azerbaijan.

Table 4.3 shows what will happen to Armenian military spending if external conflict risk falls according to the assumed scenario. We first predict the level of military spending in 2003 using regression (A) of table 4.2 and the actual values of all explanatory variables in 2003.³¹ Table 4.3 shows that the prediction is very close to the actual level. We then change the value of external conflict risk to the average value of the 30% most-risky decile, and predict what military spending would have been at that value. Military spending falls by 27%, from \$76 million to \$55 million. It falls as a percentage of GDP from 2.7% to 2.0%. A peace dividend of 0.7% of GDP is not inconsistent with other peace dividend experiences. U.S. military spending fell from almost 6% of GDP in the late 1980s to 3% in 1999 after the Cold War ended; it rose to 4% after 9/11 but is still substantially below its Cold War level. Israel has also experienced a significant decline in military spending as a percentage of GDP over the same time period, falling from above 12% in the late 1980s/early 1990s to 8% in 2005.³² A fall in Armenian military spending of the estimated magnitude of 0.7% of GDP falls well within these historical experiences. We note that the reduction in military spending identified here would be rational from the viewpoint of Armenian national security, because it would be driven by a fall in perceived external conflict risk.

Although \$21 million might seem like a small amount of resources to free up for non-military purposes, this is not a trivial impact. A “peace dividend” of this magnitude will permit a meaningful increase in social welfare. Table 4.3 summarizes what would happen to investment

³⁰ See appendix A for details on construction of external conflict risk measure.

³¹ Using regression (B) gives identical results.

³² Data obtained from the World Bank’s “World Development Indicators” database.

and social expenditure items in the budget in 2003 if \$21 million were added to them. The impact on the private sector is not great: flows of investment in gross fixed capital would increase by 3%, and the ratio of these flows to GDP would increase from 23% to 24%.³³ However, social expenditure items in the budget could increase dramatically. Public spending on education or pensions would rise by roughly 30%, and spending on health or family benefits would rise by 60% and 91% respectively. Family benefits is of particular interest, because it is this budgetary program that is intended to most directly impact the poorest and most vulnerable families in Armenian society. Almost doubling budgetary expenditures on this program would certainly have a significant impact in terms of reducing poverty and alleviating hardship in Armenia.

Table 4.2

	(A)	(B)
Number of observations	116	114
Constant	-4.05 (-3.45)***	-5.71 (-3.87)***
Log of 2003 GDP in commercial exchange rate US\$	1.09 (23.44)***	-
Log of 2003 GDP in PPP US\$	-	1.06 (18.74)***
External conflict risk	-0.17 (-2.48)**	-0.22 (-2.83)***
Internal conflict risk	-0.02 (-0.24)	0.02 (0.29)
Government stability risk	-0.02 (-0.43)	0.04 (0.52)
Socio-economic risk	-0.02 (-0.28)	0.08 (1.30)
Investment profile risk	0.06 (1.22)	0.08 (1.33)
Military in politics risk	0.05 (0.74)	0.09 (1.09)
Corruption risk	0.10 (1.12)	0.19 (1.81)*
Religion in politics risk	-0.08 (-1.32)	-0.14 (-1.82)*
Law and order risk	0.11 (1.50)	0.04 (0.39)
Ethnic tensions risk	0.05 (0.87)	0.05 (0.67)
Democratic accountability risk	-0.06 (-1.03)	-0.03 (-0.43)
Bureaucracy quality risk	-0.15 (-1.26)	-0.03 (-0.23)
Conscription dummy	0.03 (0.19)	0.02 (0.10)
Africa dummy	0.46 (0.76)	0.31 (0.43)

³³ This is related to the question of whether increases in the level of military expenditures positively or negatively impact economic growth. Crowding out of private investment is one channel that would negatively impact growth, but there are spillover and capacity utilization channels that could positively affect growth. There has been much research and lively debate on this issue in the literature, which is reviewed by Ram (1995). No clear-cut answers have emerged regarding whether decreases in the level of military expenditure promote or hurt growth. Perhaps the fact that military expenditures are a quite small component of most economies makes it difficult to identify its growth impact.

