

STATE FRAGILITY: COLONIAL INCIDENCE vs. CONTEMPORARY INSTITUTIONS

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The paper derives new empirical evidence on the efficacy of contemporary institutions in offsetting persisting adverse effects of colonial governance on fragility, apart from overcoming fragility. Pre-colonial state experience and initial population abundance tend to reduce fragility but appear weak in reducing the colonial drag. Among contemporary institutions, democracy and political stability apparently increase fragility without alleviating colonial incidence. On the other hand, civil liberty and control of executives seem to reduce fragility but colonial incidence carries over. While economic institutions like government effectiveness and rule of law show both fragility reducing and colonial incidence mitigating effects, protection of property rights does not yield any desired results and control of corruption increases fragility. The perverse behaviour of these institutions can be attributed to fragility trap and stable low-income equilibrium. Strikingly, macro-policies achieve limited success but world economic booms as luck factor do not reduce fragility.

Keywords: Fragile states, colonization, institutions, underdevelopment, corruption

JEL Classification: O10, O40, O43

1. State fragility literature and gaps

Weak or fragile states or failed states are generally considered as those which do not have the capacity or willingness to perform “core” government functions [1] (see European Report on Development 2009, Rice and Patrick, 2008, Basely and Persson, 2009: 2011). According to the World Bank, “fragility or fragile conditions can be said to be periods when states or institutions lack the capacity, accountability, or legitimacy to mediate relations between citizen groups or between citizens and the state, making them vulnerable

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to violence.” (World Bank, 2011). Since the economic base is narrow, opportunities for the government to collect tax revenues to provide core government services are few. While many countries are striving to meet the sustainable development goals, a group of 35 to 50 countries is lagging exhibiting lower growth rate and higher poverty level. Such countries are under a *fragility trap*, which is termed as *fragility syndrome* by the LSE-Oxford Commission on State Fragility, Growth and Development (2018).

The empirical literature on state fragility has emerged as a by-product of development literature focusing particularly on developmental failure. The stagnation of fragile countries has been largely explained by a set of some unchanging factors that are inherited from the past (such as economic history, colonial incidence and culture) or given factors (like geography and demography) and additionally by contemporary institutional quality. An expanding body of research supports the contention that colonial governance has detrimental growth effects (e.g., Barro, 1998; Acemoglu *et al.*, 2001; Nunn, 2007, 2009), while post-colonial institutions have promoted growth (Acemoglu *et al.*, 2001; Persson, 2004). However, similar studies on determinants of state fragility are scanty and inconclusive. Carment *et al.*, (2008), for instance, use the Funds for Peace Country Indicators Foreign Policy (CIFP) measure of fragility and find that, once they control for endogeneity, variables such as growth, democracy, openness, ethnic diversity, risk of rebellion, HDI and an index of human rights empowerment become insignificant in world sample. Per capita income level, on the other hand, emerges as the major robust determinant of fragility with the expected negative impact.

Bertocchi and Guerzoni (2012) find level of income more important than growth in explaining fragility and quality of institutions measured by ‘civil liberties’ and ‘revolutions’ emerge as major determinants reducing and enhancing likelihood of fragility, respectively while both rule of law and government effectiveness are fragility-reducing. In their long run analysis, the impact of revolutions vanishes while ‘civil liberties’ has robust impact and displays a convex behavior, suggesting that fragility is more likely both under extreme autocracies and under very liberal democracies. Moreover, the effect of colonial history on fragility disappears in the long run. On the contrary, in a recent research, Tusalem (2016) finds that state failure is largely a function of variations in the type of colonial rule and duration of colonial control. On the other hand, a vast literature exists on the consequences of state fragility and alleviating measures (For a good review of this literature, see Hoeffler, 2019; MacKay & Thorbecke, 2019).

In this literature, however, the efficacy of the post-colonial institutions in reducing fragility by overcoming the adverse effects of colonial rule has not been adequately attempted. The present paper attempts to fill this gap and extends the existing fragility literature on colonial and contemporary institutions by (i) developing a measure of colonial incidence in terms of colonial labour mentality, utilising different dimensions of colonial rule, namely settler mortality rate, duration of colonial rule and lack of education, (ii) assessing the effect of colonial incidence on fragility in the presence of pre-colonial state experience, population abundance and other control variables, and (iii) examining the efficacy of alternative contemporary institutions that matter more for weakening the force

of colonial incidence (effect 1), apart from having fragility-reducing effects (effect 2). In this way, the paper investigates both effects rather than only effect 2 as in the existing literature.

Besides this contribution, our analysis has some other new dimensions. First, contrary to the standard fragility literature that has predominantly examined underdevelopment in Africa and captured fragile status with the help of binary dummy variables, our study views all developing countries as exhibiting varying degrees of fragility based on location in World Bank Country Policy and Institutional Assessment (CPIA) quintiles over a longer period (1995-2009). Thus, each country is assigned a rank ranging between 1 and 5, which is drawn from their quintile status. This measure is different from the commonly used Failed State Index provided by Fund for Peace and State Fragility Index prepared by The Center for Systematic Peace. Second, the impact of pre-colonial state experience on fragility is assessed. Bockstette *et al.* (2002) and Chanda and Putterman (2007), for instance, demonstrate that countries with longer and deeper experience in state governance can catch up faster. Third, we argue that high population at the time of independence is a human capital endowment, which would reduce fragility. This would also capture lack of slave trade, a counterfactual for export of slaves during colonization resulting in labour shortage.

