Violent Conflict and Foreign Direct Investment in Developing Economies: A Panel Data Analysis

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Abstract

This paper examines the relationship between violent conflict and flows of foreign direct investment (FDI), using data from 22 countries in conflict-prone regions, between the years of 1991 and 2003. Conflict in general is shown to have a negative effect on FDI per capita. Civil conflict reduces FDI per capita, whereas the effect of external conflict positively affects FDI per capita. This paper also finds evidence that conflicts continue to affect FDI flows several years into the future, and while a "peace dividend" is possible five years after a civil conflict, no such effect is indicated for external conflicts.

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1. Introduction

Foreign direct investment (FDI) is often thought of as an engine for growth in developing economies. As Borensztein et al. (1998) explain, foreign direct investment is an important vehicle for the transfer of technology from richer countries to poorer ones, and as such, can generate more economic growth than domestic investment in capital-scarce countries. However, a number of developing countries, particularly in sub-Saharan Africa, are faced with civil and international conflicts. Civil conflict in particular has been shown to dramatically reduce growth by discouraging investment, and by causing the flight of financial, physical and human capital to safer havens (Collier, 1999), (Fielding, 2004). The resulting state of poverty is often difficult to exit. As Collier and Hoeffler (1998) explain, low initial income substantially increases the likelihood of civil war. This perpetuates a conflict trap, wherein countries embroiled in civil war lack the resources to improve the conditions that originally led to conflict. As such, it is important to understand the role of violent conflict in determining the location and scale of foreign direct investment. A deeper understanding of this relationship may illuminate tools to fight poverty and eliminate existing cycles of conflict and destitution.

This paper examines the relationship between violent conflict and foreign direct investment. Although there are several known determinants of foreign direct investment, there is much disagreement as to how to measure such concepts as political risk and instability. In this study, I use two separate measures of civil and international conflict, across a number of countries with a recent history of violent conflict. In less stable countries, any evaluation of political risk by potential investors will likely be dominated by the presence of civil or international conflict, so these measures of violent conflict are adopted as assessments of political risk. Comparing results from different measures allows us to better gauge the effect of civil and international conflicts on flows of foreign direct investment across countries and across time.

This paper contributes to the literature on foreign direct investment by focusing exclusively on the relationship between conflict (a key aspect of political risk) and FDI. Additionally, this paper contributes to a recent and growing body of work concerning the interaction between violent conflict and economic outcomes by comparing measures of conflict and considering the effects of past conflicts on present day FDI.

The paper is organized as follows. Section two will discuss the basic theory and some notable empirical studies on foreign direct investment. Additionally, section two includes a discussion of empirical studies of violent conflict. Section three builds a conceptual model of the determinants of FDI in developing countries, including violent conflict. Section four discusses the ideal data for this model, and section five discusses the actual data used in this study. Section six presents empirical models and results, and finally, section seven concludes and provides recommendations for further research.

2. Literature Review

2.1 – Theoretic Background

As explained by Yarborough and Yarborough (2003), firms locate their foreign direct investments where they have the highest potential for profit and least risk. The basic theory underlying foreign direct investment is expanded in a paper by Schneider and Frey (1985), who emphasize the need for a model that incorporates both economic and political determinants. High levels of income per capita demonstrate large market size in the host country, a predictor of profitability. High levels of economic growth signal growth potential in the host economy, which leads to higher future profits, and a skilled workforce in the host country contributes to a high return on capital investment, and is an important factor for firms making investment location decisions.

Economic risk is represented by measures such as balance of payments deficit and inflation rates. Schneider and Frey represent political risk with measures of multilateral and bilateral aid, which can be used to generate a good investment climate or to influence a country's political landscape. Finally, according to Schneider and Frey, high levels of political instability make a host country less attractive to foreign investors, as uncertainty about future events makes investment more risky.

In developing economies with a history of conflict, evaluations of political risk will likely be dominated by any existing conflict. Collier (1999) theorizes that civil war causes the flight of productive resources (financial, physical and human capital) to other, safer nations. In the context of direct foreign investment, civil conflict is a deterrent to the risk-averse foreign investor. However, Collier's theory does not examine the economic effects of external conflicts, though he suggests that "the breakdown of social order and the absence of a clear front line are more common to civil war than to international war" (Collier, 1999. pp. 169), and that these disruptions imply higher economic costs. Lastly, Collier suggests that sufficiently long civil wars are followed by re-adjustment of the capital stock to pre-war levels, resulting in a "peace dividend," seen in the form of economic growth or increased investment.

2.2 – Previous Empirical Research

This section outlines previous research that has considered the role of violent conflict in economic outcomes, and discusses the two strands of empirical literature on foreign direct investment: that which examines the decisions of firms to invest internationally, and that which examines the location and volume of FDI.

A number of empirical studies examine the role of violent conflict in the location of investments[1]. Fielding (2004) considers the role of civil conflict in Israel on the flight of financial capital. Measuring conflict intensity as the number of fatalities from conflict per quarter, he finds strong evidence that increased conflict intensity significantly increases the flight of capital. Knight et al (1996) examine the role of military spending on economic growth. One particular element of his paper is of interest to this study: the ratio of months at war to months of peace has a negative impact on investment as a share of GDP. Finally, as explained previously, Collier (1999) hypothesizes that civil war will cause the flight of productive resources. Representing civil war with months of war in a given decade, months of potential recovery from war in a given decade, and the length in months of any previous war, he finds that civil war negatively affects GDP per capita. In all, there seems to be little agreement as to how to best measure violent conflict, and the literature on violent conflict and economic outcomes focuses almost exclusively on civil conflict. However, civil conflict clearly discourages investments of various types.

Several notable studies have examined the decisions of firms to participate in foreign direct investment. Grubaugh (1987) uses a logit model, and finds that firms expand internationally for competitive advantage, by expanding their production of

[1] Generally, these studies focus on more liquid forms of capital, such as portfolio investment. As such, their findings may not be representative of conflict's effects on foreign direct investment.

intangible assets[2]. Kinoshita (1998) explores the behavior of Japanese firms investing in other Asian countries. Using ordinary least squares with a dependent variable that assumes the value "1" if a firm as invested internationally in the last 5 years, and a "0" otherwise, Kinoshita finds evidence that large firms invest when their target country has a large market size, whereas small firms prefer countries with low labor costs.

Several recent studies have explored the determinants of volume and location of direct foreign investment, through panel data analysis. Jun and Singh (1995) examine three hypothesized determinants of FDI in thirty one developing countries between 1970 and 1993, finding that political risk and sociopolitical instability (measured as the number of work-hours lost during periods of social upheaval) have a significant effect on foreign direct investment, controlling for market size, economic growth and time effects. Further, Jun and Singh found evidence that export orientation is a strong predictor of foreign direct investment.

Other studies take a regional focus. For example, Cheng and Kwan (2000) examine the determinants of foreign direct investment in twenty nine Chinese regions between 1985 and 1995. They find that large market size, developed transportation infrastructure, low wages and preferential economic policies contribute to higher levels of foreign direct investment. Cheng and Kwan exploit one advantage of working regionally: they include area-specific variables, such as the number of special economic zones, the number of open coastal cities/areas, and technological development zones.

Asidu (2002) examines the determinants of foreign direct investment between 1988 and 1997 in seventy one developing countries, thirty two of which are located in

[2] Research and development, intellectual property and advertising services are examples. These goods cannot be purchased in a marketplace, and thus must be produced by the firm at the lowest cost.

Sub-Saharan Africa. She finds that trade openness, infrastructure development, and return to capital have significant effects on the ratio of FDI to GDP. She includes a dummy variable for Sub-Saharan Africa, and shows that Sub-Saharan African nations attract less foreign direct investment than other developing countries, after controlling for political instability and the above variables.

Previous literature has established several methods of examining foreign direct investment. Studies on firm behavior have shown that competition with rivals, low-cost production of intangible assets and the potential for profitability motivate firms to invest internationally. However, once a firm chooses to engage in foreign direct investment, they must make a decision as to how much to invest and where. Broader studies used panel data analysis to show that firms prefer countries with a sizable market for their product and growth potential, countries with favorable policies and economic climates for business, and countries with low levels of political risk and instability. According to some, violent conflicts cause the flight of productive resources, potentially including foreign direct investment. However, there is little consensus on how to best measure conflict empirically. Caveats aside, the literature on the effects of violent conflict has shown that instability and conflict reduce the attractiveness of a nation to investors.

The literature discussed in this section is summarized in table 1.

TABLE 1. Summary of Empirical Research, grouped by approach.

Article	Year Published	Dependent Variable	Measure of Political Instability/Violent Conflict	Important Findings & Notes
Location and Volume Literature				
Schneider and Frey	1985	Net FDI per capita	Political instability index, based on number of political strikes and riots	Political instability negative and significant in all 3 regressions
Jun, Singh	1995	FDI relative to real GDP	Political Risk Index (higher=more stable)	Political risk positive (correct sign) and significant.
Cheng, Kwan	2000	Stock of FDI	None	Regional policies, infrastructure, market size are significant
Asidu	2002	Ratio of net FDI flows to GDP	Average number of assassinations and revolutions	Political instability negative, insignificant, Africa dummy significant
Firm Decision Literature				
Grubaugh	1987	1 if operations multinational	None	Competition, production of intangible assets significant
Kinoshita	1998	1 if invested abroad in last 5 years	None	Large firms like large market for products, small firms like low labor costs.
Literature on Violent Conflict and Economic Outcomes				
Knight et al	1996	Investment as share of GDP	Ratio of months of war to months of peace	War coefficient negative.
Collier	1999	GDP per capita	Months of war, months of recovery, length of previous war	War negative and significant, evidence for peace dividend after long wars. Also evidence that war harms capital-reliant industries most.
Fielding	2004	Share of Israeli wealth held abroad	Number of fatalities per quarter, number of closings of Gaza border per quarter	More fatalities result in more wealth held abroad.