Asia dummy	0.54 (0.99)	0.11 (0.17)
Latin America dummy	0.42 (0.69)	0.45 (0.62)
Eastern Europe dummy	0.64 (1.11)	0.34 (0.49)
Western Europe dummy	0.15 (0.29)	0.15 (0.23)
Middle East dummy	1.41 (2.45)**	1.36 (1.98)**
R-squared	0.93	0.91
Adjusted R-squared	0.92	0.89

*T-statistics in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively.*

Table 4.3

2003 Armenian military spending in million US dollars:	
Actual	\$76.6 m
Estimate using actual level of external conflict risk in 2003	\$75.4 m
Estimate using lowered level of external conflict risk	\$55.1 m
2003 Armenian military spending as % of GDP:	
Actual	2.7%
Estimated using actual level of external conflict risk in 2003	2.7%
Estimated using lowered level of external conflict risk	2.0%
Armenian investment flows in 2003	
Gross investment in fixed capital stock	\$643.1 m
Armenian government spending in 2003 on:	
Health ^a	\$33.9 m
Education ^a	\$61.5 m
Family benefits ^a	\$22.4 m
Pensions ^a	\$72.7 m
Percentage increase in investment or budget items if decrease in military spending given over completely to:	
Gross fixed capital investment	3%
Health spending	60%
Education spending	33%
Family benefits spending	91%
Pensions spending	28%

a : Armenian public health, education, family benefits, and pension expenditures calculated by taking expenditures as a percentage of GDP and multiplying by 2003 GDP in commercial-exchange-rate USD. All percentage-of-GDP values are taken from Poverty Reduction Strategy Paper – Progress Report (2004-2005 First Term), Government of the Republic of Armenia, Yerevan 2006. It should be noted that most expenditures in Armenia on health care are privately financed (roughly 80% according to official statistics.)

APPENDIX A : Political Risk Variables

The International Country Risk Guide (ICRG) rates the degree of overall country risk based on an evaluation of 22 risk variables. Three distinct risk groups are considered: political risk, economic risk, and financial risk. According to the description of the ICRG risk indicator, “The ICRG staff collects political information and financial and economic data, converting these into risk points for each individual risk component on the basis of a consistent pattern of evaluation. The political risk assessments are made on the basis of subjective analysis of the available information, while the financial and economic risk assessments are made solely on the basis of objective data.”³⁴ In this study, we use only the political risk indicators as right-hand-side explanatory variables.³⁵

Detailed descriptions of the political risk indicators are given in table A.2 below. During 1999-2005, 140 countries were covered by the ICRG assessment, including Armenia and Azerbaijan. Values for government stability, socio-economic conditions, investment profile, internal conflict, and external conflict range between 0-12 points, and a *higher* value indicates *lower* risk. Values for corruption, military in politics, religion in politics, law and order, ethnic tensions and democratic accountability range between 0-6 points. Values for bureaucracy quality range between 0-4 points.

One might expect *a priori* that there would be a high degree of correlation between most of these political risk indicators, but table A.1 shows that this is not in fact the case. Many of the correlations are below 0.5, and no correlation is above 0.8. (The Heritage Foundation FDI index and latitude are also included in the correlation table.)

Table A.1. Raw Correlations Between 2004 ICRG Political Risk Indicators

	Govt. Stability	Soc-Econ Conditions	Invest. Profile	Internal Conflict	External Conflict	Corruption	Military in Politics	Religion in Politics	Law and Order	Ethnic Tensions	Dem. Account.	Bur. Quality
Govt. Stability	1.00											
Soc-Econ Conditions	0.23	1.00										
Investment Profile	0.09	0.75	1.00									
Internal Conflict	0.19	0.57	0.57	1.00								
External Conflict	0.19	0.34	0.44	0.56	1.00							
Corruption	0.02	0.66	0.63	0.48	0.31	1.00						
Military in Politics	0.03	0.67	0.72	0.68	0.48	0.56	1.00					
Religion in Politics	-0.05	0.30	0.31	0.46	0.19	0.36	0.40	1.00				
Law and Order	0.20	0.72	0.60	0.62	0.24	0.62	0.58	0.29	1.00			
Ethnic Tensions	0.17	0.34	0.25	0.42	0.13	0.22	0.35	0.30	0.41	1.00		
Dem Accountability	-0.26	0.42	0.58	0.37	0.37	0.55	0.55	0.30	0.31	0.05	1.00	
Bureaucracy Quality	0.02	0.79	0.72	0.50	0.38	0.72	0.70	0.29	0.59	0.26	0.61	1.00
FDI Index	0.19	-0.50	-0.65	-0.39	-0.25	-0.59	-0.48	-0.36	-0.38	-0.16	-0.55	-0.57
Latitude	-0.03	0.55	0.48	0.54	0.14	0.44	0.61	0.34	0.63	0.28	0.37	0.51

³⁴ See http://www.icrgonline.com/page.aspx?page=icrgmethods#_The_Political_Risk

³⁵ Economic risk indicators include basic macroeconomic variables such as per-capita GDP, GDP growth, inflation, and fiscal and current account balances. Financial risk indicators include other basic macroeconomic variables such as foreign debt level, net international liquidity, and exchange rate stability.

