

Illiteracy, Colonial Labor Psychology and Productivity at Independence: *An International Perspective*

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Abstract

New colonial labor psychology (CLP) indices are constructed using historical colonial variables that impacted (initial) labor productivity at independence, directly and indirectly. Among the CLP ingredients, we postulate colonial illiteracy or lack of colonial education to have been primary mechanism for engendering CLP. Novel measures of illiteracy are generated capturing the relative disparity between uneducated population in a formerly colonized country at independence versus that in colonizer nations. Interestingly, these indices also reflect setback faced by late independence gainers versus early ones, depending on the prevalence of educational provision worldwide. Robust empirical results emanating from cross-country regressions confirm lack of education (all measures) as key CLP ingredient, directly impacting initial labor productivity. Conversely, settler mortality rate and colonial duration exert indirect influence via education disparity channel. Persistent detrimental effects of CLP on contemporary labor productivity, human capital, and institutional quality highlight the formidable challenge in overcoming colonial legacy hangover.

Keywords: Colonial labor psychology; Colonial education policy; Labor productivity; Institutional quality; Economic history

JEL: N30

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1. Introduction

This paper empirically captures colonial domination in nations through lack of education as deep determinant of colonial labor psychology of the colonized, having major consequences for their productivity at independence. Colonial labor psychology here refers the mindset of a colonized worker (native, imported forced or bonded labor) resulting from extensive subjugation by colonial masters (e.g., see Li 2017), affecting his/her self-esteem, creating inferiority complex, and involving rejection of anything that is indigenous such as culture and traditional knowledge systems (Bulhan 1985, Okazaki 2008). While these effects of colonialism are widely acknowledged in the literature, no attempt has been made to construct a colonial labor psychology index or to empirically examine the effect of such mindset on laborers' incentives and supply of effort at time of independence. The present paper seeks to address this gap in the literature. Lack of education or illiteracy is measured in absolute terms, as the incidence of uneducated population, and in relative terms, as educational disparity between colonizer and colonized, not attempted previously. This angle of research constitutes a departure from the mainstream literature that has emphasized the role of colonial education, rather than its absence or disparity, on socio-economic outcomes of former colonies.

Colonial rule as a source of underdevelopment has been captured in several important but piecemeal ways in empirical studies. These include (a) colonial status and identity (Barro 1998);

(b) European share of population in the early stages of colonization (Easterly and Levine 2016); (c) type of colony classified by extractive versus developmental institutions depending on higher and lower European settler mortality rates due to disease environment (Acemoglu et al. 2001, 2002); (d) colonial legal origins – common law (British) vs. civil law (French, German, etc.) (La Porta et al. 1999, 2008); (e) slave trade (Nunn 2007, 2009); (f) severe social and economic inequalities during extractive colonial episode leaving little incentive to supply effort and leading to current institutional decline (Sokoloff and Engerman 2000); and of greater relevance to this study (h) colonial education having long-run effects.

The latter strand of the literature has emphasized the role of colonial education by colonizer identity in explaining post-colonial development (Grier 1999; Cogneau and Moradi 2014) and in determining contemporary education levels (Feldmann 2016). Persistent effect of colonial human capital through time is documented by Huillery (2009) for countries in West Africa, Wantchekon et al. (2015) for Benin, and Rochas et al. (2017) for regions of Brazil with differing levels of settlement. Using a sample of world countries, Glaeser et al. (2004) show colonial human capital endowment (measured in 1960) as being more important for subsequent growth than institutions (captured by constraint on executive, level of autocracy and democracy in 1960). In a similar vein, Bolt and Bezemer (2009) advance that the disease environment in Africa impacted long-term growth via a human capital channel (colonial education) rather than through an extractive institutions channel. Bush and Saltarelli (2000) however argue that colonial education would have undermined local populations' beliefs and promoted social fragmentation, thereby contradicting the belief that education generated only benefits in former colonies.

The primary aim of above-mentioned literature has been to investigate linkages between characteristics of the European colonization era and post-independence performance of countries measured by their growth trajectories, educational attainments, or institutional quality (see Michalopoulos and Papaioannou 2020, for a recent survey). We record no explicit attempt in these analyses to develop some composite measure of colonial incidence capturing colonizer domination that would have deeply affected the mindset of the colonized labor, lowering their productivity at time of independence. Our paper is an effort in this direction.

Unlike earlier research that focused largely on isolated aspects of European colonial rule, we consider that the interaction between key aspects of colonialism better captures the extent of subjugation exercised by colonizers, generating colonial labor psychology (CLP) of the colonized workers with adverse effect on their efficiency. Lack of colonial education is hypothesized to be deep determinant of CLP. Two novel measures of colonial illiteracy are developed to test our proposition based on the difference between incidence of uneducated population in a formerly colonized country at time of its independence and the mean uneducated population in advanced colonizer countries in the same year. We contend that higher relative disparity may reflect greater domination motives of colonizers, strategically abstaining from further educational investments and causing deeper damage to the colonized labor's psyche, manifested as inferiority complex, discouragement, and lack of trust in own enterprise. These new indicators would also unfold the extent of challenges faced by *late* and *early* freed nations in the 'new' world governed by global institutions favoring former colonial rulers. The early demise of colonization when educational provision was not prevalent worldwide lowers educational divergence between colonizer and colonized, reducing CLP.

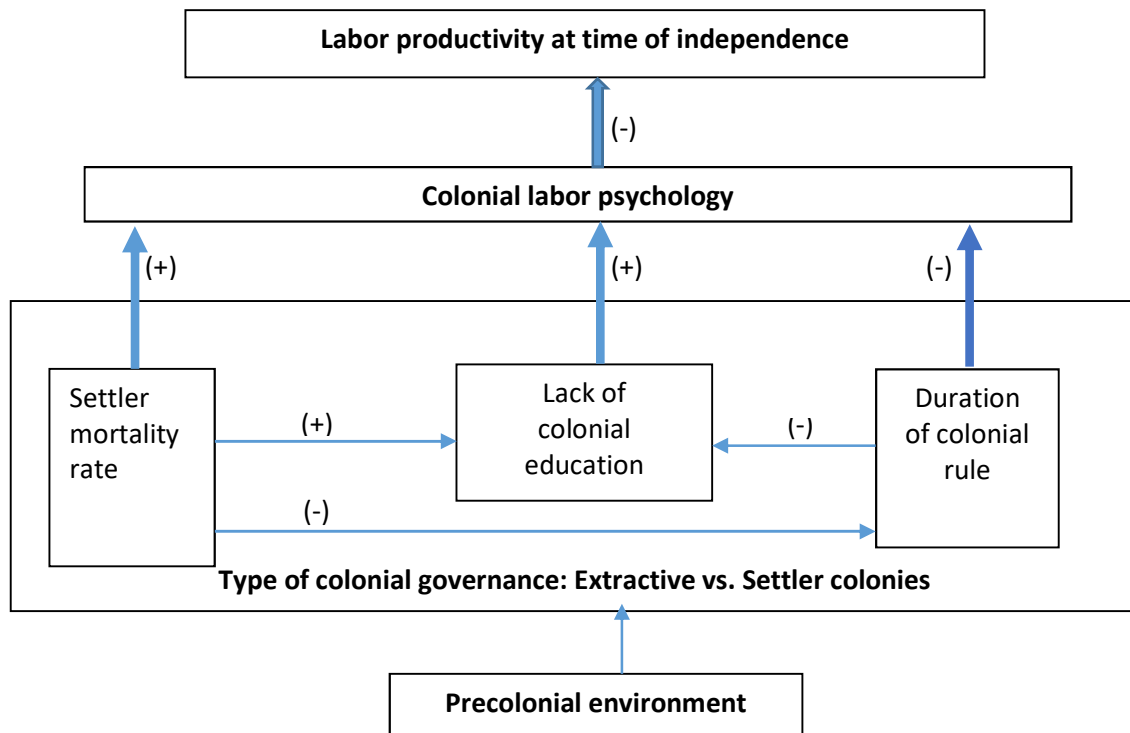
Additional colonial aspects considered are settler mortality rate influencing colonizers' motive to establish settler or extractive colonies and duration of colonial rule reflecting long-run perspective. The significant colonial variables affecting labor productivity at independence (directly or through some transmission channel) are employed to generate weighted CLP indices. Such strategy enables more meaningful comparisons to be drawn between governance approaches used by different colonial entities or incentives implied by various colonial legal systems. Moreover, lasting impact of CLP on current labor productivity, human capital and institutional quality may suggest the newly developed indicators be appropriate instruments for these contemporary endogenous factors in empirical research and growth models (subject for further research).