The rest of the paper is organised as follows. Section 2 develops a structural model of state fragility to ascertain direct and long-lasting impact of colonial episode including various contemporary control variables such as GDP, quality of institutions, micro- and macro-economic policy, and luck. The latter is measured by world economic boom, which is hypothesised to engender fragility-reducing effects. Bad luck in terms of loss due to natural environmental hazards is also incorporated to compare the severity of damage due to colonial rule. Section 3 presents results generated from robustness checks of earlier findings. Section 4 attempts to examine the fragility-reducing and colonial incidence mitigating effects of different contemporary institutions. Final section 5 concludes the paper.

2. A structural model of state fragility incorporating initial conditions

The existing growth models do not focus on state fragility *per se*. In this literature, governance is taken as an important ingredient in the growth process. State capacity is one of the country characteristics having growth-promoting effects. Moreover, country characteristics including state capacity are more persistent than policies and shocks in determining growth outcomes. The neoclassical models with exogenous technical change and some models of technological diffusion treat growth as a worldwide process where country characteristics determine the relative level of income (Easterly *et al.* 1993). In this framework, random shocks and their influence on policies play a minor role in determining long-run path of income. In other words, any random shocks in such countries are likely to be transitory and in the long-run, the economy eventually converges to a steady state. Nunn (2007) develops a model that features multiple equilibria in the security of property rights and output per worker. It is shown that a period of severe extraction, by temporarily causing

the optimal equilibrium to disappear, can cause a permanent movement to significantly lower income levels. Since this low-income level equilibrium is stable, such states remain ‘stuck’ to this equilibrium even after the high income equilibrium returns.

In the light of the fragility trap and initial conditions, our basic fragility regression model specified in (a) below uses initial governance, colonial incidence and initial population abundance as deep determinants of state fragility (Lfragility).

$$(a) \text{Lfragility}_{it} = \beta_1 + \beta_2 \text{Linitial governance}_i + \beta_3 \text{Colonial incidence}_i + \beta_4 \text{Pop abundance at indep}_i + \boldsymbol{\psi} \mathbf{Z}_{it} + \varepsilon_{it}$$

$$(b) \text{Institutions}_{it} = \gamma_1 + \gamma_2 \text{Lfragility}_{it} + \gamma_3 \text{Institutions}_{i,t-1} + \vartheta_{it}$$

$$(c) \text{LrGDP}_{it} = \lambda_1 + \lambda_2 \text{Lfragility}_{it} + \lambda_3 \text{Institutions}_{it} + \lambda_4 \text{LrGDP}_{i,t-1} + v_{it}$$

In a first stage, the basic framework is augmented to include a vector \mathbf{Z} of contemporary control variables including LrGDP (log of output or log output per worker), quality of schooling measured by primary and secondary school completion rates, and institutional quality (Polity 2 variable representing degree of democracy). Two more equations are added to the basic model to form the system of equations. The institutional equation specifies state fragility and lagged institutions quality as major determinants of contemporary institutions. The LrGDP or output function uses degree of state fragility, institutional quality and past output values as explanatory variables. The inclusion of lagged dependent variables as regressors in these models captures the impact of (omitted) variables in the past having impact on current institutional quality and output. β_1 , γ_1 and λ_1 are the intercepts in the fragility, institutional and output functions, respectively while the remaining β_s , γ_s and λ_s represent coefficients on explanatory variables. $\boldsymbol{\psi}$, in the fragility equation (a), is a vector of coefficients associated with each explanatory variable constituting \mathbf{Z} .

Ordered fragility is constructed using published World Bank CPIA/IRAI data from 1995 to 2009, grouped as five-year averages. The variable aims to capture movements in and out of fragility by studying inter-quintile movements of countries over time. The variable ranges from 5 to 1 where a value of 5 is assigned for a country in quintile Q1, that is, the most fragile quintile. At the other end of the spectrum, a value 1 indicates position in the highly stable least fragile quintile Q5. Log of fragility (Lfragility) is used as dependent variable to capture changes in degree of fragility (See Appendix Tables 1 and 2).

Cumulative state experience from year 1 to 1950 C.E. is captured by the state antiquity index initially developed by Bockstette, Chanda and Putterman (2002) and later revised by Putterman (2007).

Colonial incidence variable is a product of higher settler mortality rate, inverse colonial duration and lack of education. Intensity of colonial experience is proxied by the log of colonizer settler mortality rates compiled by Acemoglu, Johnson and Robinson (AJR) (2001). Data on colonial duration is derived from Historical accounts of countries from Wikipedia Encyclopedia. Data on percent of population with no schooling in 1950 is taken as measure of lack of colonial education. (It is to be noted that most countries attained independence in early 1960s). The index is a normalized value of the interaction between three ingredients of colonial mentality by dividing with the highest value that

each component obtains. A weighted measure of colonial mentality is also generated using factor analysis method (See Appendix Table 3).

Extensive exports of slaves or other forms of bonded labour from labour scarce economies during colonization could cause labour scarcity and pose persisting constraint to current performance of these countries and keeping them in a fragility trap. Initial labour abundance would seem to reduce state fragility.