Table A.2 Detailed Descriptions of ICRG Political Risk Indicators

<i>Political Risk Indicator</i>	<i>Rated Subcomponents</i>	<i>Indicator Description</i>
Government Stability	Government unity Legislative strength Popular support	“An assessment both of the government’s ability to carry out its declared program(s), and its ability to stay in office.”
Socioeconomic Conditions	Unemployment Consumer confidence Poverty	“An assessment of the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction.”
Investment Profile	Contract viability/expropriation Profits repatriation Payment delays	“An assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components.”
External Conflict	War Cross-border conflict Foreign pressures	“An assessment both of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out war). External conflicts can adversely affect foreign business in many ways, ranging from restrictions on operations, to trade and investment sanctions, to distortions in the allocation of economic resources, to violent change in the structure of society.”
Internal Conflict	Civil war/coup threat Terrorism/political violence Civil disorder	“An assessment of political violence in the country and its actual or potential impact on governance. The highest rating is given to those countries where there is no armed or civil opposition to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people. The lowest rating is given to a country embroiled in an on-going civil war.”
Corruption	”An assessment of corruption within the political system. Such corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and, last but not least, introduces an inherent instability into the political process. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Such corruption can make it difficult to conduct business effectively, and in some cases may force the withdrawal or withholding of an investment. Although our measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business. In our view these insidious sorts of corruption are potentially of much greater risk to foreign business in that they can lead to popular discontent, unrealistic and inefficient controls on the state economy, and encourage the development of the black market. The greatest risk in such corruption is that at some time it will become so overweening, or some major scandal will be suddenly revealed, as to provoke a popular backlash, resulting in a fall or overthrow of the government, a major reorganizing or restructuring of the country's political institutions, or, at worst, a breakdown in law and order, rendering the country ungovernable.”	

Political Risk Indicator	Indicator Description
Military in Politics	“The military is not elected by anyone. Therefore, its involvement in politics, even at a peripheral level, is a diminution of democratic accountability. However, it also has other significant implications. The military might, for example, become involved in government because of an actual or created internal or external threat. Such a situation would imply the distortion of government policy in order to meet this threat, for example by increasing the defense budget at the expense of other budget allocations. In some countries, the threat of military take-over can force an elected government to change policy or cause its replacement by another government more amenable to the military’s wishes. A military takeover or threat of a takeover may also represent a high risk if it is an indication that the government is unable to function effectively and that the country therefore has an uneasy environment for foreign businesses. A full-scale military regime poses the greatest risk. In the short term a military regime may provide a new stability and thus reduce business risks. However, in the longer term the risk will almost certainly rise, partly because the system of governance will be become corrupt and partly because the continuation of such a government is likely to create an armed opposition. In some cases, military participation in government may be a symptom rather than a cause of underlying difficulties. Overall, lower risk ratings indicate a greater degree of military participation in politics and a higher level of political risk.”
Religious Tensions	“Religious tensions may stem from the domination of society and/or governance by a single religious group that seeks to replace civil law by religious law and to exclude other religions from the political and/or social process; the desire of a single religious group to dominate governance; the suppression of religious freedom; the desire of a religious group to express its own identity, separate from the country as a whole. The risk involved in these situations range from inexperienced people imposing inappropriate policies through civil dissent to civil war.”
Law and Order	Rated subcomponents: <i>Law</i> : strength and impartiality of the law <i>Order</i> : popular observance of the law
Ethnic Tensions	“This component is an assessment of the degree of tension within a country attributable to racial, nationality, or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. Higher ratings are given to countries where tensions are minimal, even though such differences may still exist.”
Democratic Accountability	“This is a measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. The points in this component are awarded on the basis of the type of governance enjoyed by the country in question. For this purpose, we have defined the following types of governance: alternating democracy, dominated democracy, <i>de facto</i> one-party state, <i>de jure</i> one-party state, autarchy. In general, the highest number of risk points (lowest risk) is assigned to Alternating Democracies, while the lowest number of risk points (highest risk) is assigned to autarchies.”
Bureaucracy Quality	”The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions.

Source: http://www.icrgonline.com/page.aspx?page=icrgmethods#_The_Political_Risk

APPENDIX B: DATA DESCRIPTION

GDP valued at commercial exchange rate and PPP US\$: Taken from the World Bank “World Development Indicators” on-line database.