The paper is organized as follows. In Section 2, we develop a recursive framework to model inter-relationships between initial labor productivity and our posited determinants of colonial labor psychology. Section 3 empirically tests the models using historical data and computes composite CLP indices from alternate measures of lack of colonial education and other colonial variables. The performance of these indices is assessed based on their predictive power (versus the individual colonial psychology dimensions) in explaining initial output per worker and, as robustness test, early worker productivity in 1970. In Section 4, historical insights supplement comparisons of CLP indicators according to regions, colonizer entities and legal origins. Section 5 tests for the persistence of CLP on contemporary labor productivity, human capital, and institutions. The final section concludes.

2. Modeling colonial labor psychology and initial labor productivity: A recursive framework

Colonial labor psychology is an unobserved variable. We postulate that colonial intensity manifests from interactions between several dimensions of colonial rule, shaping CLP and affecting initial labor productivity. The three dimensions considered are: lack of colonial education, settler mortality rate and duration of colonial rule. Our premise is that lack of colonial education would be primary channel of colonial domination and intensity, producing more severe demoralizing effects on colonial labor psychology and on worker performance. Moreover, incidence of uneducated population at time of independence would reflect unpreparedness to face the New World order with likely persistent repercussions on nations' performance. To demonstrate this, we construct new measures of lack of colonial education capturing the disparity between human capital of natives and that of colonizers. Lack of education is augmented by colonizers' exploitative psychology, which would depend on settler mortality rate and duration of colonial rule. Higher settler mortality would have caused European colonizers to adopt shorter time horizons with associated severe extractive colonial institutions for reaping quick profits before they leave. In more extractive colonies, colonizers would have laid less emphasis on human capital development since they required a large unskilled force to work on plantations or mines. Larger population with no education may also correlate with high inequality levels (Sokoloff and Engerman 2000) that aggravated colonial incidence. The expected inter-linkages between the different aspects of colonization and their impact on initial labor productivity are illustrated in Figure 1.

Fig. 1 Colonial governance, colonial incidence and initial labor productivity



Source: Authors' postulations.

Notes: Thick arrows represent direct impact of variable(s) in the direction indicated; light arrows display likely indirect transmission channels of the CLP ingredients, reinforcing or dampening each other's effects.
(-/+) (~/+)

Direct impacts and indirect impacts of each colonial dimension on CLP are depicted by the thick and light arrows, respectively. Inter-relationships between these variables manifest as indirect channels of transmission on colonial intensity. For example, higher settler mortality rate may directly reduce initial worker productivity due to more severe treatment of the indigenous or imported (slave or indentured) labor to subjugate them and reap quick benefits. Indirect effects of settler mortality on productivity, on the other hand, would be routed via its influence on lack of colonial education and colonial duration.

In econometric terms, the framework in Figure 1 depicts a recursive system with no reverse causality between initial labor productivity and the various endogenous colonial governance variables, namely lack of colonial education, settler mortality and colonial duration. Thus, settler mortality is expected to reduce colonial duration, provision of education and worker productivity but does not depend on any these variables. Similarly, colonial duration affects education and initial worker productivity without being determined by them. Lack of education is posited to exert only direct influence on initial labor productivity, without feedback.

The figure also portrays the role of the precolonial environment, including physical geography (e.g., disease environment) and characteristics of pre-colonial civilizations that may have shaped the type of colonies instituted (settler vs. extractive), thereby indirectly impacting initial labor productivity. Higher level of accumulated state experience in pre-colonial times and higher density of pre-colonial populations indicating increased urbanization and development may have increased settling down costs of the colonizers due to greater threat of resistance (Acemoglu et al. 2001, 2002). Level of development and accumulated state experience of ancient civilizations might be associated to higher settler mortality rate, on one hand, and shorter duration of stay and lower level of colonial investment in education, on the other. These postulations are empirically verified in Section 4 after dealing with colonial illiteracy and CLP measurement issues.

3. Constructing measures of lack of colonial education and CLP

3.1 Lack of colonial education

We develop three alternate measures of the postulated key ingredient of CLP, namely lack of colonial education or colonial illiteracy. The first one is straightforward, that is, the percentage uneducated population between ages 15 to 64 at (or closest to) year of independence (denoted as ‘ilu’), using information from Barro and Lee (2013) and Lee and Lee (2016). Additionally, we construct two new measures of lack of colonial education (not attempted before) that aim to capture former colonies’ disadvantage due to illiteracy relative to colonizer nations. It is conjectured that, for a given level of colonial illiteracy, extent of this drawback would magnify over time as education provision expands worldwide. Thus, countries in the Latin America and Caribbean (LAC) region, for example, which gained freedom in an era when education provision was very low, including in colonizer nations, might have experienced less setback at independence than countries that became independent in later years. We use data on uneducated population in advanced economies grouped according to Lee and Lee (2016) as benchmark for comparison. The list includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, USA, and UK. Disparity in education is captured in two ways. First, we use the difference between percent uneducated in a country and the mean percentage uneducated population in advanced economies (denoted as ‘ilu_diff’). Second, this difference is weighed using the standard deviation of uneducated population in the advanced countries sample (called ‘ilu_extent’). Greater dispersion within the high-income countries group that existed in the 1800s and early 1900s more specifically would thus depress the degree of disadvantage faced by an early colonized country became free during those years.

Table 1. Summary statistics of pre-colonial variables, colonial variables and initial conditions (world and selected regions)

World			Africa			South Asia			EAP			LAC		
N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD

Initial worker productivity (ln)	104	8.6	1.1	43	7.8	0.8	6	7.5	0.3	11	8.9	1.2	15	9.4	0.6
Onset col (yr)	132	1747.7	156.3	51	1820.0	122.0	8	1730.0	162.0	22	1792.6	134.1	33	1570.1	67.5
End col (yr)	132	1936.0	65.7	51	1962.9	19.0	8	1946	13.5	22	1963.8	24.6	33	1887.8	73.4
Col duration (yrs)	182	137.9	146.0	52	140.1	126.7	8	199.8	163.6	27	139.4	140.0	33	317.7	58.7
ilu (%)	95	68.3	29.8	37	72.1	24.2	6	79.1	23.0	14	47.2	26.6	25	77.0	35.2
ilu_diff (%)	95	45.6	29.3	37	61.7	22.8	6	62.8	21.9	14	32.7	31.8	25	29.0	15.1
ilu_extent	95	2.5	1.8	37	3.8	1.4	6	2.8	1.0	14	1.9	1.6	25	1.1	0.8
Settler mortality (ln)	86	4.6	1.3	37	5.4	1.2	5	4.1	0.4	13	3.9	1.2	26	4.4	0.4
Popden ₁₅₀₀ (ln)	181	1.1	1.8	51	0.7	1.7	8	0.3	1.6	27	1.6	1.8	33	0.9	1.9
State exp ₁₋₁₅₀₀	155	0.3	0.3	51	0.2	0.3	6	0.6	0.2	18	0.4	0.3	25	0.1	0.2

Source: Computed; see Appendix tables A.1 and A.2.

Notes: N: Number of countries; SD: Standard deviation; ln: natural log; ilu: percent uneducated population (ages 15-64) at independence; ilu_diff: percent uneducated population in country i at independence minus mean percent uneducated population in advanced countries in that year; ilu_extent is ilu_diff divided by the standard deviation of uneducated population in advanced countries; Popden₁₅₀₀: Population density in year 1500; State exp₁₋₁₅₀₀: Accumulated state experience, years 1-1500 (standardized values).

Table 1 presents summary statistics for key variables in our framework over selected world regions (see Appendix Table A.1 for data sources and Appendix Table A.2 for data on colonial illiteracy by country and regions). Uneducated population incidence measured by ‘ilu’ is highest in South Asia followed by LAC and Africa. However, when considering relative educational disparity at independence, Africa and South Asia regions clearly emerge as more disadvantaged than LAC and EAP (East Asia and Pacific) with respect to ‘ilu_diff’ and ‘ilu_extent’. Interestingly, initial worker productivity is also seen to be lowest in South Asia and Africa – both regions experiencing levels significantly lower than the world average. It seems that these regions experienced special damage to labor productivity that might be highly correlated to colonial education policy. Lowest level of lack of colonial education is recorded in North America (comprising 2 countries with mean ‘ilu’ at 27.6, ‘ilu_diff’, -31.6, and ‘ilu_extent’, -1.1), followed by Europe and Central Asia (3 countries with mean ‘ilu’ equal to 37.9, ‘ilu_diff’, 20.5, and ‘ilu_extent’, 0.9) (see Appendix Table A.2). Further, negative ‘ilu_diff’ and ‘ilu_extent’ values for settler colonies like New Zealand, Australia, and US indicate above-average initial educational provision.