Among the remaining variables used in the regression as control, historical or distant past initial income is proxied by urbanization rate in 1500. Dataset on this variable is obtained from AJR (2002, 2005a,b) (see also Appendix A). Past initial per capita income (post-independence 1965) is taken from Sachs and Warner (1997). Data on historical education statistics and contemporary primary and secondary school completion rates are obtained from Barro and Lee (2010). Penn World Table Version 6.3 is used as source for data on population (Heston, *et al.*, 2009).

The full model is estimated using seemingly unrelated regression (SUR) technique to correct for any contemporaneous correlation between errors (ϵ , ϑ , ν) in the system (Wooldridge, 2010; Cameron and Trivedi, 2009). The underlying assumption is no reverse causality between the dependent variables in the three equations. It is important to mention that the results emanating using systems approach are generated by allowing for endogeneity of contemporary institutions that are instrumented with variables including pre-colonial, colonial and lagged values of contemporary institutions. Results in Table 1 (1a and 2a) show that, even after controlling for contemporary institutions and output per worker, colonial incidence remains an effective drag factor pulling countries into state of fragility. Moreover, higher levels of pre-colonial governance and initial labour abundance emerge as significant push factors enabling countries move out of extreme fragility. Contemporary political institutions (Polity2 for extent of democracy) dampen state fragility but fragility enhancing effect of colonial incidence remains significant. Contrary to *a priori* expectations, worker productivity enters insignificantly in our model. At low levels of income, a percentage rise in output per worker would not suffice to propel a country out of fragility. A very big push might be required. This illustrates the case of insufficient growth in a fragile country's output. Moreover, increased fragility is also reflected in reduced worker productivity (results 1b and 2b). Thus, the existence of significant fragility trap is evidenced, which may be attributed to unchanging initial conditions.

Table 1 Determinants of state fragility: SUR estimates, 1995–2009 (5 period averages)

Explanatory	Dependent variables					
	LFrugility	INST	LrGDP	LFrugility	INST	LrGDP
Variables	1(a)	1(b)	1(c)	2(a)	2(b)	2(c)
LFrugility		-1.07*** (-3.85)	-0.20*** (-4.29)		-0.79*** (-3.01)	-0.14*** (-4.51)
Institutions (Democracy)	-0.09*** (-4.76)		0.01 -0.15	-0.10*** (-5.76)		0.00 (0.05)

(Contd.)

Explanatory	Dependent variables					
	LFraility	INST	LrGDP	LFraility	INST	LrGDP
LrGDP (log real output per worker)	-0.01 (-0.58)			-0.05 (-0.98)		
Linitial	-0.22***			-0.20***		
Governance	(-5.33)			(-5.43)		
Colonial incidence (un-weighted)	0.43** (2.17)					
Colonial incidence (weighted)				0.09+ (1.61)		
Initial population	-1.32**			-1.44**		
Abundance	(-2.09)			(-2.23)		
PSC	-0.01*** (-3.76)			-0.01*** (-2.75)		
SSC	0.01 (1.33)			0.01* (1.67)		
Institutions(-1)		0.76*** (13.94)			0.77*** (14.37)	
LrGDP(-1)			0.89*** (23.46)			0.99*** (49.00)
Constant	1.70*** (2.89)	2.50*** (5.79)	1.10*** (3.25)	2.01*** (4.08)	2.31*** (5.24)	0.17 (1.01)
R ²	0.45	0.67	0.96	0.43	0.7	0.95
Obs	115	115	115	115	115	115

***, **, *, +: represent significance at 1%, 5%, 10% and 11%, respectively.

Notes: (i) Definition of variables as in Table 1; (ii) LrGDP denotes log output per worker (ii) PSC, SSC: Primary and secondary schooling completion rates, respectively measured at the beginning of each period

Another interesting result is that primary education reduces state fragility while higher secondary education apparently engenders fragility-enhancing effect (result 2a). We conjecture that very fragile states would not have the ability to match rising expectations of a more educated population at higher secondary level even though the willingness to do so may exist. In this way, a negative association would exist between higher secondary schooling and state capacity to reduce fragility. Moreover, increased instability resulting from higher unmatched expectations may push the state further towards extreme fragility. Huntington (1968), for example, postulates that better educated people in weak political contexts are more able to organise protests and foster other forms of instability. Davidson (1992) notes that Western style educated elites in African economies would have been alienated from the 'common' people thereby contributing to situation of legitimacy crisis in weak African states. Bush and Saltarelli (2000) document that colonial governments used education for divide and rule politics, resulting in ethnic tensions in several African and non-African countries with destabilising effects.

The upshot is that while democratic institutions produce fragility-reducing impact, the force of colonial incidence remains statistically significant having adverse influence on state fragility. It can be argued that this result may contain the fragility-reducing effects of policy and luck factors over and above the effect of contemporary institutions. Moreover, the underlying model estimates do not capture the reverse causality and feedback effects. The robustness of our findings is investigated by including policy and luck in the fragility equation.