Foreign investment and capital flow restriction index: Constructed by the Heritage Foundation. Value ranges between 1 (least restrictive) to 4 (most restrictive). Factors taken into account when determining index values include existence of foreign investment code, restrictions on foreign ownership of businesses, restrictions on industries and companies open to foreign investors, restrictions and performance requirements on foreign companies, foreign ownership of land, equal treatment under the law for both foreign and domestic companies, restrictions on repatriation of earnings, restrictions on capital transactions, and availability of local financing for foreign companies. See <http://www.heritage.org/research/features/index/index.cfm> Armenia’s score was 4 during the period 1996-1999, 3 in 2000, 2 in 2001-2005, and 1 in 2006.

Political risk variables: see appendix A.

Fuels exporter dummy variable: Ratios of fuels exports to total exports for the years 1995-2004 obtained from the World Bank’s “World Development Indicators” on-line database. The average of the ratio over these years was taken, and if the average value was greater than 40%, the dummy variable was assigned a value of 1.

Ores and metals exports dummy variable: Ratios of ores and metals exports to total exports for the years 1995-2004 obtained from the World Bank’s “World Development Indicators” on-line database. The average of the ratio over these years was taken, and if the average value was greater than 40%, the dummy variable was assigned a value of 1.

Latitude: Average latitude of the country taken from the CIA’s *World Fact Book*.

M2-GDP ratio: Taken from the World Bank’s “World Development Indicators” on-line database.

Military expenditure in 2003 US\$: Taken from the Stockholm International Peace Research Institute’s on-line database: http://www.sipri.org/contents/milap/milex/mex_database1.html

Military expenditure as % of central government expenditures: Taken from the World Bank’s “World Development Indicators” on-line database.

Military personnel as % of the labor force: Taken from the World Bank’s “World Development Indicators” on-line database.

Conscription dummy variable: Countries identified as employing conscription or not using information given in Mulligan and Shleifer (2005) and the CIA *World Fact Book* (2006).

APPENDIX C : Modeling the Determinants of Military Spending and Foreign Direct Investment

Economists and other social scientists often use cross-country regressions to attempt to explain the determinants of variables such as per-capita income, real income growth, foreign direct investment, and health expenditures. This approach became very popular in the 1990s as datasets covering many countries became available to researchers. Perhaps somewhat surprisingly given the popularity of the approach, cross-country regressions are run using a variety of specifications, suggesting that there is not a consensus on what the best specification is. In this appendix, we review the theoretical determinants and empirical literature on FDI flows and stocks and military spending. We then explore the specification issue in more depth, and we explain the rationale for our choice of specification that is used in the study. Finally, we consider the issue of endogeneity in the context of the regressions estimated in this study.

C.1 The Cross-Country FDI Literature

A good overview of the determinants of FDI is given by Joong-Wan Cho (2003).³⁶ Determinants influencing the decisions of foreign companies to make investments in a host economy are summarized in table C.1 below.³⁷ There are many factors that presumably affect FDI decisions.³⁸ The challenge to empirical research on FDI is to establish an appropriate theoretical framework that relates FDI to its determinants, and then to identify a set of determinants that is reasonably comprehensive and for which empirical data is available. We discuss an appropriate theoretical framework in sections C.3 and C.4 below. Here we provide a review of some of the empirical literature on the determinants of FDI inflows or stock of inflows in order to identify how other researchers have tackled these challenges.

³⁶ A very useful bibliography of the literature on FDI and its impacts can be found at the following World Bank weblink: <http://rru.worldbank.org/PapersLinks/Impact-Foreign-Direct-Investment/>

³⁷ Table C.1 is taken from Joong-Wan Cho (2003), p. 100.

³⁸ Analysts have often described investments by a foreign company in a host economy as generally being classifiable as either market-seeking or efficiency-seeking. Market-seeking FDI is intended to produce goods or services that are sold in the host country or in its regional neighborhood. Factors that influence regional demand for products are thus considered to be most important. Efficiency-seeking FDI, on the other hand, is made in order to produce exports primarily for sale outside of the country's neighborhood, and this FDI is presumably driven primarily by cost-minimization considerations. In the real world, it is not clear that such a clear line can be drawn between these two types of FDI, because a profit-maximizing investor will be interested in both revenues and costs and will take decisions to maximize the former and minimize the latter.

