

Economic Shocks and Civil Conflict: A New Instrumental Variables Approach

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Motivation

Civil Conflict and Income

- Civil conflict has resulted in three times as many deaths as international war since World War II (Fearon and Laitin, 2003).
 - Economic causes of conflict are poorly understood. Grossman (1991) proposes a contest model where participation in conflict rises as the opportunity cost of fighting (non-conflict income) declines.
 - Fearon (2007) notes the ambiguous effect of GDP growth on conflict – negative real GDP shocks could make production a less attractive source of income relative to conflict, but also reduces the overall amount of resources to fight over.
- The Search for Exogeneity
- Output does not relate to conflict exogenously. Civil conflict destroys capital stocks, decreases productivity, and weakens institutional quality. Simple OLS regression results will thus be biased.
 - Miguel, Satyanath, and Sergenti (2004) use rainfall variation as an instrument for GDP growth to evaluate the unbiased exogenous effect on civil conflict in Sub-Saharan Africa.

The Trilemma (Impossible Trinity)

- International macroeconomics highlights the tradeoff between monetary autonomy, fixed exchange rates, and free-flowing capital.
- Countries with exchange rates and a relatively open capital account have no choice but to take their base country’s interest rate as their own.
- Giovanni and Shambaugh (2008) show domestic GDP growth negatively correlates to base country interest rates under fixed exchange rates.
- Base interest rates interacted with a fixed exchange rate dummy can instrument for domestic GDP growth, yielding “control” (floating exchange rate regime) and “treatment” (fixed exchange rate regime) groups.

Data

- Internal Conflict:** from the International Peace Research Institute of Oslo (PRIO). Civil conflict is defined as 25 or more battle-related deaths per year.
- Interest Rates:** from the IMF’s International Financial Statistics database. Selected rates are short term, either money market or treasury bill. Selection depends on availability between base and local countries, with money market rates used as defaults (following Giovanni and Shambaugh, 2008).
- Exchange Rate Regime:** from Shambaugh (2004). A country is classified as *de facto* pegged if its nominal exchange rate stays within ±2% bands over the course of a year against the base country. Base countries are designated by *de jure* declaration, historical exchange rate stability, and dominant currency usage.
- Capital Account Openness:** given by Chinn and Ito (2007) and based on the IMF Annual Report on Exchange Rate Arrangements.
- GDP Growth** (and country controls): from the World Bank’s World Development Indicators (WDI).

The resulting sample is limited by dropping countries that only peg or only float, eliminating hyperinflations, dropping observations with GDP growth above 20% or below -20%, and keeping only countries with populations of 250,000 or greater.

Abstract

Incorporating theory from the trilemma of international economics, we examine the causal effects of shocks in GDP growth on the occurrence of civil conflict with pseudo-experimental instrumental variable analysis. We find strong and exogenous instruments by interacting exchange rate regime type and base country interest rates. Preliminary 2SLS results indicate a significant and negative causal relationship between GDP growth and the incidence of conflict.

Methodology: First stage

The first-stage relationship is estimated as:

$$Y_{it} = \beta_0 + \beta_1 R_{it}^b + \beta_2 Peg_{it} + \beta_3 (R_{it}^b \times Peg_{it}) + X_{it} \beta_4 + u_{it}$$

Where Y is the annual real GDP growth rate
 R^b is the base country interest rate
 Peg is a binary variable indicating whether or not country i is pegged to its base
 X is a matrix of country effects and controls
 u is a well-behaved error term

The equation is estimated using OLS with standard errors clustered at the country level.