3. Robustness checks

3SLS and 2SLS estimates have been obtained to check the robustness of our results in the event of simultaneity. While 3SLS technique assumes errors to be homoscedastic, the attractiveness of this approach is that it uses all exogenous variables in the system as instruments for the ‘potential’ endogenous variables appearing as explanatory variables in each equation in the system (Cameron and Trivedi, 2009). 2SLS approach enables to generate heteroscedasticity-robust estimators. The method has also been experimented using output per worker at the beginning of the period in the fragility function and instrumenting institutional quality with all exogenous variables and lagged values of institutions and output.

Among the policy variables, macro-policy is captured by inverse of inflation, openness and budget surplus while micro-policy is constructed utilising data on road development (kilometers of roads per land area), health (number of hospital beds per thousand people), provision of safe water (percent with access to improved water sources) and number of telephones (per hundred people). On the luck side, it is postulated that world economic boom would prove to be a good luck factor with fragility-reducing effects as well as colonial incidence mitigating effects. Environmental and natural calamities, on the other hand, may constitute bad luck factor. The cost of environmental damage (in US dollars) per thousand of population is used to ascertain the effects of environmental luck in the form of drought, earthquake (seismic activity), epidemic, extreme temperature, flood, insect infestation, mass movement dry, mass movement wet, storm, volcano and wildfire.

Instruments in 3SLS equations include exogenous variables in the system (i.e., Linitial governance, colonial incidence, initial population abundance, LrGDP, LrGDP², SSC, macro-policy, micro-policy, lagged institutional quality and lagged LrGDP). Additional instruments employed in equations 2 and 3 are real world growth rate and Lcost of environmental damage, respectively; 2SLS estimates reported as equations 4-6 assume institutional quality variable to be endogenous where lagged institutional quality is also used as instrument in the institutional regression; Lagged GDP by one period is used as regressor in equations 4-6 to avoid potential endogeneity problem; Due to space, additional equation estimates in 3SLS and 2SLS systems are not reported. Sources of data are contained in Appendix A. Given that GDP per worker is not statistically significant, in order to test our hypothesis of insufficient growth with fragility consequences, we postulate a non-linear quadratic relationship between output (log real GDP) and fragility. The additional advantage of this variable is that it provides a direct test for insufficient growth having

fragility-increasing consequence. The results (3SLS and 2SLS) are contained in Table 2. It is to be noted that the forthcoming analyses report results using weighted colonial incidence measure due to space constraint.

Table 2 Colonial incidence vs. institutions and policy: Pooled 3SLS and 2SLS estimates (Dependent variable: LFrugality)

Explanatory variables	3SLS estimates			2 SLS estimates		
	1	2	3	4	5	6
Linitial governance	-0.22*** (-2.76)	-0.20*** (-2.60)	-0.22*** (-2.79)	-0.13*** (-3.08)	-0.14** (-2.49)	-0.14** (-2.22)
Colonial incidence (weighted)	0.23** (2.08)	0.25** (2.32)	0.21* (1.97)	0.21** (2.32)	0.22** (2.20)	0.21** (2.21)
Initial population abundance	-11.0*** (-2.95)	-10.1*** (-3.04)	-11.0*** (-2.98)	-5.97*** (-3.11)	-5.95*** (-3.85)	-5.93*** (-3.79)
Institutions (Democracy)	-0.09** (-2.18)	-0.09*** (-2.62)	-0.13*** (-5.38)	-0.12*** (-4.26)	-0.12*** (-4.42)	-0.12*** (-4.29)
LrGDP (log real GDP)	4.26* (1.89)	3.65* (1.85)	4.25* (1.92)	0.96* (1.73)	0.92* (1.69)	0.95* (1.67)
(LrGDP) ²	-0.12* (1.88)	-0.10* (-1.83)	-0.12* (-1.91)	-0.03* (-1.69)	-0.02* (-1.67)	-0.03+ (-1.62)
SSC	-0.01 (-0.61)	-0.01 (-0.39)	-0.01 (-0.93)	0.02 (1.45)	0.02 (1.57)	0.02 (1.45)
Macro-policy	-0.22* (-1.81)	-0.21* (-1.84)	-0.22* (-1.83)	-0.22 (-1.90)	-0.07 (-1.12)	-0.08 (-1.10)
Micro-policy	0.41 (1.38)	0.35 (1.34)	0.41 (1.41)	-0.03 (-0.50)	-0.04 (-0.33)	-0.04 (-0.42)
Real world growth rate		0.14 (0.78)			0.06 (0.38)	
Lcost of environmental damage (per '000 population)			0.00 (0.64)			0.00 (0.67)
Constant	-33.9* (-1.79)	-29.2* (-1.76)	-33.8* (1.81)	-5.92 (-1.20)	-6.05 (-1.27)	-6.03 (-1.23)
R ²	0.51	0.58	0.52	0.72	0.72	0.71
Obs	38	38	38	38	38	38

***, **, *, +: represent significance at 1%, 5%, 10% and 11%, respectively; Robust t-statistics in parentheses.

Notes: Definition of variables as in Table 2 except for LrGDP, representing log of real GDP.

Both 3SLS and 2SLS results show that at lower levels of GDP, increments in GDP foster fragility but, as GDP increases further, fragility-reducing effects are evidenced as indicated by the negative coefficient on quadratic GDP variable. This confirms our earlier finding on insufficient growth characterising a fragile economy. Moreover, when only secondary schooling is used as regressor assuming that primary schooling is a component of former, coefficients on the variable remain insignificant in all specifications. 3SLS regression results nevertheless reveal that macro-policies have potential fragility-mitigating effects.