Table C.1. Host Country Determinants of FDI

Economic Conditions	• Markets	Size; income levels; urbanization; stability and growth prospects; access to regional markets; distribution and demand patterns.
	• Resources	Natural resources; location.
	• Competitiveness	Labor availability, cost, skills, trainability; managerial technical skills; access to inputs; physical infrastructure; supplier base; technology support.
Host Country Policies	• Macro policies	Management of crucial macro variables; ease of (payment and profit) remittance; access to foreign exchange.
	• Private sector	Promotion of private ownership; clear and stable policies; easy entry/exit policies; efficient financial markets; other support.
	• Trade and industry	Trade strategy; regional integration and access to markets; ownership controls; competition policies; support for SME's.
	• FDI policies	Ease of entry; ownership, incentives; access to inputs; transparent and stable policies.
Multinational Enterprise Strategies	• Risk perception	Perceptions of country risk, based on political factors, macro management, labor markets, policy stability.
	• Location, sourcing, integration transfer	Company strategies on location, sourcing of products/inputs, integration of affiliates, strategic alliances, training, technology.

Taken from Joong-Wan Cho (2003), p.100.

Abadie and Gardeazabal (2005) is a study that is particularly relevant to this one, because it develops a theoretical model of the impact of terrorism risk on investment. The authors postulate that terrorism impacts are innovations from a Poisson process that destroy a fraction δ of the stock of capital accumulated by investors. They show that terrorism risk has a large impact on the allocation of net investment across countries if investors are risk-neutral and conclude that "...even if terrorism risk is only a small fraction of total economic risk, it may still have a large impact in an open economy."³⁹ This finding is directly transferable to external conflict risk, which also involves a risk of physical asset destruction. The authors then regress the ratio of the net FDI stock to GDP on the log of per-capita GDP, the FDI restrictions index, a terrorism risk indicator, demographic variables, other risk variables (political, economic, legal, tax, operational, security)⁴⁰, governance indicators (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption)⁴¹, and indicators on credit, stability of the real exchange rate and economic growth. They find a robust, significant negative impact of terrorism risk on the net stock of FDI.

Benassy-Quere et al (2005) estimate a gravity-type model of bilateral FDI stocks held among 52 countries to determine the impact of institutions on inward FDI. The log-level of host-country FDI stock from a source country is regressed on the log of the two countries' GDP and per-capita GDP, distance, common border dummy, common language dummy, and a large number of variables capturing institutional quality drawn from many different source in the literature.⁴² The authors

³⁹ Abadie and Gardeazabal (2005), p. 9.

⁴⁰ As measured by the World Market Research Centre.

⁴¹ As measured by Kaufmann, Kraay, and Mastruzzi (2004).

⁴² Including a database developed by the French government in 2001.

control for endogeneity by estimating instrumented regressions. They find that institutional qualities typically have significant impacts of the expected sign.

Bevan and Estrin (2004) regress the level of bilateral FDI inflows from western countries to central/east European countries on levels of explanatory variables using a gravity-type model specification. They include a country creditworthiness rating to capture political risk. The coefficient on this variable was statistically insignificant, but the authors recognize the limitations of this measure in capturing political risk relevant to FDI decisions. Their results support the idea that FDI flows between these groups of countries were both market-seeking and efficiency-seeking.

Brada et al (2005) evaluate FDI inflows to transition countries during 1993-2001 by breaking transition countries into two groups, central European and former Soviet (CIS) countries. They first regress the log-level of FDI inflows for selected non-transition European countries on the log-levels of GDP in PPP\$, per-capita GDP in PPP\$, ratio of total trade flows to GDP, gross secondary enrollment rate, land area, and population of largest city. They then use this regression to determine how actual FDI inflows to central European economies compare to inflows for those countries predicted using the regression, and they find that in many cases, actual inflows were significantly above predicted inflows, suggesting that there was a “transition factor” that boosted inflows above what would be expected for a non-transition economy with similar fundamentals. They then regress the ratio of actual to predicted inflows for these central European countries on indicators capturing macroeconomic and fundamentals variables specific to transition. These two regressions are used to predict what FDI inflows to the CIS countries would have been if (a) they had been “normal (west) European countries” and (b) Central European transition countries. They compare these predictions with actual inflows to CIS countries and find that actual CIS inflows are typically significantly less than both predicted inflows. This shortfall is attributed to the additional political risk factors involved with CIS as compared to central European countries. This paper differs from Brada et al (2005) because it does not make any distinction between transition, non-transition developing, and developed countries, and it estimates the impact of political risk factors by including them on the RHS of the regression rather than estimate it as a prediction residual.

Chantasawat et al (2004) evaluate whether the large FDI inflows to China have diverted FDI flows to southeast Asian and Latin American developing countries or boosted them through production networking. They estimate panel regressions that regress the log-level of FDI on the log-level of GDP in US\$ (not clear whether PPP or com.ex. \$), three of the ICRG political risk variables (corruption, government stability, law and order), the corporate income tax rate, the average manufacturing wage, telephone mainlines per 1000 people, the illiteracy rate, the export duty rate, and total world outflows of FDI.