As regards European settler mortality rate (Acemoglu et al. 2001, 2002), the African region records highest incidence with a mean (5.4) exceeding that of the world average (4.6) whereas all other regions witnessed rates lower than the world mean. Settler mortality in Africa could potentially be explained by pre-colonial conditions including indigenous populations and geography. Nevertheless, from Putterman and Weil (2010) data, the region appears to have been less densely populated in pre-colonial times (year 1500) as opposed to the EAP and LAC regions. Moreover, Africa had modest state antiquity or accumulated pre-colonial state experience (Borcan et al. 2018) as compared to South Asia and EAP. Probably geography and disease environment may have been particularly severe for the colonizers. These conjectures are formally tested in Table 2 where determinants of the colonial psychology aspects are investigated.

Regarding the onset and duration of colonization (inferred from Encyclopedia Britannica and Hensel, 2019), LAC countries were colonized earliest on average (in late 1500s) and obtained independence earlier than those in other regions – around the late 1800s. By contrast, countries in South Asia mostly became independent by mid-1940s and those in EAP and Africa, around early 1960s. The duration of colonization was shortest on average in Africa and EAP. Except in the LAC region, countries in Africa, EAP and South Asia typically attained freedom for colonial domination less than a century ago while duration of colonization exceeded 100 years. In this way, EAP, African and South Asian countries can be viewed as relatively young and we may reasonably conjecture that the populations that were subjugated during colonial episode would still carry deep psychological scars of the ‘colonial psychology virus’ with long-run ramifications.

3.2 Interlinkages among CLP ingredients: Empirical evidence

Table 2 reports empirical results on formal models assessing the inter-relationships between the variables posited to contribute to colonial labor psychology (refer to Figure 1). These results would provide insight on their appropriateness in constructing CLP indices. Ordinary least squares (OLS) estimators corrected for heteroscedasticity are displayed in columns (1) to (5). As robustness exercise, we also estimate the system with each measure of colonial illiteracy separately using the seemingly unrelated regression (SUR) method and test whether errors of equations in each system are contemporaneously correlated (see Appendix Table A.3). Highly insignificant Breusch-Pagan test statistic in each case confirms independence of the equations thereby validating the use of OLS (Intriligator 1983). Appendix Table A.1 contains description of variables and sources of data and Appendix Table A.2 lists countries in our dataset.

It is evident from equation (1) that geographic tropics and malarial incidence would have increased European settler mortality rates. Similar but weakly significant impact (12%) is obtained for pre-colonial population density indicating limited opposition from indigenous populations in controlling colonizers' strategies to take over the land. Accumulated state experience of the natives (from years 1 to 1500) however did not seem important in determining settler mortality. More advanced civilizations were not necessarily successful in keeping the enemy at bay. Colonizers may have resorted to different tactics such as pacifying / bribing 'chosen' natives to represent their interests rather than resorting to violence. The regional dummies representing Africa and LAC enter positively and significantly in equation (1)

indicating region-specific factors, not explicitly captured in our model, that were detrimental to colonizers' health.

Table 2 Ingredients of CLP and their inter-linkages – OLS results from recursive framework

	Settler mort. (ln) (1)	Col. Duration (years) (2)	Lack of colonial education		
			ilu (ln) (3)	ilu_diff (%) (4)	ilu_extent (5)
Precolonial variables					
Popden ₁₅₀₀ (ln)	0.10+ (1.67)	-0.41 (-0.08)	-0.06* (-2.02)	-1.62 (-1.41)	-0.06 (-0.82)
State exp ₁₋₁₅₀₀ (std)	-0.07 (-0.43)	-15.07 (-1.37)	0.30*** (4.34)	11.42*** (5.30)	0.49*** (5.30)
Colonial variables					
Settler mortality (ln)		8.51 (0.56)	0.36*** (2.80)	15.47*** (6.30)	0.82*** (6.39)
Col duration (years)			-0.003** (-2.55)	-0.05** (-2.35)	-0.002* (-1.76)
Natural resource abundance (ln)		46.27** (2.57)	-0.18** (-1.99)	-4.13 (-1.53)	-0.23 (-1.25)
Geography					
Malaria	1.07*** (2.83)				
Tropics (%)	0.82*** (2.84)				
Coastal		52.25** (2.43)			
Africa	1.49*** (3.63)	-80.83 (-1.43)	0.21 (0.65)	21.5** (2.45)	1.48*** (2.68)
South Asia	0.77+ (1.58)	240.6*** (4.41)	0.43 (1.03)	16.7 (1.18)	0.47 (0.66)
LAC	1.20*** (3.73)	105.60** (2.46)	1.12** (2.42)	12.8* (1.69)	0.029 (0.07)
Constant	2.81*** (8.35)	202.5** (2.22)	2.25*** (4.79)	-33.5*** (-2.63)	-1.79** (-2.23)
N	72	73	64	64	64
Adj-R ²	0.567	0.463	0.528	0.770	0.728

Source: Author's estimates. Heteroscedastic-robust statistics in parentheses; + p<0.12, * p<0.10, ** p<0.05, *** p<0.01. Notes: As for Table 1.

Regression (2) reports findings on duration of colonial rule. Higher settler mortality rate did not appear to influence duration of colonial episode (contradicting our hypothesis in Figure 1). Moreover, the expectation that higher population density in pre-colonial times would have led to shorter duration of stay due to higher colonizer settling down costs is also not supported. What appeared to have effectively extended duration of colonial rule were the colony's natural resource endowment (higher rents) and coastal location. Since the European wave of colonization relied primarily on sea routes, coastal countries were strategically used as trading posts or to gain access to deeper inland regions. Such colonies thus witnessed lengthier episode of colonial dominations. Also noteworthy in our results is the significance of the South Asia and LAC regional dummies in increasing colonial duration.

Equations (3)-(5) display results on the determinants of lack of formal colonial education measured by 'ilu' (log), 'ilu_diff' and 'ilu_extent', respectively. It is worth noting that we do not use logarithm of 'ilu_diff' (reg 4) or 'ilu_extent' (reg 5) as dependent variables unlike the case of 'ilu' so as not to lose observations for countries with negative relative illiteracy values. All results show greater incidence of uneducated (in absolute and relative terms) in colonies where settler mortality rate was more severe and duration of colonial rule shorter. Moreover, the prevalence of more advanced pre-colonial civilizations, captured by cumulative state experience from years 1 to 1500, significantly boosted 'lack of education' policy. Special care was taken to demoralize populations endowed with such state experience by destroying their accumulated heritage and knowledge, and by not substituting these with colonial education. Thus, the colonizers ensured that the people remain disadvantaged. Nevertheless, we also find that higher pre-colonial population density correlates with lower percentage of uneducated population at

independence, *ceteris paribus* (regression 3). This result is however not significant in models (4) and (5) where educational disparity (with respect to advanced colonizer countries) is the focus. We conjecture that colonizers and missionaries would have worked hand in hand to provide relevant basic education where required to reduce resistance from populous lands and render them submissive.

3.3 Ingredients of CLP and initial labor productivity

Effects of each potential ingredient of CLP on initial labor productivity are explored in Table 3, while controlling for region-specific characteristics. This sample however excludes most economies in LAC and North America that obtained independence prior to the 1900s as corresponding estimates on initial worker productivity are not available. Sensitivity of our results on lack of education is investigated using the alternate measures developed. Columns (1)-(3) report OLS results adjusted for heteroscedasticity. The robustness of the findings is ascertained in two additional ways. First, to address potential endogeneity of the colonial education variables (measured at time of independence), we adopt the Lewbel (2012) 2SLS approach that provides estimators when external instruments are either weak or not existent. The method exploits on heteroskedasticity in the data to construct instruments using available regressors. Lewbel 2SLS results are displayed in columns (4)-(6). The second robustness exercise involves attempting to generalize our conjectures on productivity effects of CLP ingredients using a more representative world-setting. This is achieved by testing the impact of the colonial variables on early worker productivity in year 1970, when about 85 percent countries in our sample had gained freedom. Such strategy expands our sample to now comprise countries that obtained independence before

mid-1900s. Further, as we have greater degrees of freedom, the models are augmented with additional controls, namely coastal location and latitude. The latter variable serves as proxy for institutional quality that also correlates with income level. OLS results are displayed in columns (7)-(9), respectively.