Micro-policies, by contrast, seem ineffective. As regards luck factor, higher world growth rate seems to be linked to more fragility (results 2 and 5). The finding, although with insignificant coefficient, may contribute to the contention that, when the world economy performs better, international income inequality increases, leaving fragile economies behind. In the development economics literature, such episodes are not uncommon and are greatly supported by the proponents of the endogenous growth theory. So, fragility carries over. Moreover, contrary to our expectations, environmental damage cost variable is statistically insignificant. In other words, an increase in severity of environmental damage does not necessarily lead to higher degree of state fragility. It is important to note that results generated by these alternative specifications reinforce each other in terms of significance of colonial drag even after controlling for inherited state governance and contemporary institutions (democracy).

4. State fragility, colonial incidence and contemporary institutions

Model (a-c) uses Polity2 as a measure of institutions, which captures only democracy and shows its dampening effect on fragility. Strikingly, in most of the estimations, the coefficients on colonial incidence are not only highly significant but are also larger than those on institutional variable. This result raises an important question: is colonial incidence an unavoidable drag into fragility or is there some governance channel that can achieve fragility-reduction (effect 1) via mitigation of the deleterious colonial effect (effect 2)? To address this issue, it is imperative to consider different governance dimensions of contemporary institutions. For this purpose, a broad distinction is made between political and economic institutions. Political institutions such as democracy, civil liberty, political stability and control on executives are expected to limit governments in their abilities to expropriate rents, reverse policy reforms, and abolish property rights. On the other hand, economic institutions are designed with a view to provide incentives to take decisions resulting in higher economic growth and welfare. Examples are government effectiveness, rule of law, control of corruption and protection of property rights.

We assess the relative strengths of political versus economic institutions in overcoming the fragility-enhancing impact of colonial incidence by interacting colonial incidence with different measures of institutions in regressions. In order to address any potential endogeneity of output in the structural model, we have used instrumental variable method and report robust IV-GMM along with OLS estimates (see footnote under Table 3 regarding choice of instruments). Micro-policy is excluded due to its insignificance in previous estimates. A significant, negative sign on interaction variable (contemporary institution and colonial incidence) would indicate dominance of contemporary institution over colonial incidence, which will also be corroborated by statistical insignificance of colonial incidence variable.

Interpretation of empirical results

Our empirical results show that the co-efficient on interaction variable (democracy and colonial incidence) and interaction variable (political stability and colonial incidence) yield

significant positive sign suggesting that fragility enhancing effect of colonial incidence overpowers fragility reducing effect of democracy and political stability, rendering the latter ineffective in eliminating the colonial incidence. This result is further confirmed by significant positive co-efficient on colonial incidence variable. However, just the opposite results are obtained when colonial incidence is interacted with economic institutions, namely government effectiveness and property rights. Our results confirm the superiority of economic as against political institutions in overcoming colonial drag (effect 2). This is shown by the highly insignificant signs on coefficients of colonial incidence in results 2a and 2b. Conversely, despite the presence of political institutions, fragility-deepening impact of colonial incidence is found to persist (equations 1a and 1b). As regards the indirect effects of political institutions, we find that amongst interacted political institutions, democracy and political stability seem to reinforce the negative impact of colonial incidence on fragility. Moreover, robust results are obtained on success of civil liberties in limiting the detrimental impacts of colonial incidence. While similar tendency is observed for control on executives, our weak results (significant only in regression 1b at 10% level) might indicate that the effectiveness of this measure would be severely hampered by colonial incidence.

Amongst all economic institutions, government effectiveness emerges as most successful contemporary institutional dimension in achieving fragility reduction via mitigation of colonial incidence (see robust significant impact evidenced in models 2a and 2b). Rule of law offsets the impact of colonial incidence in the GMM results while higher transparency seems to fail when we control for other measures of economic institutions. To sum up, while economic institutions produce both effects 1 and 2, political institutions seem to generate effect 1 only. In this way, both types of institutions work to reduce the state fragility but economic institutions reduce fragility by successfully mitigating the adverse effects of colonial rule. These results contribute to the contention that economic institutions by promoting incentives are crucial to state capacity building and overcoming the colonial slack through augmenting labour productivity.

Table 3 Investigating institutional channels of colonial influence: Results from pooled OLS and IV-GMM estimates (Dependent variable: LFrugality)

Explanatory variables	OLS		IV-GMM	
	1a	2a	1b	2b
Colonial incidence (weighted)	2.23*** (4.56)	0.01 (0.02)	2.62*** (6.72)	0.01 (0.03)
Linitial state governance	-0.16*** (-3.66)	-0.18** (-2.51)	-0.18*** (-5.09)	-0.20*** (-3.42)
Initial population abundance	-4.08*** (-3.36)	-4.10** (-2.65)	-5.79*** (-4.32)	-3.31* (-1.73)
SSC	0.01 (1.27)	0.01 (0.82)	0.01 (0.88)	0.01 (0.95)
LrGDP (Log real GDP)	0.91	1.60**	2.26***	1.70*