Hye Jee Cho (2003) evaluates the impact of labor standards on the ratio of FDI inflows to GDP and includes several of the ICRG political risk variables that he aggregates into a single indicator on country political risk. He finds that increasing political risk has a significant negative impact on FDI inflows as a % of GDP.

The table below summarizes these studies, which is only a subset of all studies done in the last ten years on FDI determinants. A range of specifications and explanatory variable sets have been used in this literature. There is apparently no consensus on the specification of the mathematical relationship between LHS and RHS variables. There is some commonality between the set of RHS variables included, as researchers have usually included a variable capturing GDP (either on the RHS or in the LHS as a denominator) and political risk variables.

C.2 The Cross-Country Military Expenditure Literature

The theory of demand for military expenditures in a rational choice setting is reviewed in Smith (1995). A popular specification for analysis of military spending using cross-country regressions in earlier decades has been the linear expenditure share specification, which results from maximization of a Stone-Geary government utility function. This is a very restrictive specification, and economic theory suggests that more flexible and plausible function forms for the utility function should be explored. We estimated a linear expenditure share specification on our cross-country data. If an outlier associated with the U.S. is excluded, results are similar to those presented in the paper, but there are clearly problems such as heteroscedasticity present. We accordingly prefer to use the specification described in section C.3 below.

	Model description	Political risk variable(s)	Other explanatory variables	Countries included	Time period
Abadie and Gardeazabal (2005)	Ratio of net FDI stock to GDP on RHS variables	Terrorism, political, economic, legal, tax, operational, security; Governance risks	Demographic, credit, stability of real exchange rate, stability of growth rate	98 country sample	2003 cross-section
Benassy-Quere et al (2005)	Log-level of bilateral FDI stocks	Very large number of variables capturing institutional quality	GDP and per-capita GDP of host and sending countries, distance, language, common border	52 countries	Pooled cross-sections, 1985-2000
Bevan and Estrin (2004)	Level of bilateral FDI inflows on levels of RHS variables; gravity-type model	Country credit rating (<i>Institutional Investor</i>)	Total GDP, interest rate differential, unit labor cost, trade openness, distance between capital cities, EU accession announcement dummy	Central/East European countries	1994-2000
Brada et al (2005)	Log-levels of FDI inflows on log-levels of RHS variables	None	Total GDP, per-capita GDP, trade-to-GDP ratio, gross secondary enrollment ratio, land area of country, population of largest city	West and Central European countries	1993-2001
Chantasawat et al (2004)	Log-levels of FDI inflows on log-levels of RHS variables	ICRG corruption, law and order, govt stability variables	Total GDP, GDP growth rate, corporate tax rate, average wage rate, telephone mainlines per 1000 people, illiteracy rate, world FDI outflow, trade-to-GDP ratio, import duty rate	China, East and Southeast Asia, Latin America	1985-2002
Hye Jee Cho (2003)	Ratio of FDI inflows to GDP on levels of RHS variables	ICRG repudiation of contracts, expropriation, corruption, law and order, and bureaucracy quality risk variables	Population, growth of per-capita GDP, black market exchange rate premium, labor standards,	63-76 countries	Average of 1982-89 values

C.3 The Issue of Specification Choice

Assume that we are trying to identify the determinants of variable Z , which could be military spending or foreign direct investment stocks. One of the two common specifications used in the cross-country regression literature is to make the ratio of Z to GDP a function of explanatory variables:

$$(C1) \quad \frac{Z}{GDP} = \alpha + B * X + \varepsilon,$$

where X is a vector of explanatory variables, B is a coefficient vector, and ε is a random error term. The other common specification of the literature is to regress the natural log of Z on the natural log of GDP and a linear combination of explanatory variables:

$$(C2) \quad \ln(Z) = \alpha + \beta * \ln(GDP) + B * X + \varepsilon$$

It is useful to manipulate equation (C2) in order to see more clearly the essential mathematical difference between the specifications (C1) and (C2). Equation (C2) can be expressed as:

$$(C3) \quad e^{\ln(Z)} = e^{\alpha + \beta * \ln(GDP) + B * X + \varepsilon},$$

or

$$(C4) \quad Z = GDP^{\beta} e^{\alpha + B * X + \varepsilon},$$

or

$$(C5) \quad \frac{Z}{GDP} = GDP^{\beta-1} e^{\alpha + B * X + \varepsilon}.$$

If we assume that $\beta = 1$, then

$$(C6) \quad \frac{Z}{GDP} = e^{\alpha + B * X + \varepsilon},$$

or

$$(C7) \quad \ln\left(\frac{Z}{GDP}\right) = \alpha + B * X + \varepsilon.$$

Comparison of (C1) and (C7) is instructive. In (C1), the ratio of Z to GDP is a linear function of explanatory variables, whereas in (C7), the log of the ratio of Z to GDP is a linear function of explanatory variables. (And this requires the assumption that β equals unity.)

