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ABSTRACT

We show the existence of a diffusion process of military dictatorships in Sub-Saharan Africa from 1972 through 2007, using panel data probit estimation and a Markov chain transition model. This process is shortly-lived, since we observe an overall trend that reduces the number of military regimes. With regard to economic correlates, we also find that Manufacturing share of GDP, Primary share of GDP positively affect the probability of military dictatorship, and Openness to trade, whereas the British colonial origin are negatively associated.

Keywords: military rule, Africa, diffusion of government institutions.

Jel codes: H11, D74, F50

1. Introduction

In this paper we study whether or not there was a diffusion of military regimes in Sub-Saharan Africa from 1972 through 2007. In fact, global historical patterns present a clear-cut walk away from military rule. In 1972 military dictatorships accounted for 24.6% of the world countries, with 45.7% concentrated in Africa. Eventually, military regimes in 2010 ruled 7.5% of the world countries, with a concentration of almost 50% of them in Africa.[1] That is, in the period 1972-2010, the share of democracies increased from 28.2% to 54.0%. According to famous definition provided in Huntington (1991) the world is experiencing the third wave of democratization. Put briefly, we observed a sharp decrease in the number of military dictatorships that is possibly the effect of a 'global movement' towards democracy, with some local frictions that kept military dictatorships concentrated in Africa. This second pattern may be also the result of a 'local diffusion process.' Diffusion processes have been extensively studied to explain linkages between phenomena taking shape in different polities. A general definition is presented in Strang (1991) where diffusion is defined as the process by which the "*prior adoption of a trait or practice in a population alters the probability of adoption for remaining non-adopters".* In particular, in what follows we investigate whether the probability that a country in Sub-saharan Africa became a military regime increased as the share of neighbors governed by a military rule gets larger. Put differently, we search for spatial correlation between military regimes. In this respect, the claim that "*any analysis of democratization that does not account for spatial relationships is underspecified*" (Brinks and Coppedge, 2006: 482) is here generalized to "*any analysis of the diffusion of government institutions*".

[1] Wahman et al. (2013).

In sum, in this paper we empirically study 48 African countries for the 1972-2007 period to answer the following research questions: (a) is there a diffusion effect in military dictatorship? (b) Is this effect tempered by a slow movement toward democracy that took place also in Africa?

In geographical terms we refer to these forces as 'local' and 'global' respectively; in temporal terms we want to check whether there is a long-term pattern towards democracy which finds some short-term disturbances in the forms of military coups that have some spillover effect toward close countries. We address the dichotomy between military dictatorships and civilian rule, democracy is a particular case of the latter. We use this approach because in the African political history we do not observe a direct transition from military to democratic rule, rather a transition from military to civil autocracy, often in the form of a one-party regime. In the wake of the 'third wave' these autocracies tend to consolidate a civilian rule, which may end up in a democracy of some sort (Posner and Young, 2007).

The choice of Africa is motivated by the large number of military governments in the continent. Furthermore, the process of decolonization that ended in the late 20th century allows us to observe relatively 'young' regimes established after independence, and search for any geographical pattern of the emergence of military governments. The militarization of many independent movements in Africa created the condition for authoritarian governments, or executives backed by a strong army.

Theoretical discussions on nature and relevance of diffusion processes are in Most and Starr (1990) and Elkins and Simmons (2005). We refer to them for a discussion on general drivers of diffusion. Albeit with different terminology, the key-aspect of both works is the idea of uncoordinated interdependence between polities. Put differently, actions of one country may affect choices of other countries even in the absence of some clear-cut collaboration or coordinated process. This could help to explain why different kinds of polities may be expected to spread regionally. Diffusion of military regimes therefore would fall within this set of explanations. A large

share of military rules in the neighborhood may be expected to become a driver that increases the probability that an armed group stages a coup and takes power. In fact, Fjelde (2010) finds that military regimes exhibit a higher risk of civil armed conflict than other autocracies. Then, we have a rationale to test punctually the following two hypotheses:

(1) There is a positive and significant effect of the share of neighboring countries ruled by a military dictatorship at time t-1 and the likelihood that that country will experience a military coup at time t. That is, there is a spatial relationship in the diffusion of military governments.
(2) This neighbors' effect is non-persistent; therefore a country ruled by the military is not likely to keep its political regime.

We are to test these hypotheses also considering a set of economic control variables in order to capture some country-specific factors.
The paper is structured as follows: in Section 2 we briefly review some related literature, Section 3 describes the data and the econometric methodology, and Section 4 reports the results. Section 5 concludes.

2. The diffusion of democracy and dictatorship

This paper is related to different strands of literature. First, this paper relates to a wide literature on diffusion processes with a special focus regimes and policy diffusion. Secondly, this paper draws insights from literature on autocracies and dictatorships.