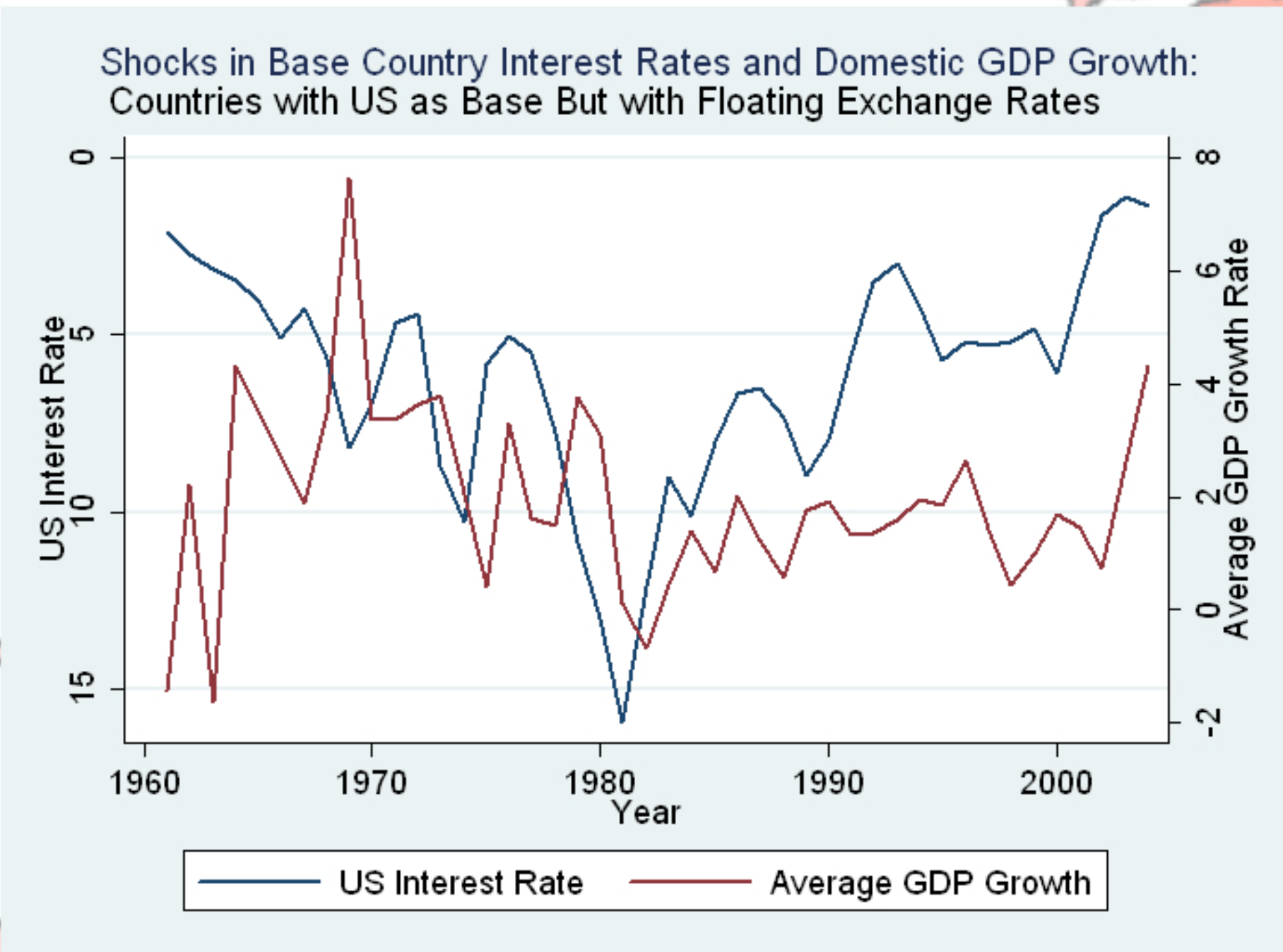


Figure 1: Countries with floating exchange rate regimes are not significantly affected by changes in the base country interest rate

Methodology: IV-2SLS

The second-stage equation estimates the impact of income growth rates on the incidence of conflict:

$$C_{it} = \alpha_0 + \alpha_1 Y_{it} + X_{it} \alpha_2 + v_{it}$$

Where C is a binary variable indicating whether or not country i experienced civil conflict within time t
 v is a well-behaved error term