3. Conceptual Model

This paper uses a model which addresses the findings of previous literature on foreign direct investment, and applies the findings of literature on the economic ramifications of violent conflict. In this conceptual model, foreign direct investment inflows are considered a function of violent conflict (a form of political risk), as well as of market size, trade openness, and economic risk[3].

$$\mathbf{FDI_{it} = f(Violent\ Conflict_{it},\ Market\ Size_{it},\ Trade\ Openness_{it},\ Economic\ Stability_{it})}$$

The control variables included are explained by the basic theory of foreign direct investment and suggested in the empirical literature. Market size and trade openness are indicators of profitability, so firms are most likely to locate where there is a substantial domestic market for their product, and where trade accounts for a large portion of national income. Economic stability is likely to attract foreign investors, as less uncertainty about future profitability will attract firms looking to make long-term investments. In countries with a recent history of violent conflict, any evaluation of political risk is likely to be dominated by the presence of a conflict. Civil conflict has been shown in the literature to cause the flight of productive resources and financial capital to safer havens, as country instability indicates a degree of uncertainty about future profitability, whereas the effect of external conflict is ambiguous.

[3] Wage costs are not included in this model, because, as Jun and Singh (1996, p. 75) explain, there is little agreement on the effect of low wages on the volume and location of foreign direct investment. Rather, wage costs explain the decision of individual firms to participate in foreign direct investment, as suggested in Kinoshita (1998).

4. Ideal Data

Measuring violent conflict is the main problem in examining the relationship between violent conflict and foreign direct investment. A measure of violent conflict should confer information about the magnitude and type of each conflict. Ideal data would include the number of deaths resulting from violent conflict in a country per amount of time, and would differentiate among types of conflict (civilian unrest, civil war, civil conflict with international involvement and international conflict are appropriate breakdowns).

Ideal measures of foreign direct investment would include all flows of foreign investments that grant control and operating ownership of assets (or liabilities) purchased or created in the host country. Such a measure would accurately describe the net flows of direct investment into a host country.

As for the control variables, market size would be ideally measured by the level of income in a country, indicating the purchasing power of the average citizen and the size of the economy. Trade openness would be best measured as the total volume of trade (both imports and exports) adjusted for the size of the economy. An ideal measure of economic risk would incorporate a number of aspects of a nation's economic environment, including levels of inflation, current and capital account balances, reserve position, and government budget surplus/deficit.

5. Actual Data

The panel data set used by this paper includes observations from 22 developing countries between the years of 1991 and 2003. Countries are distributed across Africa, Asia and the Middle East, and Central and South America, where the majority of the world's recent conflicts have occurred. The countries used are listed in the appendix of this paper.

Unfortunately, there is little freely available data on violent conflicts. As a consequence of this limitation, this paper uses three measures of violent conflict. The first is a dummy variable that takes a value of one when a conflict has claimed over 1000 lives in a given year and country. The second involves one dummy variable that takes a value of one if the conflict is completely internal, and another which is equal to one when the conflict involves an external actor[4]. These dummy variables are constructed from the data on armed conflict given in Gleditsch et al. (2002, updated 2005).

A third measure of conflict is International Country Risk Guide (ICRG) civil war risk and external conflict measures. In raw form, both these measures range from 0 (large-scale war) to 100 (no war), with intermediate values representing degrees of pressure, unrest, and minor conflict. For the purposes of this paper, I have multiplied these measures by -1, so that they range from -100 (no war) to 0 (war prevalent). Data on the ICRG civil war risk and external conflict measures was obtained though a World Bank dataset on foreign direct investment[5].

This paper measures foreign direct investment as the natural logarithm[6] of net foreign direct investment inflows (as measured in balance of payments data) per capita.

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[4] Unfortunately there were only three instances of external conflicts with over 1000 casualties, Angola in 1999, 2000 and 2001, leading this dummy variable to be a biased measure of external conflict.

[5] Data from World Bank Website, *A New Database on Foreign Direct Investment*. Unfortunately, this data was only available for 18 of the 22 countries in my sample, from 1985 to 1997. This results in a large difference in sample size between estimations using each measure.

[6] The natural logarithm compresses differences between observations at the high end of the scale, and expands them at the low end, making the FDI/Capita data more normally distributed and regression residuals more random. Unfortunately the log drops observations where FDI per capita is zero or negative, creating gaps in the data. See appendix for a comparison of logged and non- logged variables.

Data on FDI inflows were obtained from the International Monetary Fund's CD-ROM, *International Financial Statistics*. Data on FDI inflows[7] and population were obtained through the World Bank's *World Development Indicators*.

Market size is measured as the natural logarithm[8] of GDP per capita. Trade openness is represented by imports plus exports as a percentage of GDP. Economic risk is measured by total reserves as a percentage of total imports. Data on GDP per capita and trade as a percentage of GDP were obtained through the *World Development Indicators*. Data on total reserves was obtained from the *International Financial Statistics* CD-ROM, and total imports were obtained from the *World Development Indicators*.

6. Empirical Models and Results

6.1 Three Measures of Violent Conflict

Based on the conceptual model and actual data used in this study, I construct three models. One uses a simple dummy variable to represent all conflicts with over 1000 casualties in a given country and year. A second uses dummy variables for civil and external conflicts with over 1000 casualties in a given country and year. The third incorporates the International Country Risk Guide indices of civil and external conflict. All three models are estimated using ordinary least squares (a pooled model), random effects (accounting for heterogeneity across countries and across time), and fixed effects (accounting for heterogeneity across countries) estimations.

[7] FDI data (IFS CD-ROM, September 2005) were supplemented with FDI data from *World Development Indicators*, as neither source had complete series for all countries in this dataset.

[8] As with FDI/Capita data, the natural log compresses differences at the high end of the data, and expands differences at the low end, distributing the data more normally. Further, with a logged dependent variable GDP/Capita coefficient estimates can be interpreted as elasticities.

Regressions 1, 2 & 3: Simple Conflict Dummy Variable

$$\text{Log(FDI/Cap)}_{it} = \beta_0 + \beta_1\text{Log(GDP/Cap)}_{it} + \beta_2\text{OPENNESS}_{it} + \beta_3\text{RESERVES}_{it} + \beta_4\text{CONFLICT}_{it}$$

Log(FDI/Cap)_{it} is the natural log of foreign direct investment per capita in country i and year t. Log(GDP/Cap)_{it} is the natural log of GDP per capita in country i and year t. OPENNESS_{it} is imports plus exports as a percentage of GDP in country i and year t. RESERVES_{it} is total reserves as a percentage of total imports in country i and year t. CONFLICT_{it} is a dummy variable representing all conflicts with over 1000 casualties in country i and time t.

As suggested by conceptual model developed in section three, the expected sign on β_4 is negative. The presence of a major conflict will reduce foreign direct investment flows per capita. The expected signs on β_1, β_2, and β_3 are positive. Results from pooled, random effects and fixed effects estimations are presented in table 2.

The results of the pooled and random effects estimations are generally aligned with theory. The conflict dummy has a negative effect, but is not statistically significant. The presence of a conflict with over 1000 casualties will, on average, reduce foreign direct investment flows per capita to a country by approximately 33.2%[9] in the pooled model, and by 3.9% in the random effects model.

Under fixed effects, the coefficient on the conflict dummy variable is positive, where according to theory it should be negative, implying that the presence of a conflict actually *increases* foreign direct investment per person by 8.9% on average. However, a

[9] This percentage and all percentage figures associated with dummy variables in this paper are calculated using the method for interpreting dummy variables in equations with logged dependent variables, explained in Halvorsen and Palmquist (1980), where $g^* = \text{Exp}[\beta] - 1$, g^* being percentage change in the FDI flows per capita, and β being the coefficient estimate. See appendix for calculations.

Hausman test between the fixed and random effects models indicates that this model is best explained by the random effects estimation, which indicates a negative relationship between conflict and foreign direct investment per capita. Further, using a dummy variable that indicates the presence of any conflict with over 1000 conflicts has several drawbacks, most notably a lack of differentiation among types of conflict and indication of severity of conflict. These results show, however, that on a very general level, the presence of a major conflict reduces foreign direct investment.

TABLE 2. Simple Conflict Dummy Models. Dependent Variable: Natural Logartithm of Flows of Foreign Direct Investment per Capita.

	Coefficients (T-Statistic, Z-Statistic for Random Effects)		
Variable	**(1) Pooled**	**(2) Random Effects**	**(3) Fixed Effects**
Log of GDP per Capita	1.310056** (15.78)	1.500471** (z = 6.98)	3.212811** (4.67)
Trade as % of GDP	0.025765** (7.50)	0.027743** (z = 5.41)	0.0258293** (4.30)
Reserves as % of Imports	0.0043834 (1.23)	0.006228 (z = 1.77)	0.0048568 (1.30)
Conflict Dummy	-0.4038287 (-1.89)	-0.0398347 (z = -0.20)	0.0854676 (0.41)
Constant	-8.047962** (-14.90)	-9.601518** (z = -6.97)	-20.49336** (-4.69)
Observations	261	261	261
Countries	22	22	22
Years	1991-2003°	1991-2003°	1991-2003°
Adjusted R^2	0.599	-	-
R^2 Overall	-	0.600	0.570
Hausman Test Results: Do not reject null hypothesis of no fixed effects at 5% level†			

** Indicates statistical significance at 1% level, * Indicates significance at 5% level.

† See appendix. Hausman test is significant at 6.75% level. This paper considers the result at the 5% level.

° With some gaps, created when logging variables.