The issue of which of these two commonly-used competing specifications should be used is thus essentially a question about what is a more appropriate specification of the left-hand-side variable: Z/GDP , or $\ln(Z/GDP)$? Ideally, this question would be settled by appealing to economic theory. A theoretical model based on optimal choice under constraints would provide a structural model that could be solved to give reduced-form specifications that relate variables such as military spending and direct foreign investment to GDP and other explanatory variables. We do not know of such models in the literature that could provide a guide as to whether (C1), (C2), or some other functional form is most appropriate.⁴³

In the absence of proper theoretical models that can help resolve this issue, we make our decision on preferred specification for this study on purely empirical grounds. Histograms of FDI/GDP and $\ln(FDI/GDP)$ in 2003 for 155 countries of the world are given in figures C.1 and C.2 respectively. Figure C.1 shows that FDI/GDP is distributed highly non-normally, with a few large outliers. Figure C.2 has a much more normal distribution, and the impact of outliers is greatly reduced.⁴⁴ Given this, and the fact that specification (C2) has often been used in the literature, we prefer it over specification (C1). We estimate equation (C2) rather than (C7) because it is restrictive to assume that $\beta=1$, and results of the regressions confirm that in all cases, β is significantly different from unity.

⁴³ A theoretical model of the determination of national income in which optimal levels of labor and capital inputs are determined through rational choice is the canonical Ramsey-Cass model of macroeconomics. In this model, GDP is determined by a set of inputs including the physical capital stock, K . The stock of inward FDI is one component of K . If domestic investors are treated as equivalent to foreign investors in terms of their access to international capital markets, investment opportunities and information, then the Ramsey-Cass model could serve as the theoretical basis for specification choice. If there are systematic differences between domestic investors and international investors, then the theoretical model should take that into account. It should be possible to modify the Ramsey-Cass model to introduce two investor classes.

⁴⁴ It should be noted that the Jarque-Bera test for normality rejects that $\ln(FDI/GDP)$ is distributed normally at the 1% level.

Figure C.1. Histogram of (FDI Inward Stock/GDP)