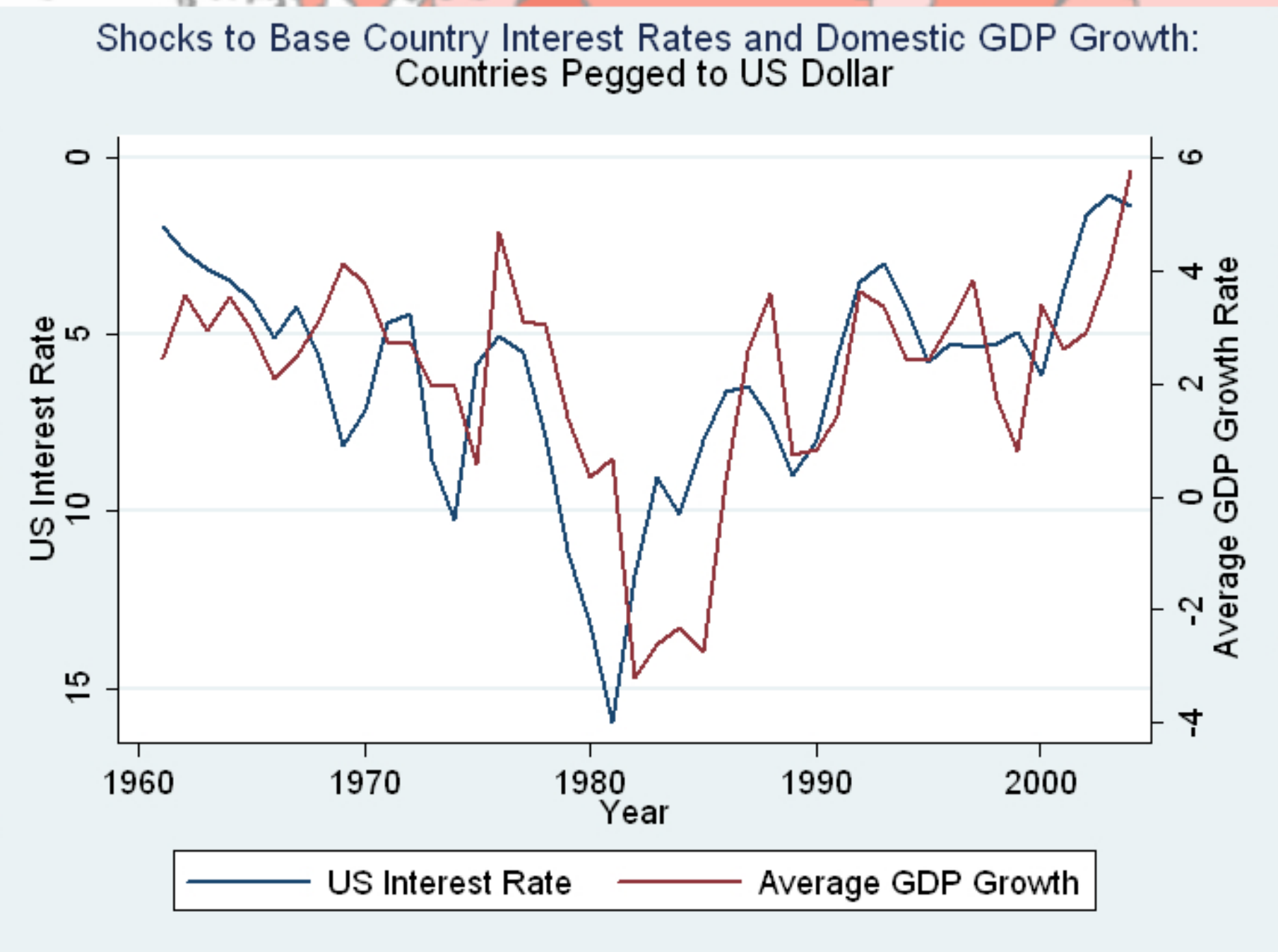


Figure 2: Output growth rates of Countries with fixed exchange rate regimes are significantly affected by changes in the base country interest rate

Results: First stage

- Base country nominal interest rate strongly affects domestic GDP growth rate, but only if the economy has a pegged exchange rate.

Dependent Variable: Annual GDP Growth				
	(1) Full sample	(2) Non-pegs	(3) Pegs	(4) Full sample
Base R	-0.143*** (0.0530)	-0.106 (0.0670)	-0.197** (0.0757)	-0.0608 (0.0543)
Peg				1.18*** (0.394)
Base R * Peg				-0.154*** (0.0519)
Obs.	3505	1516	1989	3498
R-squared	0.046	0.045	0.076	0.05

- Results are robust to the inclusion of country controls. Capital account openness, as with Giovanni and Shambaugh (2007), is not a very relevant factor.