Regressions 4, 5 & 6: Civil and External Conflict Dummy Variables

$$\text{Log(FDI/Cap)}_{it} = \beta_0 + \beta_1\text{Log(GDP/Cap)}_{it} + \beta_2\text{OPENNESS}_{it} + \beta_3\text{RESERVES}_{it} + \beta_4\text{CIVIL}_{it} + \beta_5\text{EXTERNAL}_{it}$$

CIVIL_{it} is a dummy variable which indicates the presence of a civil (internal) conflict resulting in more than 1000 casualties in year t and country i. EXTERNAL_{it} is a dummy variable which indicates the presence of a conflict involving a foreign actor resulting in over 1000 casualties in a given country and year. As above, a negative sign is expected on β_4. However, the effects of external conflicts on FDI are ambiguous, so the expected sign of the coefficient β_5 is uncertain. As in regressions 1 – 3, β_1, β_2, and β_3 are expected to be positive. The results of pooled, random effects and fixed effects estimations of this model are reported in table 3.

The results of the pooled and random effects estimations are aligned with theory. The coefficient on civil conflict is negative in both cases, and significant in the pooled estimation. The presence of a civil conflict with over 1000 casualties decreases foreign direct investment flows per capita by 35.1% on average in the pooled estimation, and by 4.5% on average in the random effects estimation. In these regressions, external conflict has a positive coefficient, but is not statistically significant in any instance. Specifically, external conflict increases average FDI flows per person by 24.7% in the pooled estimation, and by 13.4% in the random effects estimation. A note of caution about this model: the dummy variable for external conflict only represents three instances of external conflict, as footnoted in the section five. Angola received external intervention in conflicts in 1999, 2000 and 2001, while attracting significant amounts of foreign direct investment. As a result, this measure is only representative of a single country.

The fixed effects regression estimates the wrong sign for civil conflict, predicting that civil conflict will actually increase foreign direct investment flows per capita by 8.3%. In this estimation, the presence of an external conflict will result in an increase in FDI flows per capita of 19.9%. A Hausman test between the fixed and random effects regressions indicates that this model is best explained by a random effects model, and as such, the random effects estimator is more efficient. These estimations have shown that while civil conflict continues to have a negative effect on FDI per capita, external conflict has substantially increased foreign direct investment.

TABLE 3. Civil and External Conflict Dummy Models. Dependent Variable: Log of Foreign Direct Investment per Capita.

	Coefficients (T-Statistic, Z-Statistic for Random Effects)		
Variable	**(4) Pooled**	**(5) Random Effects**	**(6) Fixed Effects**
Log of GDP per Capita	1.315165**	1.508805**	3.213136**
	(15.76)	(z = 6.88)	(4.66)
Trade as % of GDP	0.0248201**	0.0274309**	0.0256202**
	(6.69)	(z = 5.13)	(4.13)
Reserves as % of Imports	0.0042145	0.0061747	0.0048164
	(1.18)	(z = 1.74)	(1.28)
Civil Conflict Dummy	-0.4324213*	-0.046398	0.0800497
	(-1.98)	(z = -0.23)	(0.38)
External Conflict Dummy‡	0.2211564	0.1264793	0.1819471
	(0.24)	(z = 0.17)	(0.25)
Constant	-8.02128**	-9.63581**	-20.48188**
	(-14.79)	(z = -6.86)	(-4.68)
Observations	261	261	261
Countries	22	22	22
Years	1991-2003°	1991-2003°	1991-2003°
Adjusted R^2	0.598	-	-
R^2 Overall	-	0.600	0.571
Hausman Test Results: Do not reject null hypothesis of no fixed effects at 5% level†			

** Indicates statistical significance at 1% level, * Indicates significance at 5% level.
† See appendix. Hausman test is significant at 15.6% level. This paper considers the result at the 5% level.
‡ External conflict dummy represents only 3 years of conflict in Angola.
° With some gaps, created when logging variables.

Regressions 7, 8 & 9: ICRG Civil and External Conflict Indices

$$\text{Log(FDI/Cap)}_{it} = \beta_0 + \beta_1\text{Log(GDP/Cap)}_{it} + \beta_2\text{OPENNESS}_{it} + \beta_3\text{RESERVES}_{it} + \beta_4\text{ICRG\_CIVIL}_{it} + \beta_5\text{ICRG\_EXTERNAL}_{it}$$

This model incorporates a more responsive measure of conflict. ICRG_CIVIL_{it} represents the ICRG civil conflict index in year t and country i. $\text{ICRG\_EXTERNAL}_{it}$ represents the ICRG external conflict index in year t and country i. As explained in section five, the indices are modified so that a lower value represents less severe conflict, and a higher value represents more severe conflict. Basic theory on violent conflict and investment suggests a negative expected sign on β_4, while the expected sign of β_5 is uncertain. As in previous models, β_1, β_2, and β_3 are expected to be positive. Table 4 shows results of pooled, random effects and fixed effects estimations.

The results of all three estimations are generally aligned with theory. In all three regressions, a rise in the ICRG civil conflict index (indicating more severe conflict) generates a statistically significant fall in foreign direct investment per capita. In the pooled model, a unit increase in the index generates, on average, a 1.05% decrease in foreign direct investment per capita. On average, a unit increase in the measure creates a 1.90% decrease in FDI per capita in the random effects estimation, and a 1.65% decrease in FDI per capita in the fixed effects model.

For the ICRG external conflict index, a one unit increase causes a 0.74% increase, 0.96% increase and 0.70% increase in foreign direct investment per capita, in the pooled, random effects and fixed effects regressions, respectively, and none of these coefficient estimates are statistically significant. However, these results suggest that external conflict actually increases flows of foreign direct investment per capita to a country. Lastly, a

Hausman test indicates that this model is best explained by a fixed effects estimator, accounting for heterogeneity among nations.

TABLE 4. ICRG Civil and External Conflict Indices. Dependent Variable: Log of Foreign Direct Investment per Capita.

Variable	Coefficients (T-Statistic, Z-Statistic for Random Effects) (7) Pooled	(8) Random Effects	(9) Fixed Effects
Log of GDP per Capita	1.301535** (11.06)	1.36583** (z = 5.38)	3.382806** (2.52)
Trade as % of GDP	0.0334204** (7.35)	0.0137426** (z = 2.34)	0.0069386 (0.97)
Reserves as % of Imports	0.0211021** (3.43)	0.008628 (z = 1.42)	0.0064683 (1.01)
ICRG Civil Conflict Index	-0.010473* (-1.94)	-0.0189587** (z = -3.83)	-.0164522** (-2.61)
ICRG External Conflict Index	0.0074481 (0.88)	0.0095924 (z = 1.50)	.0069833 (1.05)
Constant	-9.330007** (-9.95)	-8.690882** (z = -4.99)	-21.63613** (-2.42)
Observations	115	115	115
Countries	18	18	18
Years	1991-1997°	1991-1997°	1991-1997°
Adjusted R^2	0.678	-	-
R^2 Overall	-	0.627	0.565
Hausman Test Results: Reject null hypothesis of no fixed effects at 5% level†			

** Indicates statistical significance at 1% level, * Indicates significance at 5% level.
† See appendix. Hausman test is significant at 2.5% level. This paper considers the result at the 5% level.
° With some gaps, created when logging variables.

A Note on Residuals

In all nine models presented in this section, Bolivia, Mozambique and Peru consistently produce the noticeably high residuals, indicating that my models have underpredicted foreign direct investment flows for these countries. Bolivia and Mozambique have very low GDP per capita, but relatively high foreign direct investment. Although Mozambique experienced major civil conflicts in the early 1990’s, they have made a substantial economic recovery, attracting significant foreign direct investment and greatly increasing income per capita. Similarly, Peru experienced a period of civil conflict near the beginning of this sample, and since, has received large flows of foreign direct investment and increased GDP per capita. These countries deserve additional attention to determine how they have attracted foreign direct investment in the shadow of war and poverty.

6.2 Legacy of War and Peace Dividends

This section undertakes an analysis of the legacy of civil and external conflicts, and the existence of a peace dividend. As explained in the basic theory of violent conflict, sufficiently long civil wars are sometimes followed by a "peace dividend," in which a country's capital stock readjusts to pre-war levels, causing a period of increased investment and growth. However, it is quite possible that investors remain weary of war-torn countries for several years after the end of a war, and until perceptions change, they will invest elsewhere.

To analyze these issues, I use what seems to be the best model of the nine presented in the previous section. The model using the ICRG indices incorporates levels of conflict severity, whereas dummy variables for major conflicts do not, and this model was shown to be best represented by a fixed effects estimator, indicating the presence of unobserved differences between countries. To examine the legacy and peace dividend effects of conflict, I have constructed lagged versions of the ICRG indices. In the first lag, FDI per capita in 1991 – 1997 is explained by ICRG data from 1990 – 1996. In the sixth (and last) lag, FDI per capita in 1991 – 1997 is explained by ICRG data from 1985 – 1991. In this fashion, I estimate the effects of past conflicts on present day foreign direct investment, through six lagged periods, while maintaining a consistent sample size and number of years examined.

Regressions to Examine Legacy and Peace Dividends in Civil Conflict:

$$\text{Log(FDI/Cap)}_{it} = \beta_0 + \beta_1\text{Log(GDP/Cap)}_{it} + \beta_2\text{OPENNESS}_{it} + \beta_3\text{RESERVES}_{it} + \beta_4\text{ICRG\_CIVIL}_{i(t-[0\text{ to }6])} + \beta_5\text{ICRG\_EXTERNAL}_{it}$$

All variables are defined in section 6.1. The first regression of seven is equivalent to regression 9, with no lag. In the second, ICRG_CIVIL_{it} is lagged by one period. In the third through seventh, ICRG_CIVIL_{it} is lagged by two through six periods, respectively. In all regressions, control variables are not lagged and represent present-day values. Coefficient estimates for β_4 are presented in table 5, and illustrated in figure 1.