Table 3. Initial worker productivity at independence and CLP ingredients: Findings and sensitivity analysis

Dependent:	ln GDP per worker at independence						ln GDP per Worker 1970		
	OLS			Lewbel 2SLS			OLS		
	ilu(ln)	ilu_diff	ilu_ext	ilu(ln)	ilu_diff	ilu_ext	ilu(ln)	ilu_diff	ilu_ext
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Col	-0.30**	-0.01*	-0.23***	-0.38**	-0.02**	-0.34**	-0.33**	-0.01***	-0.25***
Illiteracy	(-2.43)	(-1.69)	(-3.08)	(-2.24)	(-2.31)	(-2.25)	(-2.48)	(-3.20)	(-3.39)
Settler	-0.11	-0.05	-0.00	-0.10	-0.08	-0.07	-0.22**	-0.15	-0.14
Mortality	(-0.96)	(-0.34)	(-0.03)	(-0.80)	(-0.52)	(-0.46)	(-2.06)	(-1.28)	(-1.22)
Col	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001
Duration	(1.13)	(0.78)	(0.69)	(0.89)	(0.07)	(0.18)	(0.69)	(0.76)	(0.87)
Africa	-0.80**	-0.80*	-0.75**	-0.76*	-0.59	-0.64	-0.18	0.03	0.07
	(-2.13)	(-1.93)	(-2.09)	(-1.88)	(-1.33)	(-1.55)	(-0.48)	(0.09)	(0.16)
South	-1.60***	-1.57***	-1.67***	-1.53***	-1.18**	-1.57***	-1.09***	-0.87**	-1.10***
Asia	(-4.26)	(-3.38)	(-4.76)	(-3.53)	(-2.25)	(-3.75)	(-2.83)	(-2.04)	(-2.94)
LAC	0.11	-0.06	-0.19	0.14	-0.15	-0.29	0.56*	0.37	0.18
	(0.32)	(-0.18)	(-0.59)	(0.39)	(-0.40)	(-0.80)	(1.72)	(1.15)	(0.54)
Coastal							0.55**	0.51**	0.50**
							(2.45)	(2.28)	(2.13)
Latitude							1.96***	1.58**	1.56**
(ln)							(3.05)	(2.42)	(2.50)
Constant	10.3***	9.40***	9.42***	10.6***	9.49***	9.58***	10.22***	9.18***	9.21***
	(21.7)	(18.3)	(22.1)	(11.71)	(15.53)	(14.19)	(15.9)	(19.01)	(18.39)
N	40	40	40	38	38	38	69	69	69
R ²	0.666	0.653	0.691	0.663	0.620	0.677	0.657	0.660	0.668
Adj-R ²	0.605	0.590	0.635				0.611	0.614	0.624
j				5.60	4.07	1.22			
Jdf				4	4	4			
Jp				0.23	0.40	0.88			
Endog-p				0.11	0.04	0.06			

Source: Computed. Heteroscedastic robust statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Notes: As for Tables 1 and 2. J-test is Hansen j-test for overidentification and, jdf and jp, corresponds the degrees of freedom and p-value of the J-test. Endog-p is the p-value for endogeneity test.

In Table 3, the coefficient on each posited CLP ingredient captures its direct impact on initial labor productivity. Robust evidence is obtained from OLS and Lewbel 2SLS results in columns (1)-(6) on lack of education (measured by ‘ilu’, ‘ilu_diff’ and ‘ilu_extent’) producing direct damage to labor productivity at independence. Interestingly, OLS findings reveal that ‘ilu_extent’ seems to pose greatest challenge to worker productivity, with one standard deviation rise inducing 0.41 percent decline in productivity as compared to 0.30 and 0.24 per cent productivity fall for comparable rise in ‘ilu_diff’ and ‘ln ilu’, respectively. As regards other colonial determinants of worker productivity, settler mortality and colonial duration are insignificant in specifications (1)-(6). In the light of Table 2 findings, their effects would be transmitted to initial labor productivity indirectly via lack of education route.

In an attempt to improve the worldwide regional representation of our sample, robustness exercise is conducted with worker productivity in 1970 as dependent variable. Heteroscedasticity-robust estimates from models (7)-(9) employing the expanded dataset show persistent debilitating consequences of colonial illiteracy (all measures) on early worker productivity, confirming its importance as key CLP ingredient. The explanatory power of the model improves when including educational divergence variables, with ‘ilu_extent’ performing better than ‘ilu_diff’. Settler mortality rate appears to exert direct effects on GDP per worker when ‘ilu’ is used colonial lack of education measure (reg. 7) but is insignificant in regressions including the relative educational measures. Duration of colonial rule is insignificant everywhere indicating that its influence on labor productivity would operate exclusively via education channel. It worth mentioning at this stage that when settler mortality rate and colonial duration are used as excluded instruments for colonial illiteracy, all colonial education variables in 2SLS

regressions emerge as exogenous in the initial worker productivity equations as well as early worker productivity (in 1970) functions (results with author).

3.3 Construction of alternative CLP indices and their impact on labor productivity

From the empirics in Tables 2 and 3, ‘lack of education’ emerges as prime ingredient of CLP, affecting initial labor productivity directly whereas settler mortality and colonial duration adopt education policy as transmission channel. Three new composite CLP indicators are generated by the principal component analysis method employing the predicted values of each educational measure, settler mortality and duration (Table 2, equations 1-5). This technique transforms a set of inter-related variables to a new set of variables called principal component that exhibits maximum variation in the data (Vyas and Kumaranayake 2006). Positive values of CLP are generated that lie between 0 and 6, where higher values indicate deeper colonial labor psychology from extractive colonialism. The advantages of such indices over using three individual channel variables in empirical analyses include (i) acknowledging the possibility of combined effects of these colonial dimensions having consequences on worker productivity; and (ii) gain in degrees of freedom improving precision of estimators.

OLS regressions (1)-(3) in Table 4 show direct and highly significant detrimental impact of CLP on initial worker productivity. In particular, the inclusion of CLP3, the weighted index using educational measure ‘ilu_extent’ (reg. 3), improves the predictive power of the model (adjusted- R^2) relative to CLP1 and CLP2, and also exhibits greater setback to initial labor productivity. These findings find support in Lewbel 2SLS results (4)-(6) generated with pre-colonial

population density in 1500 and log of area as external instruments. Nevertheless, insignificant p-values of the endogeneity tests confirm relevance of the OLS estimators. From the latter, one standard deviation increase in CLP3 is shown to reduce output per worker by 0.43 percent, exceeding the decline due to similar rise in CLP1 and CLP2 by about 1.15 times. Interestingly, throughout regressions (1)-(6), greater regional-specific adversity (not controlled for in our models) seems to have been witnessed in South Asia than in Africa.