Dependent Variable: Annual GDP Growth				
	(1)	(2)	(3)	(4)
Base R	-0.0608 (0.0543)	-0.0718 (0.0534)	-0.118** (0.052)	-0.0592 (0.0519)
Peg	1.18*** (0.394)	1.02*** (0.385)	0.945** (0.397)	1.09*** (0.380)
Base R * Peg	-0.154*** (0.0519)	-0.154*** (0.0519)	-0.137*** (0.053)	-0.161*** (0.0519)
Base Inflation		-0.0476*** (0.0139)		-0.0483*** (0.0140)
Base ΔGDP				0.181** (0.0710)
KA Openness			0.224* (0.129)	
Obs.	3498	3498	2925	3498
R-squared	0.05	0.053	0.038	0.058

Notes: Robust standard errors clustered at the country level in parentheses. Asterisks indicate statistical significance at 90%(*), 95%(**), and 99%(***) confidence. All regressions include a constant term and country fixed effects (estimates not reported). The sample period is 1961-2007. Observations are drawn from a sample of 130 countries.

Results: Instrumental Variable

- Instrumentation of GDP growth dramatically increases the magnitude and significance of its effect on the likelihood of civil conflict.

Dependent Variable: Civil Conflict					
	(1) Probit	(2) OLS	(3) Probit	(4) OLS	(5) 2SLS
GDP Growth	-0.00142 (0.00129)	-0.00146 (.00131)	-0.00460*** (.00098)	-0.00522*** (0.00141)	-0.0535*** (.0232)
Country Fixed Effects	No	No	Yes	Yes	No
Observations	4327	4327	4327	4327	3875
(Pseudo) R-sq.	0.0003	0.0003	--	0.0003	--

- Postestimation statistics suggest that the instruments are strong and exogenous.

Post-estimation Instrumentation Tests		
	(5)	(6)
Weak identification test (Kleibergen-Papp rk Wald F statistic)	10.2	16.0
Stock-Yogo critical values:		
5% maximal IV relative bias	13.9	13.9
10% maximal IV relative bias	9.08	9.08
Overidentification test (Hansen J statistic)	2.63	0.996
Chi-square(2) P-value	0.268	0.608

Notes: Robust standard errors clustered at the country level in parentheses. Asterisks indicate statistical significance at 90%(*), 95%(**), and 99%(***) confidence. All regressions include a constant term and country fixed effects (estimates not reported). The sample period is 1961-2007. Observations are drawn from a sample of 130 countries.

Conclusions

- The implications of the impossible trinity are borne out by the data – only in countries with fixed exchange rates do base country interest rates affect domestic GDP growth.
- The interaction of exchange rate regime and base interest rates is a statistically significant and relatively large predictor for output growth rates.
- Preliminary IV-2SLS results estimate a negative and statistically significant relationship between GDP growth and civil conflict. These results agree with Miguel, Satyanath and Sergenti (2004), but our coefficient estimates are nearly twice as large. This may be related to our wider country sample.
- Post-estimation statistics indicate that the selected instruments are strong and uncorrelated with the second-stage error term (v_{it}), thus passing both requirements for unbiased instrumentation.

Future Work

- Test the robustness of first-stage results with alternative measures of exchange rate regime and capital openness.
- Ensure the exogeneity of base country interest rates by estimating the first-stage regression over a subsample of small countries that are unlikely to affect base country monetary policy (as in Giovanni and Shambaugh, 2008).
- Test the robustness of second-stage results with the inclusion of country controls. Theory suggests that political institution quality, logged per capita income, religious and ethnolinguistic fragmentation, country terrain, climate, and natural resource abundance all may effect the incidence of conflict.
- Explore alternative measures of civil conflict, including just measures of civil war (>1,000 deaths in a year).

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Background Image

Coloring represents the number of years since 1946 a given country has seen internal armed conflict (greater than 25 conflict-related fatalities in a year) within its borders