Regressions to Examine Legacy and Peace Dividends in External Conflict:

$$\text{Log(FDI/Cap)}_{it} = \beta_0 + \beta_1\text{Log(GDP/Cap)}_{it} + \beta_2\text{OPENNESS}_{it} + \beta_3\text{RESERVES}_{it} + \beta_4\text{ICRG\_CIVIL}_{it} + \beta_5\text{ICRG\_EXTERNAL}_{i(t-[0\text{ to }6])}$$

All variables are defined in section 6.1. As above, seven regressions are run. The first is equivalent to regression 9, containing no lags. In the second through seventh, $\text{ICRG\_EXTERNAL}_{it}$ is lagged by one through six periods, respectively. All other variables remain fixed. Coefficient estimates for β_5 are presented in table 5 and figure 2.

As indicated in table five, civil conflicts are followed by a significant period of suppressed investment. However, after four years the coefficient estimate rises, indicating the possibility of a peace dividend. In fact, a one unit increase in the ICRG civil conflict measure actually increases FDI per capita by approximately 0.46% five years later. Figure one illustrates this pattern. It is clear from this graph that civil conflict negatively affects foreign direct investment for around a four year period. After this countries may experience a peace dividend, although the uncertainty of this effect is relatively high (due to increased standard errors).

Although present-day external conflict has a positive effect on foreign direct investment per capita, table 5 shows that the legacy of external conflicts may adversely affect foreign direct investment per capita for a number of years. FDI flows per capita decrease by 0.72%, 0.75% and 0.56%, for a one unit increase in the ICRG measure of external conflict two, three and four years previous, respectively. Figure 2 illustrates this phenomenon graphically. Although the effect of a current external conflict on foreign direct investment flows is positive, foreign conflicts in the recent past actually decrease FDI flows in the present. Further, the existence of peace dividends following external conflicts is uncertain, given increasing standard error.

TABLE 5. Coefficient Estimates for Lagged Variables[†]. Dependent Variable: Log of Foreign Direct Investment per capita.

	ICRG Civil Conflict Index		**ICRG External Conflict Index**	
Years Lagged	**Coefficient (T-Statistic)**	**Standard Error**	**Coefficient (T-Statistic)**	**Standard Error**
0	-0.0164522** (-2.61)	0.0063111	0.0069833 (1.05)	0.0066475
-1	-0.0104211** (-2.14)	0.0048771	-0.0051001 (-0.87)	0.0058809
-2	-0.0078068* (-1.72)	0.0045461	-0.0071965 (-1.40)	0.0051437
-3	-0.0114235** (-2.38)	0.00479	-0.0074908 (-1.51)	0.0049623
-4	-0.0061507 (-1.08)	0.0056703	-0.0056149 (-1.03)	0.0054735
-5	0.0046297 (0.57)	0.0081859	0.0022359 (0.33)	0.0067059
-6	0.0042046 (0.33)	0.0127746	0.0001555 (0.01)	0.0104219

** Indicates statistical significance at 1% level, * Indicates significance at 5% level.
[†] Other coefficient estimates not reported. See appendix for regression output for all 12 regressions.

FIGURE 1. ICRG Civil Conflict Index Coefficient Estimations:
Elasticities plus and minus one standard error.

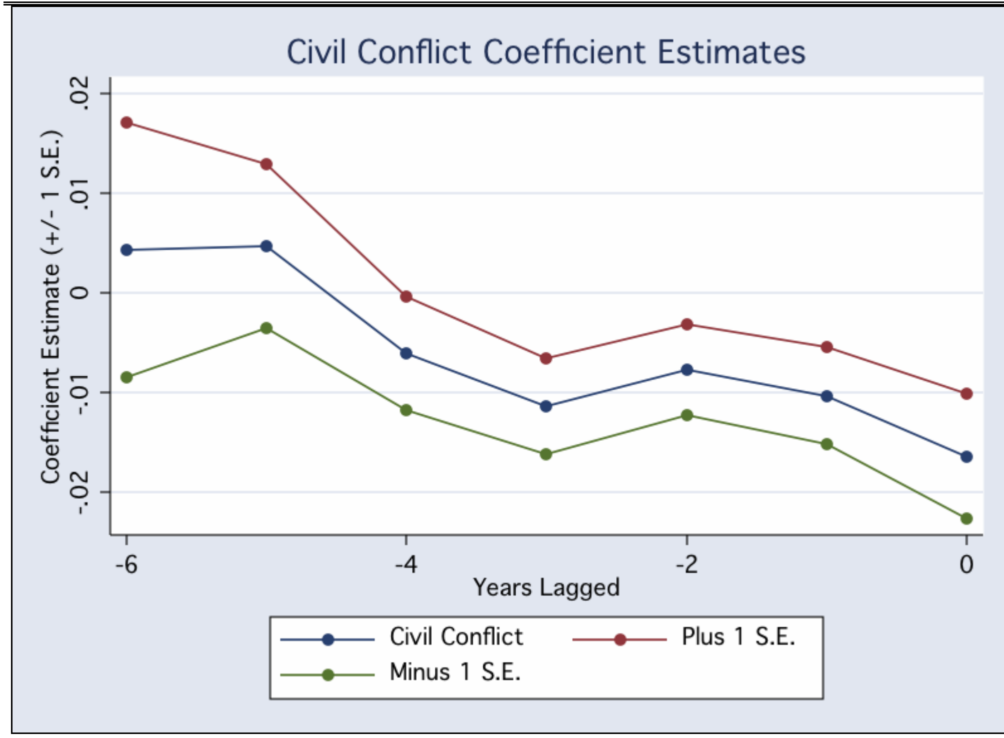
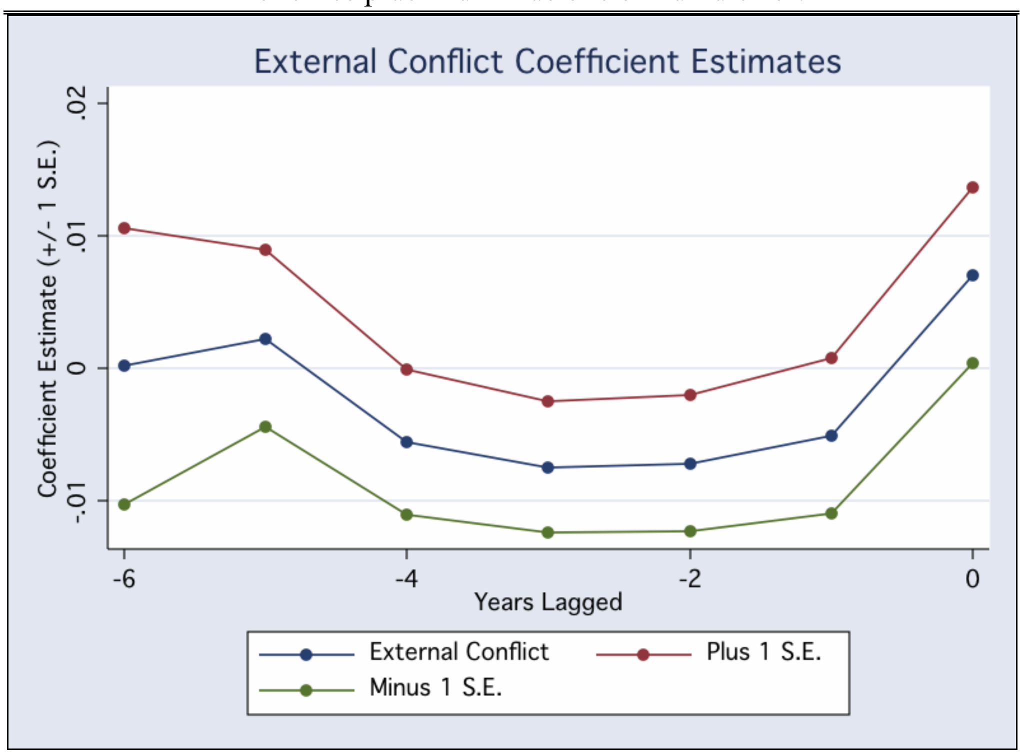


FIGURE 2. ICRG External Conflict Index Coefficient Estimations:
Elasticities plus and minus one standard error.



7. Conclusions and Directions for Future Research

This paper has estimated the effects of three measures of violent conflict on flows of foreign direct investment per capita. Using data from 1991-2003 from 22 countries, I have found evidence that violent conflict reduces flows of foreign direct investment per capita. Additionally, using two measures, civil conflict is shown to reduce FDI flows per person, whereas external conflict has a positive effect on FDI flows per person.

This paper has also found that violent conflicts have lasting effects on a country's investment climate. Civil war can harm a country's prospects for attracting FDI for several years. However, five years after a conflict ends, some countries may experience a "peace dividend" in the form of increased foreign direct investment. Though present-day external conflict positively affects FDI per capita, flows of foreign direct investment are substantially reduced two to four years after external conflict. This analysis does not suggest the presence of peace dividends after external conflicts, indicating an inability of states to create a positive investment climate in the wake of international conflicts.

Unfortunately, the data used to represent violent conflict in this study are far from ideal. The dummy variables representing major conflicts did not incorporate any degree of conflict scale, where clearly, investment decisions will certainly differentiate between a conflict with 1000 casualties in a year, and conflicts with 10,000 casualties in a year. The ICRG measures were responsive to this concern, but the use of an index complicates interpretation. A 1% increase in the index does not necessarily correspond to a 1% increase in the severity of conflict, and as such, the explanatory power of these variables is reduced.

Additional caveats concern the potential endogeneity of conflict and foreign direct investment. Consider the positive relationship shown by this paper between external conflict and foreign direct investment. If one country is heavily invested in another, the first may have an incentive to provide military aid in the case of unrest in the second, causing political instability to escalate to externally involved conflict. Or in the case of civil conflict, as Collier and Hoeffler (1998) explain, low incomes increase the risk of civil war. As foreign direct investments both consider and affect income levels, civil conflicts and foreign direct investment may be simultaneously determined.