Table 4 Colonial labor psychology, initial labor productivity and early worker productivity

Dep var:	ln(GDP per worker at independence)						ln(GDP per worker in 1970)		
	OLS			Lewbel 2SLS					
	CLP1 (ln ilu)	CLP2 (ilu_diff)	CLP3 (ilu_ext)	CLP1 (ln ilu)	CLP2 (ilu_diff)	CLP3 (ilu_ext)	CLP1 (ln ilu)	CLP2 (ilu_diff)	CLP3 (ilu_ext)
	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)	(6)
CLP index	-0.38*** (-3.69)	-0.37*** (-3.29)	-0.43*** (-3.75)	-0.52* (-1.69)	-0.48* (-1.76)	-0.58** (-2.21)	-0.48*** (-3.82)	-0.58*** (-4.10)	-0.62*** (-4.28)
Coastal							0.50** (2.23)	0.46** (2.07)	0.44* (1.96)
Latitude (ln)							2.15*** (3.55)	1.76*** (2.79)	1.76*** (2.82)
Africa	-0.74** (-2.66)	-0.77*** (-2.81)	-0.68** (-2.52)	-0.48 (-0.78)	-0.57 (-1.01)	-0.42 (-0.78)	-0.21 (-0.58)	-0.03 (-0.09)	-0.01 (-0.03)
South Asia	-1.66*** (-6.26)	-1.66*** (-6.16)	-1.76*** (-6.04)	-1.61*** (-4.08)	-1.62*** (-4.09)	-1.74*** (-4.67)	-1.24*** (-3.51)	-1.13*** (-3.04)	-1.30*** (-3.63)
LAC	0.11 (0.41)	0.02 (0.06)	-0.03 (-0.10)	0.16 (0.49)	0.03 (0.09)	-0.039 (-0.13)	0.41 (1.38)	0.27 (0.92)	0.14 (0.48)
Constant	8.80*** (37.73)	8.87*** (32.70)	8.88*** (36.38)	8.67*** (22.81)	8.78*** (26.9)	8.78*** (29.78)	8.02*** (22.43)	8.10*** (22.32)	8.15*** (21.90)
N	40	40	40	40	40	40	69	69	69
R ²	0.662	0.647	0.670	0.651	0.640	0.656	0.652	0.651	0.657
Adj-R ²	0.623	0.607	0.632				0.618	0.617	0.624
J				1.77	2.00	2.44			
Jdf				4	4	4			
Jp				0.78	0.74	0.66			
Endog-p				0.58	0.29	0.44			

Source: Computed. Heteroscedastic robust statistics in parentheses; + p<0.12, * p<0.10, ** p<0.05, *** p<0.01.

Notes: As for Table 3. CLP1, CLP2, CLP3: colonial labor psychology indices generated by principal components method using settler mortality rate, duration, and lack of education measured by ilu (ln), ilu_diff (%) and ilu_extent, respectively.

As sensitivity check, regressions (4)-(6) using worker productivity in 1970 as dependent variable provide robust evidence on critical harm of each CLP index, with CLP3 emerging as most detrimental. Interestingly, the estimated extent of harm due to CLP on GDP per worker in 1970 exceeds the effects at independence. Since most countries attained independence by 1970, we conjecture that harm due to lack of education would have been more challenging in early post-independence period. As earlier, goodness-of-fit statistics in models (4)-(6) suggest CLP3 to be preferred measure of colonial labor psychology. Additional results include the benefits of latitude proxying institutional quality and income, and coastal location as an asset for worker productivity. Insignificance of the Africa dummy indicates harm to worker productivity is encompassed by the CLP indices. South Asia however retains region-specific effects.

4 CLP indices: International comparison and historical insights

The present section provides some historical insights to supplement our econometric analyses and findings. Colonial labor indices and educational policies are portrayed along with colonizer identity and legal origin with implications for labor productivity.

4.1 Regional CLP, labor and educational policies

Table 5 presents CLP indices according to region, colonizer identity and legal origins. On average, the African region records highest incidence by all measures (CLP1, CLP2 and CLP3), indicating greatest damage in that part of the world arising from colonial domination. Strikingly, extremely and persistently fragile (poor governance) countries belonging to the least-developed income category are also disproportionately represented in that region. South Asia stands second

in terms of CLP ranking, followed by EAP and LAC regions. North America (US and Canada), where settler colonies were instituted, experienced lowest CLP incidence (results with author). Amongst developing regions, LAC, comprising predominantly middle-income nations, manifests lowest average CLP despite higher level of uneducated population than Africa at independence (see Table 1). As noted previously, most LAC countries were freed from colonial rule very early, when education was not widespread even in advanced countries. The relative drawback of lagging education witnessed at independence (captured by ‘ilu_diff’ and ‘ilu_extent’) thus shows the region to be least disadvantaged than other developing parts. Africa and South Asia emerge as worst sufferers in terms of initial educational disparity, reflected in severity of the CLP indices.

Table 5. CLP by region, initial conditions, colonial identity and legal origin

Panel A: By region												
	CLP1 (ln ilu)			CLP2 (ilu_diff)			CLP3 (ilu_extent)					
Region	N	Mean	SD	N	Mean	SD	N	Mean	SD			
World (Aggregate)	70	4.0	1.0	70	4.0	1.0	70	4.0	1.0			
Africa	28	4.7	0.9	28	4.9	0.8	28	4.9	0.8			
South Asia	5	3.7	0.7	5	3.8	0.7	5	3.6	0.6			
EAP	10	3.5	0.9	10	3.5	1.0	10	3.6	0.9			
LAC	24	3.6	0.7	24	3.4	0.4	24	3.3	0.3			
Panel B: By colonizer												
	Belgium			British			French			Spanish		
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Initial worker prod. (ln)	3	7.2	0.8	43	8.6	1.3	20	8.1	0.9	7	8.4	0.8
Onset col.	3	1891.7	11.0	62	1772.1	134.6	26	1857.2	78.9	21	1545.2	78.6
End col.	3	1961.3	1.2	62	1958.2	31.3	26	1953.0	31.1	21	1851.1	49.8
Duration	3	69.7	9.9	62	186.1	134.4	26	95.9	62.2	21	306.0	78.8
Settler mort (ln)	3	5.6	0.1	32	4.2	1.4	22	5.5	1.0	17	4.4	0.3
Lack of educ. – ilu (%)	3	82.9	5.0	48	51.1	31.6	19	82.0	12.8	19	91.4	10.8
ilu_diff (%)	3	73.3	5.0	48	37.3	34.7	19	69.0	14.0	19	35.8	3.6
ilu_extent	3	4.2	0.3	48	2.3	2.0	19	3.8	1.0	19	1.4	0.6
CLP1	3	5.0	0.1	30	3.4	1.1	17	4.8	0.5	17	3.9	0.1
CLP2	3	5.1	0.1	30	3.6	1.1	17	4.9	0.6	17	3.5	0.1
CLP3	3	5.1	0.1	30	3.7	1.1	17	4.9	0.6	17	3.4	0.2

Panel C: By legal origin

	<i>Civil law</i>			<i>Common law</i>			<i>Mixed Law</i>		
	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
CLP1	36	4.4	0.5	19	3.4	1.2	3	2.4	0.9
CLP2	36	4.3	0.8	19	3.5	1.1	3	2.7	0.4
CLP3	36	4.2	0.8	19	3.6	1.1	3	2.8	0.2

Source: Authors' elaborations. For type of legal system, La Porta *et al.* (2008).

Notes: As for Table 3. (i) European civil legal origin applies to former French, Spanish and Portuguese colonies; (ii) Common law: British former colonies (iii) Mixed legal origin: hybrid of common and civil law in countries which had more than one European colonizer.

Conspicuously, within the African region, while controlling for colonizer identity, a highly positive correlation emerges between the CLP measures, lack of education and geographic location in Western Africa. The West coast of Africa was part of the elaborate transatlantic slave trade network (Ndege 2007; Klein 2001). Slaves were taken in sizeable numbers from the Bight of Biafra (Benin and Nigeria), West Central Africa (Zaire, Congo, and Angola), and the Gold Coast (Ghana). Mali and Nigeria were also important sources of slave to Arab countries (Nunn 2008, 2009). Strikingly, in our entire sample, Mali emerges as worst sufferer of CLP (measured in terms of initial educational disparity), followed closely by Sierra Leone, Togo, Niger, and Central African Republic, all located in the West of Africa.

Massive export of slave labor degraded deeply the socio-cultural fabric in supplier countries whose main source of income became slave trade. The psychology of the natives was affected by constant threat of enslavement backed by the local judicial systems and lack of trust in own communities and families that could kidnap and deceitfully sell one as slave. Nunn and Wantchekon (2011) using contemporary Afrobarometer data demonstrate lack of trust in own community as overwhelmingly persistent feature of people living in the African region. Additionally, harsh working and living conditions to which indigenous labor were subjected and the policy of not giving priority to colonial education damaged self-esteem of the individual and

worker productivity, with lasting effects. The colonial institutional framework was not conducive to foster creative minds or enterprise by locals whose immediate concerns were about survival and freedom.

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In Africa, two former British colonies, Mauritius and South Africa, that adopted predominantly labor import policy (rather than export of local population as slaves) and gave greater focus to education provision, record lowest CLP incidence (not reported). Both countries witnessed typically lower settler mortality rates and longer colonial domination than other African nations. In the case of Mauritius, due to absence of indigenous population, colonizers resorted to imports of slaves to develop sugarcane plantations. Post the abolition of slavery, the British experimented with a system of low-cost labor originating from India (called indentured labor) as substitute for slave labor. This strategy contributed to rapid expansion of sugar plantations as evidenced by a strong positive association between net number of Indian immigrants and acreage under sugarcane cultivation (Madhoo and Nath 2013). The small island became a leading sugar producer in the Empire. The indentured labor experiment in Mauritius was deemed a success and replicated in South Africa and other colonies. These historical correlations suggest that the constructed CLP indices may be used as proxy for slave labor policy (export and imports) in the African region.