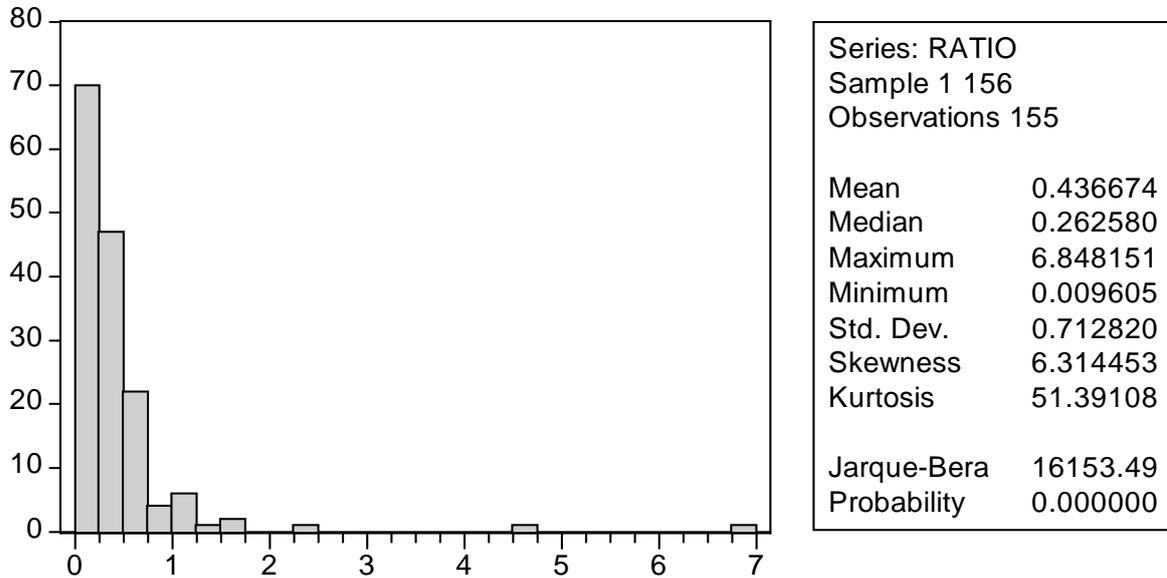
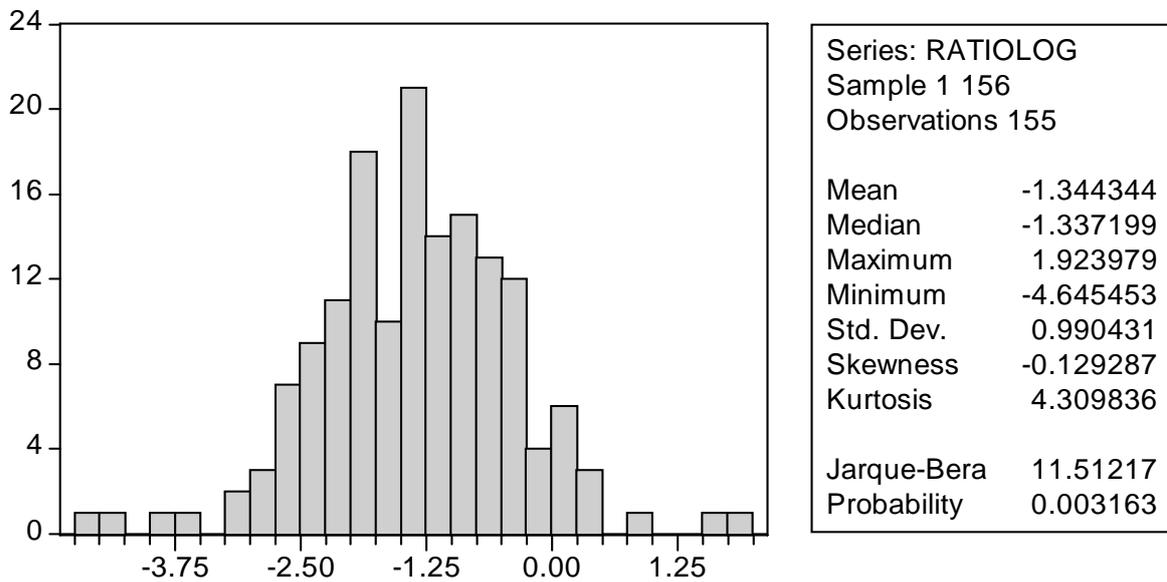


Figure C.2. Histogram of ln(FDI Inward Stock/GDP)



C.4 Endogeneity Issues

Another important issue is endogeneity. Consider equation C2:

$$(C2) \quad \ln(Z) = \alpha + \beta * \ln(GDP) + B * X + \varepsilon$$

The variable Z is modeled as being caused by GDP and the variables in X . However, GDP and some or all of the X variables will also be caused by Z . This introduces the well-known simultaneity problem, and estimating (C2) without addressing this issue results in biased coefficient estimates. The simultaneity problem is usually addressed by finding instrumental variables, or instruments. The cross-country regression literature began to focus on finding instruments intensively in the last seven years, but it has proven difficult to find satisfactory instruments.

Endogeneity issues are present with respect to both military spending and FDI. The level of GDP might be impacted by the level of military spending. There has been a lively debate in the economics literature on what the sign of this impact is. Some argue that military spending crowds out investment and reduces the level of GDP. Others argue that military spending can produce a variety of spillovers that increase GDP, and/or that increased national security enhances activities that produce income. In the absence of a theoretical model of the determinants of military spending, it is not clear what instruments might be used.

The influence of FDI on GDP is more straightforward than in the case of military spending. FDI is a component of the stock of physical capital and thus directly impacts a determinant of national income. It has also been argued that FDI has special impacts in developing countries, such as boosting productivity in domestic business operations, that would further increase GDP.

There are also potentially other endogeneity issues between the dependent and explanatory variables. For example, the level of external conflict risk might be influenced by the level of a country's military spending. A nation with a high level of military spending might be perceived as threatening by its neighbors and might be rated as more risky. A nation with a low level of military spending surrounded by neighbors with high levels of spending might be perceived as a vulnerable target and might be rated as more risky. These arguments assume that intentions are a function of capabilities. Whether this assumption is valid or not is an open question.

Addressing these endogeneity issues is beyond the scope of this paper. We have not been able to find studies in the literature that establishes an estimation framework based on economic theory ("first principles") that identifies functional forms and instruments. This is a task for future research.

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