Future research on the topic might take these issues into account. Data on the number of casualties caused by conflicts would best represent the scale of violence, and provide for more meaningful analysis. Further, examining the issue of endogeneity between conflict and foreign direct investment might yield considerable insight and deeper understanding of this complex relationship.

Violent conflict and investment decisions are very intricately related. This paper has provided a glimpse of this relationship, wherein civil conflict decreases flows of foreign direct investment, and external conflict increases foreign direct investment. With further understanding of this relationship, our society may find ways to be more peaceful and more prosperous.

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Appendix

Countries Used in This Study (Panel Code in Parentheses, Used to Examine Residuals)

Africa	Eurasia	Latin America
Algeria (1)	Bangladesh (3)	Bolivia (4)
Angola (2)	India (13)	Colombia (7)
Burundi (5)	Nepal (17)	Ecuador (9)
Chad (6)	Philippines (19)	El Salvador (10)
DR Congo (Zaire) (8)	Sri Lanka (21)	Mexico (14)
Ethiopia (11)	Turkey (22)	Peru (18)
Ghana (12)		
Mozambique (15)		
Namibia (16)		
Rwanda (20)		

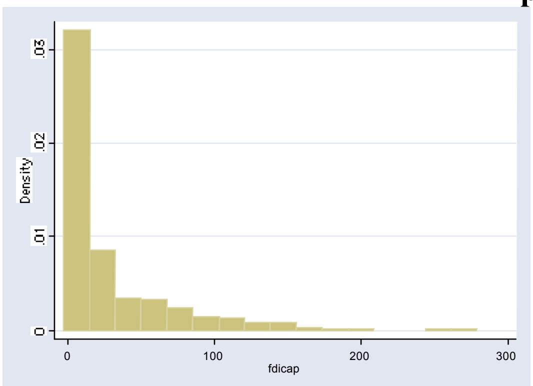
Percentage Change Interpretations of Dummy Variables for Regressions 1 – 6:

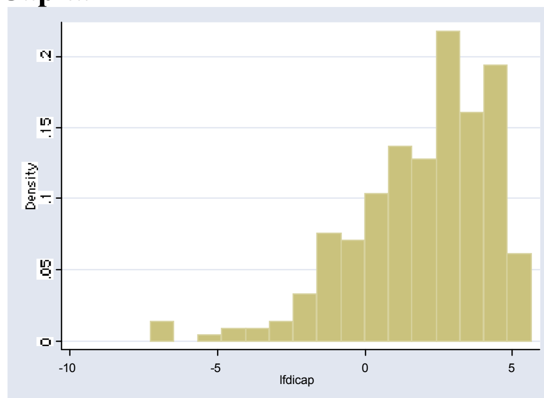
```
Regression 1
Conflict - Solve[g == (Exp[-.4038287]-1), g]
 {{g→-0.332242}}

Regression 2
Conflict - Solve[g == (Exp[-.0398347]-1), g]
 {{g→-0.0390517}}

Regression 3
Conflict - Solve[g == (Exp[.0854676]-1), g]
 {{g→0.0892263}}

Regression 4
Civil - Solve[g == (Exp[-.4324213]-1), g]
 {{g→-0.351064}}
External - Solve[g == (Exp[.2211564]-1), g]
 {{g→0.247519}}

Regression 5
Civil - Solve[g == (Exp[-.046398]-1), g]
 {{g→-0.0453381}}
External - Solve[g == (Exp[.1264793]-1), g]
 {{g→0.134826}}

Regression 6
Civil - Solve[g == (Exp[.0800497]-1), g]
 {{g→0.0833409}}
External - Solve[g == (Exp[.1819471]-1), g]
 {{g→0.199551}}
```

Comparison of Logged and Non-Logged Variables:

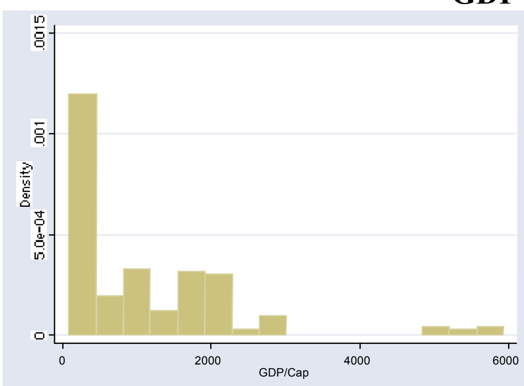
Non-Logged	Logged

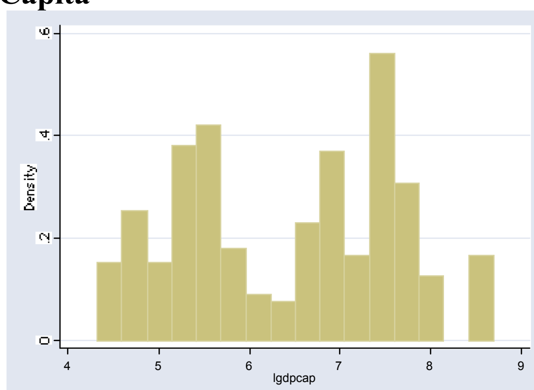
FDI per Capita



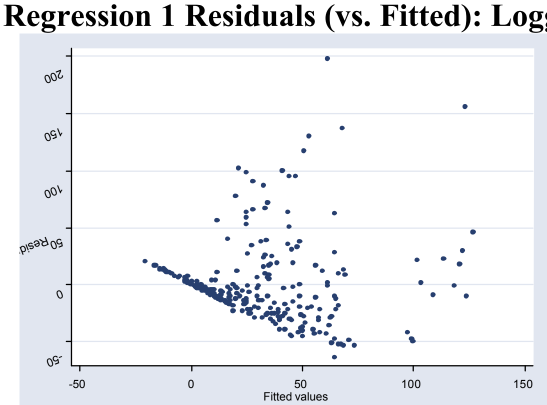


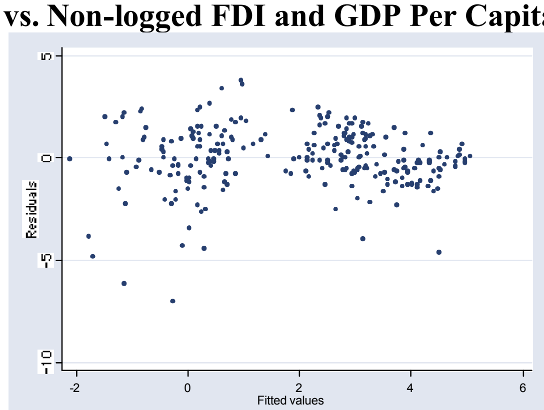
GDP per Capita





Regression 1 Residuals (vs. Fitted): Logged vs. Non-logged FDI and GDP Per Capita

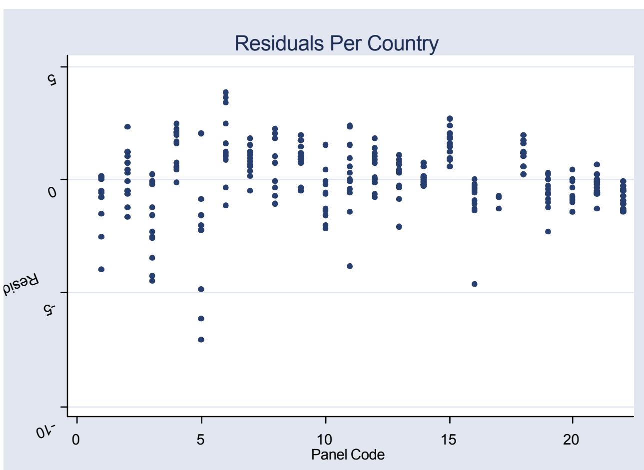




Stata Regression Output:

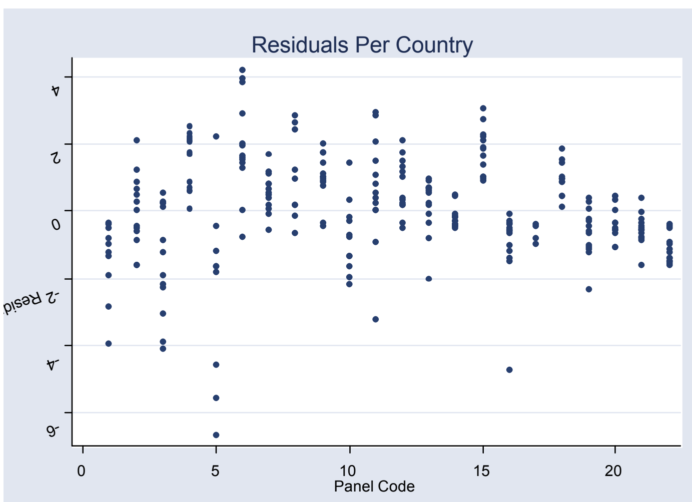
Regression 1:

```
. reg lfdicap lgdpcap open resimp conflict

      Source |       SS       df       MS              Number of obs =     261
-------------+------------------------------           F(  4,   256) =   98.16
       Model |  875.591741     4  218.897935           Prob > F      =  0.0000
    Residual |   570.86005   256  2.22992207           R-squared     =  0.6053
-------------+------------------------------           Adj R-squared =  0.5992
       Total |  1446.45179   260  5.56327612           Root MSE      =  1.4933

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   1.310056   .0830329    15.78   0.000     1.146542    1.473571
        open |    .025765   .0034366     7.50   0.000     .0189975    .0325325
      resimp |   .0043834   .0035673     1.23   0.220    -.0026416    .0114084
    conflict |  -.4038287   .2140432    -1.89   0.060    -.8253385     .017681
       _cons |  -8.047962   .5402683   -14.90   0.000    -9.111898   -6.984025
------------------------------------------------------------------------------
```