The region with second highest CLP incidence is South Asia (5 countries) where ancient India encompassed current India, Pakistan, and Bangladesh (3 countries). During pre-colonial times, the famed wealth of India attracted Europeans who vied with each other to take control over her assets and trade. The list includes the British East India Company, French East India Company,

Dutch East India Company, Danish East India Company and Swedish East India Company. India records the lengthiest duration of European colonial rule in the region (nearly 450 years) starting with the Portuguese settlement in Goa in 1505. South Asia also has highest level of pre-colonial state governance, which can be thought as an asset that could have rendered the area more resilient to colonial damage. Nevertheless, explicit colonial policy to deprive advanced pre-colonial civilizations from colonial education and render them vulnerable is starkly evident in Table 1 where the region is seen to have witnessed highest percentage of uneducated population during colonization. Chaudhary (2009) notes that while “British India was among the largest colonies of the British Empire, public investments in human capital were among the lowest in the world and lagged behind other colonies of the British Empire”. Primary education was not considered colonial government obligation and was financed largely by weak local authorities. At independence, only a fifth of children were receiving any primary schooling and 88 percent of the population was illiterate (Maddison 1971).

In the 19th century, Britain’s industrial revolution coincided with a phase of de-industrialization in (ancient) India with increased disappearance of indigenous knowledge (e.g. family-transmitted artisan skills) and the demise of traditional industries (Clingsmith and Williamson 2004). In addition to the disruption of livelihoods and widespread unemployment caused, these processes would have more persistently rendered the local population at large more vulnerable as no substitute (for instance, in the form of colonial education) was offered for the traditional knowledge, which would equip them with new including entrepreneurial skills. In fact, the policy of the colonizer was to use a small group of educated locals to represent the interests of the British and facilitate the smooth management of the colony. Basu (1974) observes that whereas

India diverged from the rest of Asia and Latin America in expanding basic education, secondary and more specifically English education flourished among a small group of elites.

4.2 Colonial identity and legal origins

Panel B of Table 5 provides information on the link between colonizer identity and CLP. Belgium colonies witnessed greatest colonial incidence followed by the French, British and Spanish colonies. Moreover, CLP indices by colonizer strongly correlate with (lack of) colonial education policy. Excepting the Spanish colonies (due to early independence), Belgium ones score highest in terms of lack of education ('ilu', 'ilu_diff' and 'ilu_extent'), followed by the French and the British. Conversely, countries that became settler colonies seemed more proactive in terms of establishing relatively well-developed institutions including education (Grier 1999). In our sample, the North American region, Australia, and New Zealand, recorded higher levels of colonial education than advanced countries' mean at the time of independence (not reported).

In British non-settler colonies, the role of colonial education, where provided, was to keep the colonized population subjugated. There was a concern that increasing demand by natives should be controlled and schools would not 'overeducate' them (Nherera 2000). Education program offered was generally very restrictive, combining religious instruction, and with emphasis on basic industrial technical training and agriculture (Atkinson et al. 1978: 34). The major aim was to provide the colonial system a pool of cheap labor with only bare basic skills. In Egypt, the British "attempted to confine the Westernized schools to the training of the future civil servants

and to direct the bulk of primary school graduates into vocational institutes” (Cleveland 1994: 101). This would have also been the experience of many colonies.

The associations between legal origins and CLP incidence are portrayed in Panel C of Table 5. La Porta et al. (1997) argue that countries with British Common Law offered greater investor protection relative to countries with legal system based on European civil law. Our findings confirm that non-common law colonies witnessed greater CLP on average and lower worker productivity at independence. Interestingly, however, countries with mixed European legal origins (Mauritius, South Africa, and Sri Lanka) record lowest CLP and highest initial labor productivity.

5. Testing for persistent CLP effects

This section explores the performance of our newly constructed CLP indicators with respect to contemporary measures of worker productivity, human capital, and institutional quality. Table 6 reports results for index CLP3 (constructed using ‘ilu_extent’) due to similarity of results but relatively superior goodness-of-fit as compared to CLP1 and CLP2 measures. As earlier, our specifications control for regional specificities of Africa, South Asia and LAC. Latitude ($\ln$) is proxy for institutional quality and correlates with income. Initial income per capita measured in 1990 ($\ln Y_0$) is also included to reduce omission bias in specifications with averaged contemporary variables. Appendix Table A.1 lists sources of data.

Results (1) and (2) show lasting deleterious impact of CLP on contemporary worker productivity in 2010 and GDP per worker averaged over years 1990-2010. Human capital measures (averaged over years 1990-2017) in equations (3)-(5) include life expectancy, literacy rate and a composite human capital index with four components, namely: (i) adult literacy rate; (ii) combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. In all cases, robust and significant damage to human capital due to CLP legacy is observed. Thus, while the persistence of essential features of colonial education to educational achievements in contemporary times is well-documented (Bolt and Bezemer 2009, Huillery 2009, Rocha et al. 2017), colonial illiteracy seems to have produced, if not more importantly, some low equilibrium trap with lasting adverse repercussions on human capital and worker productivity.

Table 6. Effects of colonial labor psychology on contemporary worker productivity, human capital and institutions

	Worker productivity		Human capital			Contemporary institutions				
	(1) ln Worker prod 2010	(2) ln Worker prod. 90-2010	(3) Life exp. 90-17	(4) Literacy 90-17	(5) Human capital index 02-17	(6) Fragile states index 90-17	(7) Corrupt 90-17	(8) Prop. Rights 90-17	(9) Govt. Effect. 90-17	(10) Political Stability 90-17
CLP3	-0.75*** (-7.15)	-0.47*** (-3.64)	-3.92** (-2.39)	-13.8*** (-4.33)	-0.33*** (-3.32)	8.34*** (2.79)	5.75** (2.59)	-0.60*** (-3.07)	-0.50*** (-4.95)	-0.21* (-1.80)
lnY ₀		0.42*** (4.35)	1.25* (1.70)	2.36 (1.27)	0.13*** (3.04)	-4.80*** (-2.84)	-1.67 (-1.07)	0.05 (0.39)	0.16** (2.08)	0.12 (1.56)
Latitude (ln)	1.81** (2.52)	1.37* (1.86)	14.8** (2.28)	-18.2 (-1.31)	0.20 (0.69)	-43.6*** (-3.02)	-23.8+ (-1.63)	2.28* (1.88)	1.16* (1.68)	1.30* (1.90)
Africa	-0.47 (-1.49)	-0.27 (-1.18)	-4.93 (-1.47)	-8.96* (-1.90)	-0.28 (-1.48)	5.32 (0.81)	3.51 (0.75)	-0.85* (-1.76)	-0.10 (-0.36)	-0.43 (-1.42)
South Asia	-1.31*** (-5.62)	-0.70*** (-2.72)	-2.63 (-0.90)	-20.3*** (-3.17)	-0.40* (-1.74)	23.5*** (3.20)	12.1** (2.40)	-1.89*** (-3.04)	-0.61** (-2.60)	-1.47*** (-4.76)
LAC	-0.41* (-1.68)	-0.19 (-1.15)	0.84 (0.50)	-4.43 (-1.34)	-0.23* (-1.94)	7.60 (1.44)	15.4*** (3.22)	-1.68*** (-3.83)	-0.69*** (-2.79)	-0.56** (-2.62)
Constant	9.24*** (30.5)	5.78*** (7.99)	55.6*** (9.80)	68.1*** (4.42)	1.34*** (4.05)	113.0*** (8.87)	62.2*** (5.38)	4.81*** (5.06)	-1.37** (-2.65)	-0.15 (-0.63)

N	69	66	67	63	65	67	67	66	67	70
Adj-R ²	0.672	0.805	0.718	0.640	0.705	0.622	0.428	0.475	0.610	0.400

Source: Computed. Heteroscedasticity robust t-statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Notes: As for Table 3. Results for CLP3 is reported due to better predictive power than for CLP1 and CLP2.