In particular, diffusion has been studied with regard to both interstate wars (see among others Houweling and Siccama, 1985; Siverson and Starr, 1990, O'Loughlin and Anselin, 1991) and civil wars (see among others Salehyan and Gleditsch, 2006; Buhaug and Gleditsch, 2008) domestic forms of political violence. Diffusion effects have also been analyzed in the

context of failed states (Iqbal and Starr, 2008) and international terrorism (Neumayer and Plümper, 2010). In recent years, diffusion models have been extensively studied to analyze the global widespread of democracy, economic liberalism and trade regionalism. Needless to say, fragmentation of Soviet Union and eastern enlargement of European Union favored a novel interest in diffusion processes. A global movement towards democracy has been verified by Starr (1991). The author presents an analysis of bordering governmental transition during the period 1977-1987, using variations in the Freedom House degree of political rights and civil liberties. He finds significant global and regional effects, but he warns that they are solely the trigger for a change, because the necessary prerequisite is that the country is ready for innovation in terms of their internal setting. Starr and Lindborg (2003), enriches the foregoing work by analyzing the period 1974-1996 so confirming that neighbor effects matter to explain institutional settings. Doorenspleet (2004) finds a geographical pattern of the transition to democracy: countries surrounded by more democratic neighbors tended to improve their level of democratization, and vice versa.

O'Loughlin et al. (1998), present a cautionary reasoning on the spatial diffusion of democracy universally. The authors show that the study of spatial diffusion of regimes would significantly benefit from considering 'domain-specific' factors. That is, albeit diffusion may be expected to follow some general rules, analysis of local and contextual elements cannot be disregarded.

Gleditsch and Ward (2006) provide a thoughtful discussion on the diffusion of democracy, and use a Markov transition model to test for this hypothesis. They find a significant effect of diffusion in the change from autocracy to democracy. Moreover, they estimate the likelihood that an autocracy remains an autocracy, and also in this case diffusion has a significant role (neighbor countries becoming democratic reduce this likelihood). An important aspect of this study is the inclusion of a number of domestic covariates (such as GDP per capita) in order to that take into

account idiosyncratic characteristics that may also relate with external factors. Brinks and Coppedge (2006) move a step forward and provide an explanation of the diffusion mechanism, modeling a process of "neighbor emulation" where bordering countries tend to converge towards a shared level of democracy or non-democracy.[2] The core assumption is that countries are rewarded when their regimes are similar to those of their neighbors, and the differential in the index of democracy between bordering countries generates pressure for a change. The democracy index is defined by the authors according to the Freedom House sum of the degree of political rights and civil liberties, scaled in the interval from 2 to 14. The authors challenge the idea that diffusion is an econometric illusion generated by global trends, correlation among the disturbances or the regional clustering of domestic factors that is a severe issue especially in cross-country datasets. The results of the empirical analysis confirm the presence of a pattern of diffusion of democratization across bordering states, the relevance of global trends and the stimulus represented by being in the US sphere of influence. Leeson and Dean (2009) also study whether the theory of democratic diffusion holds for a large panel of 180 countries in the period 1850-2000. Empirical findings show that some democratic contagion does exist but it is less relevant than those predicted by the model. Gassebner et al. (2013), in a gigantic study on determinants and survival of democracies for 165 countries in the period 1976-2002 find that if a country has democratic neighbors survival of democracy is more likely. With specific regard to African countries, De Groot (2011) focuses on development of political freedoms and democracy. The author analyzes several path-dependent variables, such as the history of political freedom and also the improvements emerged in neighboring countries finding that an

[2] In an early contribution on the diffusion of dictatorships (Li and Thompson, 1975), emulation was one of the sources of spreading of coups, together with the roles of disinhibitor, negative example, and reference group.

improvement of political freedom is associated with an increase in the probability of improvement in neighboring countries.