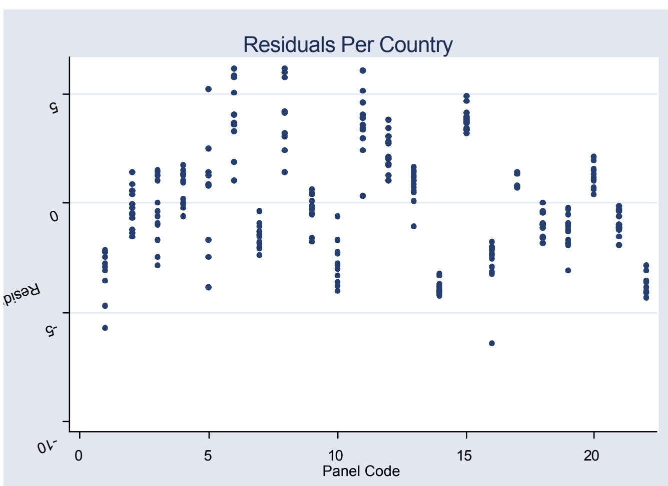
Regression 2:
. xtreg lfdicap lgdpcap open resimp conflict

```
Random-effects GLS regression                  Number of obs      =       261
Group variable (i): code                     Number of groups   =        22

R-sq:  within  = 0.1833                      Obs per group: min =         4
       between = 0.7367                                     avg =      11.9
       overall = 0.6002                                     max =        13

Random effects u_i ~ Gaussian                  Wald chi2(4)       =    100.91
corr(u_i, X)       = 0 (assumed)              Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   1.500471   .2150404     6.98   0.000        1.079    1.921943
        open |    .027743   .0051321     5.41   0.000     .0176843    .0378017
      resimp |    .006228   .0035257     1.77   0.077    -.0006823    .0131383
    conflict |  -.0398347   .2011835    -0.20   0.843    -.4341472    .3544778
       _cons |  -9.601518   1.377447    -6.97   0.000    -12.30127   -6.901771
-------------+----------------------------------------------------------------
     sigma_u |  1.1620252
     sigma_e |  1.0753927
         rho |  .53866188   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```



Regression 3:

```
. xtreg lfdicap lgdpcap open resimp conflict, fe

Fixed-effects (within) regression               Number of obs      =       261
Group variable (i): code                        Number of groups   =        22

R-sq:  within  = 0.2009                         Obs per group: min =         4
       between = 0.7137                                        avg =      11.9
       overall = 0.5704                                        max =        13

                                                F(4,235)           =     14.77
corr(u_i, Xb)  = -0.8835                        Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.212811   .6884875     4.67   0.000     1.856415    4.569207
        open |   .0258293   .0060017     4.30   0.000     .0140054    .0376533
      resimp |   .0048568   .0037369     1.30   0.195    -.0025053    .0122189
    conflict |   .0854676   .2070022     0.41   0.680    -.3223495    .4932847
       _cons |  -20.49336    4.36809    -4.69   0.000    -29.09898   -11.88775
-------------+----------------------------------------------------------------
     sigma_u |  2.5089522
     sigma_e |  1.0753927
         rho |   .8447965   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(21, 235) =    12.32             Prob > F = 0.0000
```

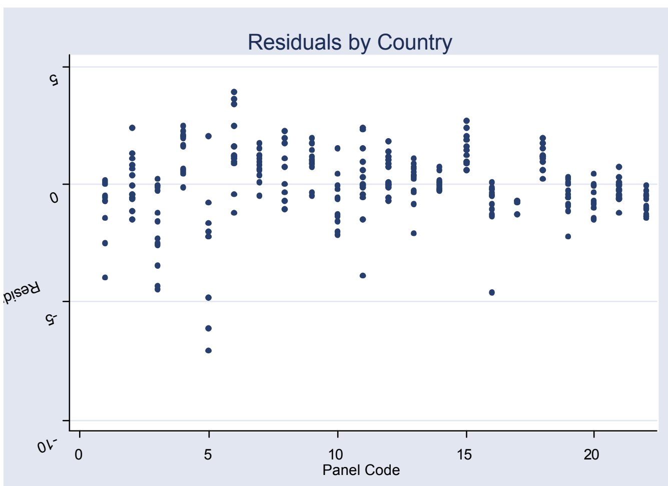


Hausman Test between Regressions 2 & 3:

```
. hausman xtfe xtre

    Test:  Ho:  difference in coefficients not systematic

                 chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                         =        8.75
               Prob>chi2 =      0.0675
```

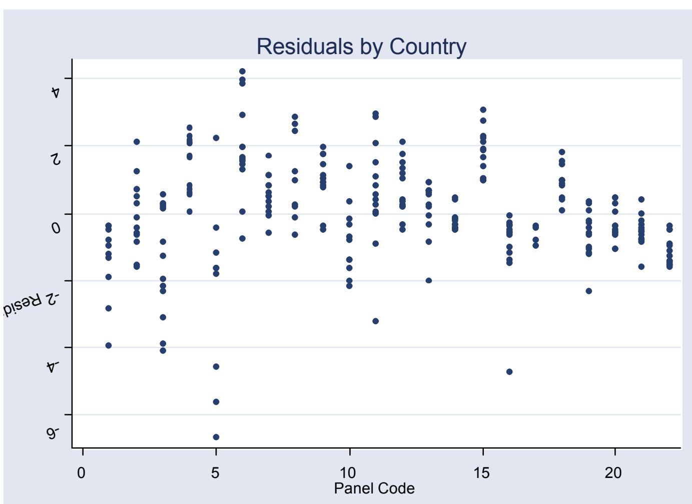
Regression 4:
. reg lfdicap lgdpcap open resimp civil international

```
      Source |       SS       df       MS              Number of obs =     261
-------------+------------------------------           F(  5,   255) =   78.46
       Model |  876.635332     5  175.327066           Prob > F      =  0.0000
    Residual |  569.816459   255  2.23457435           R-squared     =  0.6061
-------------+------------------------------           Adj R-squared =  0.5983
       Total |  1446.45179   260  5.56327612           Root MSE      =  1.4948

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   1.315165    .083455    15.76   0.000     1.150816    1.479514
        open |   .0248201   .0037076     6.69   0.000     .0175187    .0321215
      resimp |   .0042145   .0035796     1.18   0.240    -.0028349    .0112638
       civil |  -.4324213   .2183131    -1.98   0.049    -.8623476   -.0024949
internatio~l |   .2211564    .939303     0.24   0.814    -1.628623    2.070936
       _cons |   -8.02128    .542239   -14.79   0.000    -9.089117   -6.953443
------------------------------------------------------------------------------
```



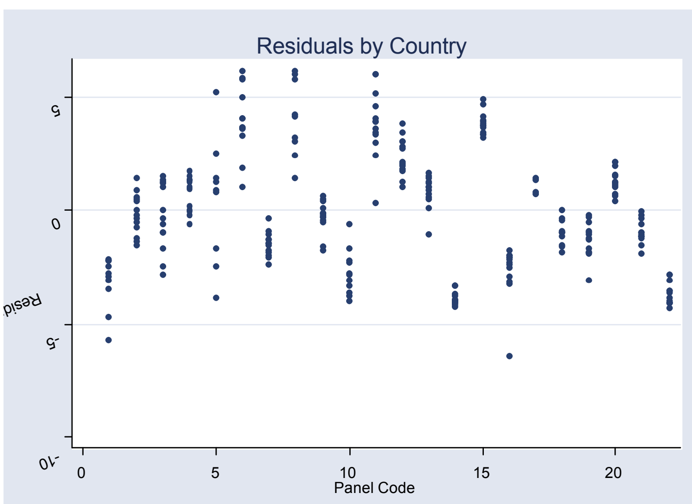
Regression 5:

```
. xtreg lfdicap lgdpcap open resimp civil international

Random-effects GLS regression                 Number of obs      =       261
Group variable (i): code                   Number of groups   =        22

R-sq:  within  = 0.1835                    Obs per group: min =         4
       between = 0.7370                                   avg =      11.9
       overall = 0.6004                                   max =        13

Random effects u_i ~ Gaussian                Wald chi2(5)       =     98.95
corr(u_i, X)       = 0 (assumed)            Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   1.508805   .2191792     6.88   0.000     1.079222    1.938389
        open |   .0274309   .0053478     5.13   0.000     .0169493    .0379124
      resimp |   .0061747   .0035457     1.74   0.082    -.0007747     .013124
       civil |   -.046398   .2050293    -0.23   0.821    -.4482481    .3554522
internatio~l |   .1264793   .7329376     0.17   0.863    -1.310052    1.563011
       _cons |   -9.63581   1.404076    -6.86   0.000    -12.38775   -6.883872
-------------+----------------------------------------------------------------
     sigma_u |  1.1902115
     sigma_e |  1.0776447
         rho |  .54951381   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```



Regression 6:

```
. xtreg lfdicap lgdpcap open resimp civil international, fe

Fixed-effects (within) regression           Number of obs     =     261
Group variable (i): code                   Number of groups   =      22

R-sq:  within  = 0.2010                    Obs per group: min =       4
       between = 0.7137                                   avg =    11.9
       overall = 0.5705                                   max =      13

                                            F(5,234)          =   11.77
corr(u_i, Xb)  = -0.8834                    Prob > F          =  0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.213136   .6899333     4.66   0.000     1.853862    4.572411
        open |   .0256202   .0062041     4.13   0.000     .0133972    .0378432
      resimp |   .0048164   .0037563     1.28   0.201    -.0025841    .0122168
       civil |   .0800497   .2111553     0.38   0.705    -.3359586     .496058
internatio~l |   .1819471    .732643     0.25   0.804    -1.261472    1.625366
       _cons |  -20.48188   4.378037    -4.68   0.000    -29.10728   -11.85647
-------------+----------------------------------------------------------------
     sigma_u |  2.5077886
     sigma_e |  1.0776447
         rho |  .84412511   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(21, 234) =    12.22           Prob > F = 0.0000
```