Moreover, in models (1)-(5), South Asia exhibits significant negative regional effects on worker productivity and human capital, possibly correlating some special treatment by colonizers due to its advanced pre-colonial status, not captured otherwise in our models. The general insignificance of Africa suggests that included variables in the models capture essential causal factors affecting the region.

Coming to institutional quality, CLP indices are highest in the African region that hosts greatest number of least developed nations, characterized by state fragility. The literature refers to state fragility as a situation in which countries do not have the capacity or willingness to perform “core” government functions. It is conjectured that deep colonial roots may underlie persistent underdevelopment over decades despite attempts at policy and institutional reform and international efforts in the form of foreign aid (European Report on Development 2009). We use the fragility index developed by Funds for Peace as proxy for weak institutions and poor governance to test this hypothesis. From equation (6), CLP strongly enhances state fragility (averaged over 1990-2017), after controlling for region specificities, initial income in 1990 and latitude. Interestingly, the coefficient on Africa is insignificant, so fragility in the region may indeed be attributed to these deep colonial occurrences.

Persistent institutional damage due to CLP legacy is further evidenced in regression results (7)-(10). CLP correlates positively with level of corruption and is associated with weaker system of legal property rights, lower government effectiveness, and lesser political stability (and higher

incidence of terrorism). These results on long lasting consequences of built-in colonial labor mindset for developing countries presents formidable challenge to public policy and governance.

6. Conclusion

This analysis seeks to assess the impact of colonization on labor productivity at the time of independence via adverse colonial labor psychology. We argue that ‘lack of colonial education’ or ‘colonial illiteracy’ as against ‘colonial education’ is primary channel of colonial domination and incidence. Besides percent of uneducated (‘ilu’), two new measures of colonial education disparity with respect to colonizer nations at (or near to) independence year (‘ilu_diff’ and ‘ilu_extent’) are constructed to test this contention. The colonial illiteracy measures are used in our empirical analyses to ensure robustness of findings. Initial labor productivity is modeled within a recursive framework as the outcome of colonial labor psychology that encompasses three colonial dimensions, namely colonial education policy, settler mortality and duration of rule. Results overwhelmingly support the supremacy of lack of provision of colonial education (all measures) as key determinant of initial labor productivity. This factor is augmented albeit indirectly by settler mortality rate that captures colonizer’s exploitative motivations and seems to be dampened to some extent by colonial duration.

The variables affecting worker productivity directly (lack of education) and indirectly (settler mortality and duration) are used to generate new indices of colonial labor psychology (not attempted in earlier studies) that aim to capture the adverse effects of colonialism on self-esteem, enterprise and labor productivity through subordination. Robust damage to initial productivity is

evidenced using all CLP measures. Higher predictive power of the models including these composite indices versus models with the individual colonial factors suggest that the combined mix of the colonial variables explain better the reduced productivity of labor at independence.

It is instructive to note that the computed indices vary significantly across geographical regions (highest in Arica closely followed by South Asia), by colonizer's identity (more severe in Belgium and French colonies versus British and Spanish ones); and by colonial legal origins (least in British and mixed legal systems versus Common Law colonies).

The persistence of colonial psychology legacy to contemporary times robustly manifests as lower current labor productivity and human capital. Moreover, the damage to institutional quality translates as higher state fragility, higher prevalence of corruption, lower government effectiveness, weaker protection of property rights, and decreased political stability. These findings point out to the need for well-targeted and persistent efforts on the parts of governments to diminish the colonial psychology drag and perhaps the moral and financial commitment from nations that benefitted from this episode of humanity. As noted in this study, most colonized countries, especially those that gained independence around mid-1950s, are relatively very young whereas they have witnessed the onslaught of 'imported culture' for more than a century. Tremendous work would be required to root out colonial labor psychology causing lack of faith in own enterprise and capabilities, leading to decreased worker productivity. One important policy recommendation that emanates from this research is aggressive expansion of education equipping the populations with required skills but also instilling faith in own culture and identity as path to increase self-confidence and productivity. Moreover, further research needs to be

undertaken to understand specific problems faced by one of the worst sufferers from colonial episode, namely South Asia.

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Appendix Table A.1: Description of variables and sources of data

Variables	Definition, construction of variables and sources of data
Settler mortality	European settler mortality rate during colonization (in natural log). Sources: Acemoglu <i>et al.</i> (2001, 2000).
Malaria	Prevalence of malaria during colonial times. Malarial incidence in 1966 is used as proxy. Source: Gallup <i>et al.</i> (2001).
Tropics	Proportion of a country's land area within geographic tropics. Source: Gallup <i>et al.</i> (2001).
Col duration	European colonial duration (years). Source: Constructed from historical accounts reported in Encyclopedia Britannica and Hensel (2019). Onset year coincides with establishment of a permanent and relatively durable European settlement. Some countries with no European colonial settlement include China, Ethiopia, Iran, Mongolia, Nepal, Oman, Saudi Arabia, South Korea, Thailand as well as most countries in Europe and Central Asia.
Popden ₁₅₀₀	Density of pre-colonial population measured in year 1500 (persons per km ²). Source: Putterman and Weil (2010).
State exp ₁₋₁₅₀₀	Accumulated precolonial state experience/ State History index from year 1 to 1500. (standardized values). Source: Borcan <i>et al.</i> (2018).
Coastal	Dummy variable for coastal location. Adapted from CIA (2016).
Natural resource abundance	Natural resource abundance during European colonial episode. Log primary exports intensity in 1970 is used as proxy. Source: Sachs and Warner (1997).
ilu (percent uneducated)	Absence of colonial schooling policy (percent uneducated) at independence. For countries that gained independence before 1870s, we use percentage of uneducated in 1870 as proxy. Sources: Barro and Lee (2013); Lee and Lee (2016).
ilu_diff	Percent uneducated in country <i>i</i> at independence minus mean percent uneducated in advanced countries (OECD) in that year. Source: Computed from above sources.
ilu_extent	ilu_diff divided by standard deviation of uneducated in advanced countries. Source: As above.
Initial worker productivity	Real GDP per worker at (close to) independence (constant 2010 prices). Source: Heston <i>et al.</i> (2012).
Worker productivity 2010	Real GDP per worker (constant 2010 prices). Source: Heston <i>et al.</i> (2012).
Latitude	Latitude (absolute value) in natural log. Source: La Porta <i>et al.</i> (1999).
lnY ₀	Initial GDP per capital at constant 2010 USD (natural logarithm). Source: Computed Teorell <i>et al.</i> (2020).
Life exp. 90-17	Life expectancy averaged over years 1990 to 2017. Source: World Bank (2020).
Literacy 90-17	Average literacy (averaged years 1990-2017). Source: World Bank (2020).
Human capital index 02-17	Human capital index consisting of four components: adult literacy rate; combined primary, secondary and tertiary gross enrolment ratio; expected years of schooling; and average years of schooling. Higher scores represent higher level of human capital. Source: Teorell <i>et al.</i> (2020).
Failed states index 90-17	Funds for Peace Failed States Index averaged over years 1990-2017. Ratings range from 0 to 10, with 0 being the lowest intensity (most stable) and 10, the highest intensity (least stable). Source: Computed from Teorell <i>et al.</i> (2020).
Corrupt 90-17	Corruption Index. Values lie between 0 -100, with an increase in the index corresponding to a rise in the level of corruption. Source: Teorell <i>et al.</i> (2020).
Property rights 90-17	Fraser Institute Legal Structure and Security of Property Rights (average 1990-2017). Source: Computed from Teorell <i>et al.</i> (2020).
Govt. effect. 95-17	Government effectiveness index (averaged 1995-2017). Source: Computed from World Bank (2020).
Pol. stability 95-17	Political stability and absence of terrorism index (averaged 1995-2017). Source: Computed from World Bank (2020).