Explanatory variables	OLS		IV-GMM	
	1a	2a	1b	2b
	(1.23)	(2.04)	(2.93)	(1.85)
(LrGDP) ²	-0.03	-0.04**	-0.06***	-0.07*
	(-1.22)	(-2.05)	(-2.96)	(-1.89)
Macro-policy	-0.05	-0.11	-0.19*	-0.07
	(-0.43)	(-1.25)	(-1.84)	(-0.99)
Political institutions × colonial incidence				
Democracy	0.21+		0.33***	
	(1.63)		(3.17)	
Civil liberty	-0.66***		-0.80***	
	(-3.06)		(-4.42)	
Control on executives	-0.07		-0.19*	
	(-0.55)		(-1.86)	
Political stability	0.31**		0.30**	
	(2.33)		(2.50)	
Economic institutions × colonial incidence				
Govt. effectiveness		-0.67**		-0.70***
		(-2.53)		(-3.18)
Property rights		-0.00		-0.00
		(-0.50)		(-0.01)
Rule of law		-0.28		-0.77**
		(-0.63)		(-2.36)
Control of corruption		0.45		1.27**
		(0.65)		(2.17)
Constant	-6.71	-13.0*	-18.5***	-13.9*
	(-1.06)	(-1.93)	(-2.76)	(-1.77)
N	50	51	50	48
R ²	0.62	0.59	0.56	0.59
adj. R ²	0.51	0.47	0.43	0.46
Hansen J-test for overidentification [p-value]			6.66 [0.16]	3.47 [0.32]
Endogeneity test [p-value]			5.63 [0.02]	4.22 [0.04]

Robust t statistics in parentheses; + p<0.12, * p<0.10, ** p<0.05, *** p<0.01

Notes: Definition of variables as in Table 3. In addition to exogenous variables present in fragility equations, LrGDP in GMM models is instrumented with lagged real output, and a set of geographic measures including landlocked dummy, tropical location, geographic regions. Ethic fractionalisation is also used in regression 2b.

Findings in Table 3 confirm superiority of economic institutions over political institutions in overcoming colonial drag (effect 1) and alleviating fragility (effect 2). This is shown by the highly insignificant coefficients on colonial incidence in results 2a and 2b when (interacted) economic institutions variables are controlled for. Conversely, despite the presence of political institutions, fragility-deepening impact of colonial incidence is found to persist (equations 1a and 1b). Strikingly, democracy and political stability increase

fragility. Moreover, civil liberty (both OLS and IV-GMM estimates) and control on executives (in terms of only IV-GMM estimates) generate the fragility reducing effects. While all economic institutions yield better results, government effectiveness emerges as most successful contemporary institutional tool in achieving fragility-reduction as well as mitigation of colonial incidence (robust significant impact evidenced in models 2a and 2b). Rule of law reduces fragility and control of corruption increases fragility (only GMM results). Institution of property rights however produces neither result.

Three perverse results on the role of political stability, control of corruption and property rights need separate consideration. Political stability and control of corruption are found to be fragility enhancing and property rights do not generate any meaningful result. It can be conjectured that political stability may not help in improving the investment climate if the countries are in the fragility trap at low level of equilibrium. What may be required is, as the sufficient condition for fragility alleviation, some new political alignments with big-push policy strategies. Moreover, control of corruption is shown to be fragility enhancing, which can indicate the limitations of such legislations and implemental bottlenecks.

5. Conclusion with policy implications

Findings in this paper support the existence of a low-equilibrium fragility trap, which would reflect persistent deleterious impact of colonial episode. What is demonstrated is that the situation is compounded as increases in current output and secondary schooling seem insufficient to push countries out of extreme fragility. The crux of the issue therefore is to address the dual problems of fragility as well as colonial drag. A vast literature exists to show that colonial governance has detrimental growth effects while post-colonial institutions have boosted development and state capacity. These studies however do not analyse the role of post-colonial institutions in reducing fragility by overcoming adverse effects of colonial institutions. We extend this literature by examining the impact of pre-colonial, colonial and post-colonial institutions on fragility. In the first case, our analysis reveals that pre-colonial state governance and population abundance at time of independence (lack of large-scale slave trade) engender -reducing impacts. These historical endowments however are not strong enough to overcome colonial drag.

In the second case, we examine the efficacy of different regimes of contemporary institutions that matter more for weakening the force of colonial incidence (effect 1), apart from significantly reducing fragility (effect 2). Empirical results reveal that different types of institutions seem to be similar in terms of effect 2 but they differ significantly in terms of effect 1. More specifically, economic institutions described by rule of law and government effectiveness produce both effects 1 and 2. By contrast, while political institutions measured by civil liberties dampen fragility, the force of colonial incidence seems to carry over in the presence of these institutions. Similarly, control on executives is to some extent fragility-reducing but seems to exhibit weak ability to mitigate colonial incidence. Interestingly, both democracy and political stability are fragility enhancing without mitigating colonial incidence. It may be argued that political institutions provide macro-level environment engendering fragility reducing effects whereas economic institutions generate incentives

and raise worker productivity at the micro level. In other words, economic institutions seem to overcome colonial slack by having direct positive impact on worker productivity.