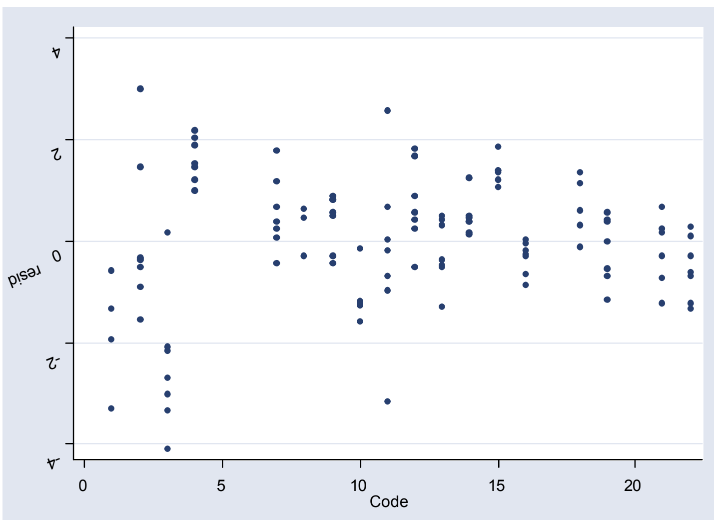


Hausman Test between Regressions 5 & 6:

```
. hausman xtfe xtre
    Test:  Ho:  difference in coefficients not systematic

                 chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                         =        8.00
               Prob>chi2 =      0.1561
               (V_b-V_B is not positive definite)
```

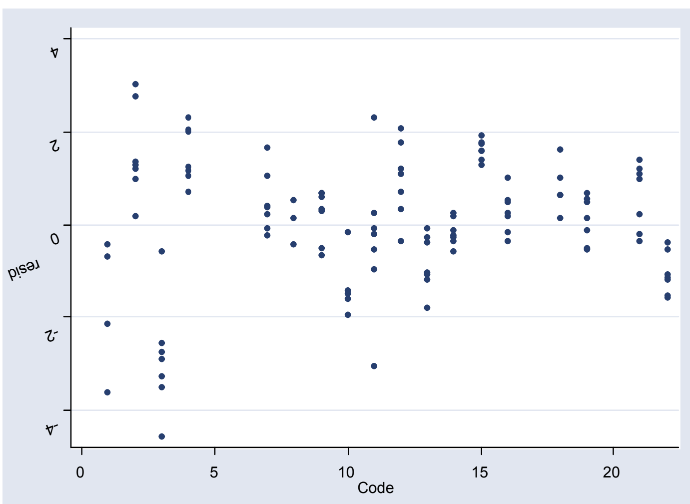
Regression 7:

```
. reg lfdicap lgdpcap open resimp civ ext

      Source |       SS       df       MS              Number of obs =     115
-------------+------------------------------           F(  5,   109) =   49.00
       Model |  406.461991     5  81.2923981           Prob > F      =  0.0000
    Residual |  180.833084   109  1.65901912           R-squared     =  0.6921
-------------+------------------------------           Adj R-squared =  0.6780
       Total |  587.295074   114  5.15171118           Root MSE      =   1.288

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   1.301535   .1177141    11.06   0.000      1.06823    1.534841
        open |   .0334204   .0045458     7.35   0.000     .0244107      .04243
      resimp |   .0211021   .0061529     3.43   0.001     .0089072     .033297
         civ |   -.010473   .0054065    -1.94   0.055    -.0211884    .0002425
         ext |   .0074481   .0084973     0.88   0.383    -.0093933    .0242895
       _cons |  -9.330007   .9381312    -9.95   0.000    -11.18935   -7.470661
------------------------------------------------------------------------------
```



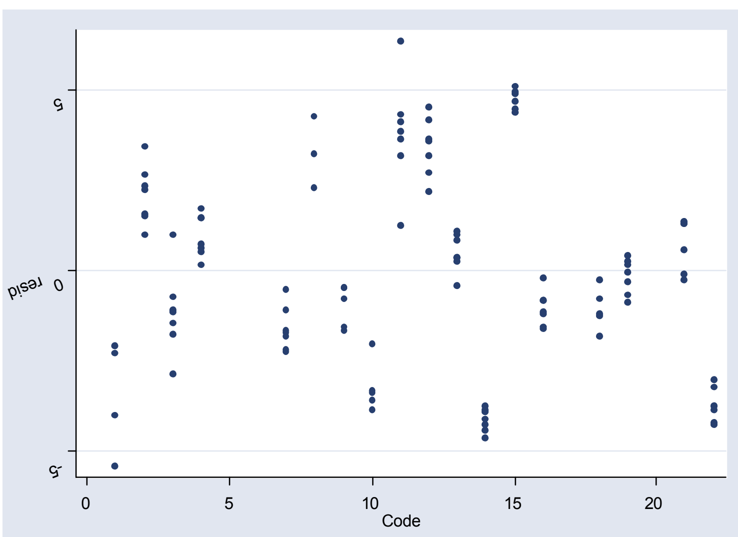
Regression 8:

```
. xtreg lfdicap lgdpcap open resimp civ ext

Random-effects GLS regression                   Number of obs      =       115
Group variable (i): code                        Number of groups   =        18

R-sq:  within  = 0.3196                         Obs per group: min =         3
       between = 0.6891                                        avg =       6.4
       overall = 0.6274                                        max =         7

Random effects u_i ~ Gaussian                   Wald chi2(5)       =     80.91
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |    1.36583   .2538606     5.38   0.000     .8682719    1.863387
        open |   .0137426   .0058666     2.34   0.019     .0022442     .025241
      resimp |    .008628   .0060858     1.42   0.156    -.0032999    .0205559
         civ |  -.0189587   .0049534    -3.83   0.000    -.0286672   -.0092503
         ext |   .0095924    .006377     1.50   0.133    -.0029063    .0220911
       _cons |  -8.690882   1.741901    -4.99   0.000    -12.10495   -5.276818
-------------+----------------------------------------------------------------
     sigma_u |  1.1214674
     sigma_e |  .79561042
         rho |  .66520287   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```



Regression 9:

```
. xtreg lfdicap lgdpcap open resimp civ ext, fe

Fixed-effects (within) regression             Number of obs      =       115
Group variable (i): code                      Number of groups   =        18

R-sq:  within  = 0.3501                       Obs per group: min =         3
       between = 0.6257                                      avg =       6.4
       overall = 0.5645                                      max =         7

                                              F(5,92)            =      9.91
corr(u_i, Xb)  = -0.8629                      Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.382806    1.34359     2.52   0.014     .7143198    6.051293
        open |   .0069386   .0071357     0.97   0.333    -.0072335    .0211107
      resimp |   .0064683   .0064276     1.01   0.317    -.0062974    .0192341
         civ |  -.0164522   .0063111    -2.61   0.011    -.0289865   -.0039179
         ext |   .0069833   .0066475     1.05   0.296    -.0062191    .0201857
       _cons |  -21.63613      8.945    -2.42   0.018    -39.40167   -3.870588
-------------+----------------------------------------------------------------
     sigma_u |  2.7117955
     sigma_e |  .79561042
         rho |  .92074504   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.39              Prob > F = 0.0000
```



Hausman Test between Regressions 8 & 9:

```
. hausman fix rand
   Test:  Ho:  difference in coefficients not systematic

              chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       12.86
            Prob>chi2 =      0.0248
            (V_b-V_B is not positive definite)
```

12 Regressions with Lagged ICRG Indices:

```
. xtreg lfdicap lgdpcap open resimp civ ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3501                    Obs per group: min =         3
       between = 0.6257                                   avg =       6.4
       overall = 0.5645                                   max =         7

                                           F(5,92)            =      9.91
corr(u_i, Xb)  = -0.8629                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.382806    1.34359     2.52   0.014     .7143198    6.051293
        open |   .0069386   .0071357     0.97   0.333    -.0072335    .0211107
      resimp |   .0064683   .0064276     1.01   0.317    -.0062974    .0192341
         civ |  -.0164522   .0063111    -2.61   0.011    -.0289865   -.0039179
         ext |   .0069833   .0066475     1.05   0.296    -.0062191    .0201857
       _cons |  -21.63613      8.945    -2.42   0.018    -39.40167   -3.870588
-------------+----------------------------------------------------------------
     sigma_u |  2.7117955
     sigma_e |  .79561042
         rho |  .92074504   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.39              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l1 ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3351                    Obs per group: min =         3
       between = 0.6341                                   avg =       6.4
       overall = 0.5713                                   max =         7

                                           F(5,92)            =      9.27
corr(u_i, Xb)  = -0.9055                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.872958   1.324091     2.92   0.004     1.243199    6.502717
        open |   .0099504   .0069504     1.43   0.156    -.0038536    .0237544
      resimp |   .0068262   .0065287     1.05   0.298    -.0061403    .0197927
      civ_l1 |  -.0104211   .0048771    -2.14   0.035    -.0201075   -.0007347
         ext |   .0014014   .0058023     0.24   0.810    -.0101224    .0129252
       _cons |   -25.0755   8.774164    -2.86   0.005    -42.50175   -7.649251
-------------+----------------------------------------------------------------
     sigma_u |  3.1906076
     sigma_e |  .80474563
         rho |  .94018841   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    10.75              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l2 ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3238                    Obs per group: min =         3
       between = 0.6335                                   avg =       6.4
       overall = 0.5688                                   max =         7

                                           F(5,92)            =      8.81
corr(u_i, Xb)  = -0.9212                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   4.156953    1.34469     3.09   0.003     1.486281    6.827624
        open |   .0104832   .0070346     1.49   0.140    -.0034881    .0244546
      resimp |   .0095195   .0064107     1.48   0.141    -.0032127    .0222517
      civ_l2 |  -.0078068   .0045461    -1.72   0.089    -.0168357    .0012221
         ext |  -.0024482   .0053746    -0.46   0.650    -.0131226    .0082262
       _cons |  -27.20337   8.835189    -3.08   0.003    -44.75082   -9.655922
-------------+----------------------------------------------------------------
     sigma_u |  3.4878712
     sigma_e |  .81156758
         rho |  .94863945   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    10.38              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l3 ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3428                    Obs per group: min =         3
       between = 0.6265                                   avg =       6.4
       overall = 0.5642                                   max =         7