Appendix Table A.2 Initial illiteracy and colonial labor psychology indices according to world regions

Country	ilu year	ilu	ilu_diff	ilu_extent	CLM1	CLM2	CLM3
East Asia and Pacific							
Australia	1900	24.90	-15.61	-0.56	2.75	2.36	2.60
Fiji	1970	15.90	8.27	0.60	2.66	2.88	3.04
Indonesia	1950	75.00	62.22	2.93	4.03	4.16	4.00
Laos	1955	71.00	59.86	3.09	4.69	4.72	4.67
Malaysia	1965	41.60	26.05	1.68	2.38	2.44	2.55
Myanmar	1950	76.50	63.72	3.01	3.96	4.10	3.98
New Zealand	1905	9.80	-27.30	-1.03	2.36	2.30	2.61
Papua New Guinea	1975	72.26	65.90	4.24	4.69	4.81	4.95
Singapore	1965	43.04	34.21	2.20	3.27	3.32	3.47
Vietnam	1955	50.36	39.22	2.02	4.38	4.31	4.31
Latin America and Caribbean							
Argentina	1870	90.80	31.79	1.13	3.89	3.47	3.35
Barbados	1965	1.10	-7.73	-0.69	1.30	2.79	2.82
Belize	1980	6.50	1.31	0.25	2.80	3.36	3.48
Bolivia	1870	98.60	39.59	3.51	3.92	3.57	3.93
Brazil	1870	96.50	37.49	1.33	3.88	3.52	3.36
Chile	1870	90.40	31.39	1.12	3.90	3.47	3.35
Colombia	1870	90.10	31.09	1.11	3.86	3.44	3.32
Costa Rica	1870	91.40	32.39	0.55	3.90	3.49	3.21
Dominican Rep.	1870	98.30	39.29	1.40	4.01	3.66	3.47
Ecuador	1870	95.00	35.99	1.28	3.89	3.51	3.36
El Salvador	1870	94.40	35.39	1.26	3.92	3.53	3.39
Guatemala	1870	94.50	35.49	1.26	3.83	3.45	3.31
Guyana	1965	10.20	1.37	0.09	2.12	2.54	2.63
Haiti	1870	100.00	40.99	1.46	4.37	3.99	3.81
Honduras	1870	93.80	34.79	1.24	3.87	3.49	3.34
Jamaica	1960	15.30	5.72	0.33	2.65	2.88	2.93
Mexico	1870	88.20	29.19	1.04	3.83	3.39	3.29
Nicaragua	1870	95.80	36.79	1.31	4.19	3.79	3.62
Panama	1905	76.70	39.60	1.49	3.85	3.65	3.47
Paraguay	1870	98.20	39.19	1.39	4.01	3.65	3.48
Peru	1870	99.40	40.39	1.44	3.93	3.59	3.41
Trinidad and Tobago	1960	11.00	1.42	0.08	2.45	2.79	2.87
Uruguay	1870	91.70	32.69	1.16	4.18	3.72	3.61
Venezuela	1870	99.50	40.49	1.44	3.92	3.59	3.40
Middle East and North Africa							
Algeria	1960	82.50	72.92	4.20	4.32	4.53	4.56
Egypt	1955	90.70	79.56	4.10	4.48	4.72	4.63
Malta	1965	21.70	12.87	0.83	2.79	2.91	3.05
Morocco	1955	95.00	83.86	4.32	4.59	4.86	4.76

Tunisia	1955	88.00	76.86	3.96	4.43	4.65	4.57
North America							
Canada	1870	29.70	-29.31	-1.04	2.70	2.02	2.33
United States	1870	25.20	-33.81	-1.20	2.81	2.13	2.48
South Asia							
Afghanistan	1920	99.40	71.46	2.66	4.77	4.80	4.47
Bangladesh	1945	79.80	65.01	2.84	4.09	4.23	4.03
India	1947	75.05	60.26	2.63	3.17	3.39	3.18
Pakistan	1950	85.20	72.42	3.42	3.43	3.73	3.56
Sri Lanka	1945	36.60	21.81	0.95	2.95	2.95	2.92
Sub-Saharan Africa							
Benin	1960	88.10	78.52	4.52	4.98	5.17	5.17
Burundi	1960	87.43	77.85	4.48	5.08	5.25	5.26
Cameroon	1960	78.60	69.02	3.97	4.88	4.99	5.01
Central African Rep.	1960	90.37	80.79	4.65	5.10	5.30	5.30
Congo	1960	78.83	69.25	3.99	4.92	5.02	5.04
Congo, Dem. Rep.	1960	77.60	68.02	3.92	4.96	5.00	5.02
Cote d'Ivoire	1960	84.50	74.92	4.31	5.27	5.40	5.39
Gabon	1960	84.06	74.48	4.29	4.93	5.09	5.10
Gambia	1965	94.30	85.47	5.50	5.14	5.40	5.50
Ghana	1955	84.30	73.16	3.77	4.26	4.49	4.34
Kenya	1965	68.20	59.37	3.82	4.50	4.57	4.71
Liberia	1870	99.10	40.09	1.43	5.50	4.97	4.80
Mali	1960	95.00	85.42	4.92	6.09	6.22	6.19
Mauritania	1960	67.48	57.90	3.72	4.83	4.85	4.98
Mauritius	1970	23.80	16.17	1.18	2.86	2.99	3.14
Niger	1960	91.80	82.22	4.73	5.34	5.52	5.53
Rwanda	1960	83.59	74.01	4.26	5.07	5.20	5.21
Senegal	1960	58.70	49.12	2.83	3.87	3.94	3.96
Sierra Leone	1975	94.10	87.74	7.80	5.05	5.34	6.01
South Africa	1995	4.40	0.52	0.11	1.36	2.27	2.39
Sudan	1955	88.48	77.34	3.99	4.62	4.82	4.73
Tanzania	1960	67.79	58.21	6.07	4.89	4.91	5.62
Togo	1960	88.50	78.92	4.54	5.43	5.57	5.57
Uganda	1960	74.50	64.92	3.74	4.97	5.04	5.06

Appendix Table A.3 Ingredients of CLP: SUR results from cross-sectional regressions

	sett mort	col dur	Lilu	sett mort	col dur	ilu_diff	sett mort	col dur	ilu_ext
	(1)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)
Precolonial									
Popden ₁₅₀₀ (ln)	0.08*	0.03	-0.09***	0.08*	0.04	-1.95**	0.08*	29.21*	-0.08
	(1.67)	(0.00)	(-3.48)	(1.71)	(0.01)	(-1.99)	(1.72)	(1.89)	(-1.22)
State exp ₁₋₁₅₀₀ (std)	-0.04	13.4	0.28***	-0.05	13.42	10.63***	-0.06	0.03	0.47***
	(-0.33)	(0.93)	(4.72)	(-0.45)	(0.94)	(4.79)	(-0.50)	(0.00)	(3.04)
Colonial									
Settler mortality (ln)		29.2*	0.50***		29.2*	17.7***		13.4	0.98***
		(1.89)	(8.20)		(1.89)	(7.59)		(0.94)	(6.07)
Col duration (years)			-0.00***			-0.03*			-0.00
			(-4.07)			(-1.65)			(-1.24)
Nat res (ln)		33.3**	-0.067		33.4**	-4.26+		33.4**	-0.25
Abund (ln)		(1.97)	(-0.96)		(1.98)	(-1.62)		(1.98)	(-1.37)
Geography									
Malaria	1.05***			0.98***			0.95***		
	(3.63)			(3.33)			(3.21)		
Tropics (%)	0.84***			0.82***			0.82***		
	(2.74)			(2.66)			(2.62)		
Coastal		63.3*			62.1*			62.3*	
		(1.78)			(1.75)			(1.75)	
Africa	1.70***	-194.4***	-0.50**	1.75***	-194.7***	20.7**	1.77***	-194.8***	1.24**
	(5.27)	(-3.74)	(-2.15)	(5.41)	(-3.75)	(2.38)	(5.46)	(-3.75)	(2.05)
South Asia	0.67	89.8	0.070	0.71+	89.9	16.5+	0.73+	89.8	0.28
	(1.47)	(1.37)	(0.25)	(1.56)	(1.37)	(1.60)	(1.59)	(1.37)	(0.40)
LAC	1.38***	18.7	0.57***	1.38***	18.5	11.1*	1.38***	18.5	-0.23
	(5.05)	(0.44)	(3.28)	(5.06)	(0.44)	(1.70)	(5.06)	(0.43)	(-0.50)
_cons	2.67***	179.0**	2.34***	2.67***	180.5**	-47.0***	2.67***	180.2**	-2.53***
	(10.5)	(2.01)	(7.25)	(10.5)	(2.03)	(-3.85)	(10.5)	(2.03)	(-2.99)
R-sq	0.692	0.541	0.669	0.693	0.541	0.794	0.695	0.546	0.758
B-P test pval	0.279			0.548			0.700		

Source: Computed. + p<0.12, * p<0.10, ** p<0.05, *** p<0.01.