What is instructive is that political stability and control of corruption are found to be fragility enhancing and property rights do not generate any meaningful result. It can be conjectured that political stability may not help in improving the investment climate if the countries are in the fragility trap at low level of equilibrium. Even increases in output and secondary schooling result in unmatched expectations and perpetuate fragility. Strikingly, world economic booms as luck factor do not favour fragile states and macro-policy exhibits limited success. What may be required, as a sufficient condition for fragility alleviation, is to undertake some new political alignments with big-push strategies and international aid and technology transfer.

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Appendix A

Variables used and sources of data

Variables	Description and source
Lfragility	Natural logarithm of ordered fragility variable constructed using average position in World Bank CPIA quintiles over the period 1995-2009. The variable takes values from 1 to a maximum of 5. Value 5 is associated with position in the most fragile quintile Q1 while value 1 is assigned if country is located in the least fragile quintile Q5. Source: World Bank (2013a) for data on CPIA (also known as IRAI or IDA Resource Allocation Index) from 2005 to 2009. CPIA data for years 1995 to 2004 were obtained upon request from the World Bank.
Initial governance	State antiquity index Version 3 (year 1 to 1500). Source: Putterman (2007).
Log settler mortality rate	Log of European settler mortality rate at the time of colonisation. Source: Acemoglu <i>et al.</i> (2001), Teorell <i>et al.</i> (2013) and Albouy (2012).
Duration of colonial rule	Duration of colonial rule till time of independence. Dataset constructed by author from historical accounts reported in Encyclopedia Britannica as well as Lange, Mahoney and vomHau (2006). In our sample, Ethiopia and Nepal are recorded as not colonised while Liberia is regarded as a colony till date of independence.
No colonial schooling	Proxied by lack of schooling in 1950. Source: Barro and Lee (2010).
Linitial worker productivity	Log of worker productivity at (or close to) year of independence. Source: Computed using data from Heston <i>et al.</i> (2012).
Linitial income	Post-independence income proxied by log of per capita income in 1965. Source: Sachs and Warner (1997),
Initial population abundance	Measured as log (population 1960 /population in 1950). Computed using population data from Penn World Table 6.3 published by Heston <i>et al.</i> (2012).
Log real output per worker (LrGDP)	Log of real output per worker. Source: Heston <i>et al.</i> (2012)
Log of real GDP (LrGDP)	Log of real output. Source: World Bank (2013a)
Institutions (Polity2)	Freedom House Polity 2 index for democracy. The indicator ranges from 0 to 10 where 10 indicates the highest degree of democracy. Source: Reported in Teorell <i>et al.</i> (2013).
PSC	Primary schooling completion rate. Source: Barro and Lee (2010).
SSC	Secondary schooling completion rate. Source: Barro and Lee (2010).
Macro-policy (weighted)	Weighted composite index using factor analysis method. Sources of data: budget surplus and inflation data are from World Bank (2013a), and openness data from Sachs and Warner (1995).
Micro-policy (weighted)	Weighted composite index of micro-policies using factor analysis method. Policies considered include kilometer roads per area (in km ²), number of hospital beds per thousand people, percent people with access to improved water sources and number of telephones per hundred people. Source: World Bank (2013a).
Real world growth rate	Real world growth rate, five year average. Source: Shane (2012).

(Contd.)

Variables	Description and source
Lcost of environmental damage per '00 population	Log of cost of damage due to environmental catastrophes (in US dollars) per thousand population. Data on a wide range of environmental calamities such as drought, earthquake (seismic activity), epidemic, extreme temperature, flood, insect infestation, mass movement dry, mass movement wet, storm, volcano and wildfire is obtained from EM-Database at http://www.emdat.be/ . Population data is obtained from World Bank (2013a).
Govt. effectiveness, rule of law, control of corruption, political stability	A value of -2.5 for these measures of institutional quality corresponds to worst governance, zero is average governance and +2.5 is best governance. Source: World Bank (2013b).
Civil liberties, property rights, control on executives	Computed from Freedom House index of civil liberties with grades 1 (least free) to 7 (most free) assigned to countries. Freedom House index of property rights ranges from 0 and 100, where 100 represents the maximum degree of protection of property rights. A seven-category scale is used for control on executives where 0 denotes no constraint on executive actions. Source: Teorell <i>et al.</i> (2013).

Appendix B: Statistical Tables

Table 1: Assessing fragile equilibrium (1995-2009)

	Countries at any point of time in:		
	Fragility (Q1/Q2)	Q3	Non fragile quintiles (Q4 /Q5)
No. of countries	53	53	51
No. Stayed in Fragility (Q1 and Q2) 1995-2009	15 (28.30)		
No. Moved in Fragility (Q1 or Q2) by 2009	16 (30.19)	15 (28.30)	9 (17.65)
Total fragile in 2009	31 (58.49)	14 (26.41)	9 (17.64)
Countries ranked Q3 in 2009	11 (20.75)	15 (27.78)	9 (17.65)
Least fragile (Q4&Q5) in 2009	11 (20.75)	24 (45.28)	33 (64.71)
Remark on stability of quintiles	Relatively Stable in	Unstable	Stable out

Note: Figures in () represent percentages. Indonesia, Kosovo, Serbia and Montenegro and Albania have been omitted in the computations due to only one or two year data availability.

Source: Computed using CPIA data from World Bank website for 2005-2009 and data provided by World Bank staff for years 1995-2004.