                                           F(5,92)            =      9.60
corr(u_i, Xb)  = -0.9177                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   4.068188   1.231651     3.30   0.001     1.622022    6.514354
        open |   .0085872   .0070212     1.22   0.224    -.0053575     .022532
      resimp |   .0115899   .0063437     1.83   0.071    -.0010092     .024189
      civ_l3 |  -.0114235     .00479    -2.38   0.019    -.0209368   -.0019101
         ext |  -.0044877   .0052536    -0.85   0.395    -.0149217    .0059464
       _cons |  -26.88989    8.04387    -3.34   0.001    -42.86571   -10.91407
-------------+----------------------------------------------------------------
     sigma_u |  3.4562967
     sigma_e |  .80011101
         rho |   .9491364   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    10.67              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l4 ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3109                    Obs per group: min =         3
       between = 0.6321                                   avg =       6.4
       overall = 0.5626                                   max =         7

                                           F(5,92)            =      8.30
corr(u_i, Xb)  = -0.9540                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   5.129899   1.153609     4.45   0.000     2.838732    7.421067
        open |   .0117124   .0070825     1.65   0.102     -.002354    .0257788
      resimp |   .0110295    .006522     1.69   0.094    -.0019238    .0239827
      civ_l4 |  -.0061507   .0056703    -1.08   0.281    -.0174124    .0051111
         ext |  -.0044124   .0054036    -0.82   0.416    -.0151444    .0063196
       _cons |  -33.79041   7.532106    -4.49   0.000    -48.74982     -18.831
-------------+----------------------------------------------------------------
     sigma_u |  4.5482927
     sigma_e |  .81924998
         rho |  .96857542   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    10.10              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l5 ext, fe

Fixed-effects (within) regression          Number of obs      =       115
Group variable (i): code                   Number of groups   =        18

R-sq:  within  = 0.3045                    Obs per group: min =         3
       between = 0.6348                                   avg =       6.4
       overall = 0.5637                                   max =         7

                                           F(5,92)            =      8.06
corr(u_i, Xb)  = -0.9598                   Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   5.517606   1.102148     5.01   0.000     3.328645    7.706567
        open |   .0144621   .0070286     2.06   0.042     .0005027    .0284215
      resimp |   .0095815   .0065525     1.46   0.147    -.0034323    .0225953
      civ_l5 |   .0046297   .0081859     0.57   0.573    -.0116281    .0208875
         ext |  -.0033826   .0054366    -0.62   0.535    -.0141801     .007415
       _cons |  -35.90114   7.267174    -4.94   0.000    -50.33437   -21.46791
-------------+----------------------------------------------------------------
     sigma_u |  4.8480835
     sigma_e |  .82304255
         rho |  .97198667   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    10.10              Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ_l6 ext, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3029                     Obs per group: min =         3
       between = 0.6350                                    avg =       6.4
       overall = 0.5638                                    max =         7

                                            F(5,92)            =      8.00
corr(u_i, Xb)  = -0.9584                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   5.435808   1.130549     4.81   0.000      3.19044    7.681176
        open |   .0142066   .0070899     2.00   0.048     .0001255    .0282878
      resimp |   .0101017   .0065007     1.55   0.124    -.0028092    .0230127
      civ_l6 |   .0042046   .0127746     0.33   0.743    -.0211669    .0295762
         ext |  -.0034937   .0054624    -0.64   0.524    -.0143425    .0073551
       _cons |  -35.39315   7.576342    -4.67   0.000    -50.44042   -20.34588
-------------+----------------------------------------------------------------
     sigma_u |  4.7642155
     sigma_e |  .82398712
         rho |  .97095592   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =     9.98            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l1, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3477                     Obs per group: min =         3
       between = 0.6224                                    avg =       6.4
       overall = 0.5595                                    max =         7

                                            F(5, 92)           =      9.81
corr(u_i, Xb)  = -0.9166                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |    4.11178   1.329801     3.09   0.003     1.470681    6.752879
        open |   .0070222   .0071479     0.98   0.328    -.0071741    .0212185
      resimp |   .0063842   .0064395     0.99   0.324    -.0064052    .0191737
         civ |  -.0088803   .0063667    -1.39   0.166    -.0215251    .0037644
      ext_l1 |  -.0051001   .0058809    -0.87   0.388     -.01678     .0065798
       _cons |  -26.98578   8.803647    -3.07   0.003    -44.47058   -9.500973
-------------+----------------------------------------------------------------
     sigma_u |   3.457049
     sigma_e |  .79711651
         rho |  .94951809   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.45            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l2, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3560                     Obs per group: min =         3
       between = 0.6151                                    avg =       6.4
       overall = 0.5544                                    max =         7

                                            F(5,92)            =     10.17
corr(u_i, Xb)  = -0.9079                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.963304   1.279716     3.10   0.003     1.421676    6.504931
        open |   .0053105   .0072315     0.73   0.465    -.0090518    .0196727
      resimp |   .0059147   .0064076     0.92   0.358    -.0068113    .0186407
         civ |  -.0083519   .0056941    -1.47   0.146     -.019661    .0029571
      ext_l2 |  -.0071965   .0051437    -1.40   0.165    -.0174122    .0030193
       _cons |  -25.99642    8.42577    -3.09   0.003    -42.73073   -9.262117
-------------+----------------------------------------------------------------
     sigma_u |  3.3297624
     sigma_e |  .79198699
         rho |  .94645609   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.67            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l3, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3582                     Obs per group: min =         3
       between = 0.6118                                    avg =       6.4
       overall = 0.5529                                    max =         7

                                            F(5,92)            =     10.27
corr(u_i, Xb)  = -0.8881                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.663618   1.276447     2.87   0.005     1.128485    6.198751
        open |   .0046817   .0072867     0.64   0.522    -.0097903    .0191537
      resimp |   .0056353   .0064074     0.88   0.381    -.0070902    .0183609
         civ |  -.0094077   .0052902    -1.78   0.079    -.0199146    .0010991
      ext_l3 |  -.0074908   .0049623    -1.51   0.135    -.0173462    .0023647
       _cons |  -24.01968   8.384504    -2.86   0.005    -40.67203    -7.36733
-------------+----------------------------------------------------------------
     sigma_u |  3.0418547
     sigma_e |  .79063639
         rho |  .93671727   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.72            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l4, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3498                     Obs per group: min =         3
       between = 0.6136                                    avg =       6.4
       overall = 0.5538                                    max =         7

                                            F(5,92)            =      9.90
corr(u_i, Xb)  = -0.8808                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.562446    1.30355     2.73   0.008     .9734829    6.151409
        open |   .0052864   .0073845     0.72   0.476    -.0093798    .0199527
      resimp |   .0059607   .0064436     0.93   0.357    -.0068368    .0187581
         civ |  -.0112012   .0050759    -2.21   0.030    -.0212823   -.0011201
      ext_l4 |  -.0056149   .0054735    -1.03   0.308    -.0164857     .005256
       _cons |  -23.34515   8.542704    -2.73   0.008     -40.3117   -6.378608
-------------+----------------------------------------------------------------
     sigma_u |  2.9426498
     sigma_e |  .79582966
         rho |  .93184368   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.50            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l5, fe

Fixed-effects (within) regression           Number of obs      =       115
Group variable (i): code                    Number of groups   =        18

R-sq:  within  = 0.3431                     Obs per group: min =         3
       between = 0.6283                                    avg =       6.4
       overall = 0.5648                                    max =         7

                                            F(5,92)            =      9.61
corr(u_i, Xb)  = -0.9040                    Prob > F           =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.896667   1.314108     2.97   0.004     1.286736    6.506597
        open |   .0076431   .0072627     1.05   0.295    -.0067812    .0220675
      resimp |   .0066404   .0065007     1.02   0.310    -.0062705    .0195514
         civ |  -.0125068   .0050026    -2.50   0.014    -.0224425   -.0025711
      ext_l5 |   .0022359   .0067059     0.33   0.740    -.0110826    .0155545
       _cons |  -25.28593   8.588149    -2.94   0.004    -42.34274   -8.229128
-------------+----------------------------------------------------------------
     sigma_u |  3.2051778
     sigma_e |  .79988498
         rho |  .94137111   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.28            Prob > F = 0.0000
```

```
. xtreg lfdicap lgdpcap open resimp civ ext_l6, fe

Fixed-effects (within) regression            Number of obs     =       115
Group variable (i): code                     Number of groups  =        18

R-sq:  within  = 0.3423                      Obs per group: min =         3
       between = 0.6253                                     avg =       6.4
       overall = 0.5623                                     max =         7

                                             F(5,92)           =      9.58
corr(u_i, Xb)  = -0.8993                     Prob > F          =    0.0000

------------------------------------------------------------------------------
     lfdicap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lgdpcap |   3.813882   1.325444     2.88   0.005     1.181436    6.446327
        open |   .0072452     .00719     1.01   0.316    -.0070347    .0215251
      resimp |   .0064244   .0066131     0.97   0.334    -.0067098    .0195587
         civ |  -.0123434   .0049831    -2.48   0.015    -.0222404   -.0024465
      ext_l6 |   .0001555   .0104219     0.01   0.988    -.0205434    .0208543
       _cons |  -24.82701    8.59711    -2.89   0.005    -41.90161   -7.752406
-------------+----------------------------------------------------------------
     sigma_u |  3.1427347
     sigma_e |  .80036716
         rho |  .93909241   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(17, 92) =    11.26             Prob > F = 0.0000
```