Table 2: Geographic distribution of countries across fragile categories, 2009

Geographic distribution (Percent)	Category A Q1	Category B Q2	Total A + B	Category C*			
				Total	Q3	Q4	Q5
Africa [41]	80.00 (29.3)	62.50 (28.2)	70.97 (53.7)	42.22 (46.3)	42.85 (14.6)	46.67 (17.1)	41.18 (14.6)
SSA [39]	73.33 (28.2)	56.25 (23.1)	64.51 (51.3)	42.22 (48.7)	42.85 (15.4)	46.67 (17.9)	41.18 (15.4)
South Asia [8]	6.67 (12.5)	6.25 (12.5)	6.45 (25.0)	13.33 (75.0)	14.28 (25.0)	13.33 (25.0)	5.88 (25.0)
East Asia & Pacific [12]	6.67 (8.3)	25.00 (33.3)	16.13 (41.7)	13.33 (58.3)	28.57 (33.3)	6.67 (8.3)	5.88 (16.6)
Asia [20]	13.33 (10.0)	18.75 (15.0)	16.13 (25.0)	33.33 (75.0)	35.71 (25.0)	33.33 (25.0)	29.41 (25.0)
LAC [9]	6.67 (11.1)	0.00 (0)	3.22 (11.1)	15.56 (88.9)	7.14 (11.1)	20 (33.3)	17.64 (44.4)
No. of countries	15	16	31	48	14	15	17

Notes: (i) *: excluding Kosovo and Serbia and Montenegro for which only one year CPIA is reported in 2005 and Albania with rankings in years 2005 and 2006; (ii) Figures in [] report number of countries in each geographic region; (iii) Figures in () represent the percentage of countries in each region in terms of their location in Categories A, B or C in 2009.

Source: Authors' computation

Table 3: Colonial labor mentality according to countries and regions

Countries	Colonial labor mentality I (Interactive/un-weighted measure)	Colonial labor mentality II (Factor analysis/weighted measure)
Africa		
Algeria	2.31	2.97
Benin	3.05	3.75
Burundi	2.89	4.05
Cameroon	2.81	3.84
Central African Republic	2.83	4.05
Congo, Dem. Rep.	2.72	3.79
Congo, Republic of	2.71	3.73
Cote d'Ivoire	3.65	3.98
Egypt	1.94	3.76
Gabon	3.21	3.64
Gambia, The	5.00	4.12
Ghana	4.66	3.21
Kenya	2.28	3.45
Lesotho	1.12	2.39
Liberia	2.20	4.61
Malawi	1.84	3.23
Mali	4.34	5.00
Mauritania	2.54	3.10
Mauritius	1.27	1.73
Mozambique	4.04	2.89
Niger	2.70	4.46
Rwanda	3.00	4.07
Senegal	2.38	2.43
Sierra Leone	4.07	3.77
South Africa	1.00	1.44
Sudan	2.22	3.60
Tanzania	2.23	3.68
Togo	3.47	4.30
Tunisia	2.17	3.35
Uganda	2.56	3.81
Zambia	1.97	3.45
Zimbabwe	1.72	3.16
<i>Mean</i>	<i>2.716</i>	<i>3.525</i>
<i>Standard deviation</i>	<i>0.97</i>	<i>0.76</i>
South Asia		
Afghanistan	2.53	3.54
Bangladesh	2.41	2.63

Countries	Colonial labor mentality I (Interactive/un-weighted measure)	Colonial labor mentality II (Factor analysis/weighted measure)
India	2.06	2.47
Pakistan	2.19	2.54
Sri Lanka	1.14	1.74
<i>Mean</i>	<i>2.065</i>	<i>2.583</i>
<i>Standard deviation</i>	<i>0.55</i>	<i>0.64</i>
Latin America and Caribbean		
Argentina	0.44	1.48
Belize	0.43	1.89
Bolivia	2.14	2.26
Brazil	2.04	2.21
Chile	0.67	1.52
Colombia	1.31	1.82
Costa Rica	0.68	1.52
Dominican Republic	1.56	2.01
Ecuador	1.52	1.94
El Salvador	2.14	2.25
Guatemala	2.26	2.30
Guyana	0.47	1.03
Haiti	2.92	3.27
Honduras	2.08	2.22
Jamaica	0.68	1.43
Mexico	1.49	1.89
Nicaragua	2.50	2.53
Panama	1.30	1.99
Paraguay	1.18	1.82
Peru	1.37	1.86
Uruguay	0.53	1.64
Venezuela	1.64	2.01
<i>Mean</i>	<i>1.425</i>	<i>1.950</i>
<i>Standard deviation</i>	<i>0.74</i>	<i>0.46</i>
East Asia and Pacific		
Fiji	0.44	1.51
Vietnam	1.40	2.86
Papua New Guinea	2.82	3.63
Malaysia	1.41	1.39
Laos	2.02	3.50
<i>Mean</i>	<i>1.619</i>	<i>2.578</i>
<i>Standard deviation</i>	<i>0.88</i>	<i>1.07</i>

Notes: (i) Colonial labor mentality indices are computed using data on European settler mortality rate, duration of colonialism and lack of education in 1950; (ii) Regional means and standard deviations are reported.

Source: Author's computations.