There is a limited literature on dictatorship contagion. Earlier works apply probabilistic models. Midlarsky (1970) compares a Poisson and a "diffusion Poisson" (which is a Poisson process augmented with a diffusion parameter) models for sub-Saharan Africa over 1963-1967 finding no evidence of diffusion effects. Li and Thomson (1975) apply three stochastic models (Poisson, "contagious Poisson", and an ARMA) to 1946-1970 data on successful and unsuccessful military coups, aggregated at the World and selected regional levels. The paper finds that the "contagious Poisson" outperforms the Poisson model, and in the ARMA the first lag is significant, and the authors maintain that some contagion is in place at the World level, whereas in the Sub-Saharan sample the evidence is weaker. These models are extremely simple and are mainly able to trace correlations without taking into account the behavior of covariates. The more recent literature applies parametric models that take into account the impact of previously neglected covariates. Lunde (1991) studies African coups d'état during the period from 1955 to 1985, by examining whether they can be explained by structural factors (social mobilization, cultural pluralism, party dominance and electoral turnout), as in Jackman (1978). The latter analysis shows that coups are contagious. Moreover, the likelihood of coups d'état is reduced as a function of the density of coups, which implies that regimes have become increasingly well insulated from coups. This may either have occurred as a result of a selection process where vulnerable regimes have been selected out of the population, as a result of institutionalization of measures reducing the vulnerability to military takeovers. Finally, the likelihood of a coup also is a function of the time spent in a given regime form, i.e. that the rate of coups d'état is duration dependent. The rate is initially low, and then increases up to some maximum point and starts to decline again.

Eventually, this work also draws insights from the recent literature that analyses the relationship between economic factors, autocracies and

military governments. Classical references on economics of autocracy are McGuire and Olson (1996), Wintrobe (1998). Recent theoretical models describe an agency problem: within a polity the elite imposes predatory policies that generate pressures for civil war. The risk of social unrest increases as the income distribution becomes more uneven, a situation that is encouraged by weak state capacity, namely legal and fiscal capacity (Besley and Robinson, 2009; Besley and Persson, 2008, 2009). The scholars recognized two alternatives for the authoritarian regime to survive. First, autocrats may introduce legislative and partisan institutions to channel political opposition, co-opt external groups and decrease internal pressures (Gandhi, 2008). Second, the army is used to defend the governing elite from the risk of internal violence. As noted above, a larger army, however, reduces the opportunity-cost for the military to run a coup d'état and seize power, establishing a military rule (Acemoglu et al., 2010 and Besley and Robinson, 2010). The three main causes of coups that the authors predict are income inequality, ethnic fractionalization and external threat. Recently, Caruso et al. (2013) empirically supported the impact of economic variables and political factors on the probability of a military rule emerging from coups. In particular, it is shown that productive sectors as manufacturing are positively associated with the existence of a military rule even if a negative association does take shape with regard to per capita income.

3. Data and methodology

In this section we present the data and the empirical strategy. Crucial to the development of this study is the choice of the dependent variable capturing the existence of a military autocracy. In fact, in choosing the military regime variable, we face the choice of a number of datasets. In particular, we choose the relevant variable in the Authoritarian Regimes

Dataset[3] (Hadenius and Teorell, 2007; Wahman et al. 2013), where the military category is defined as follows: "*The actual or threatened use of military force, referring to Military regimes, where the armed forces may exercise political power either directly or indirectly (i.e., by controlling civilian leaders behind the scenes). Regimes where persons of military background are chosen in open elections (which have not been controlled by the military) thus should not count as military*."

The military category also includes *rebel regimes*, i.e., cases where a rebel movement (not formed from the regular armed force) has taken over the power by military means, and the regime has not been modified in another kind of regime. This category is particularly important in Africa, where these groups often seize power from existing regimes (Congo-Kinshasa from 1997 to 2003 is one example). Compared with other dataset, the definition of the Authoritarian Regime Dataset is more encompassing. For example, in Geddes (1999), a regime is military when "*a group of officers decides who will rule and exercises some influence on policy*". Moreover, the Authoritarian Regimes Dataset explicitly aims at improving Geddes database, since it includes a number of nondemocratic regimes that were neglected, it uses a more stringent definition of 'personalist' regimes, and it make a distinction between one-party and dominant party regimes.[4] The Database of Political Institutions (Beck et al., 2001) defines a military regime when the chief executive has a military rank, which on the one hand leaves out the external influence of the military (if the chief executive is a civilian) and, on the other hand, it does not consider the overall political system, which may not be a military dictatorship, even if the chief executive is a military supported by other powers. The same issue arises with the democracy-dictatorship indicator developed by Cheibub et al. (2010). Regan

[3] The variable "regime1ny" has the following categories: 1 Monarchy, 2 Military, 3 One party, 4 Multi-party, 9 No-party, 99 Other, 100 Democracy.

[4] Geddes et al. (2012) provide an improvement of the previous database on several issues, but the definition of a military regime is the same.

et al. (2009) consider a military regime as "*an executive [that] has the power to use military force abroad without legislative approval*," which appears to be too narrow for our purposes.[5]

We analyze the diffusion of military dictatorships by estimating the interaction coefficients between the domestic regime and the neighboring ones. Our dependent variable, the military nature of the government, is dichotomic. This poses some econometric issues. The econometric literature to analyze spatial data with such variables is fragmented and still incomplete. The main model that has been considered is the spatial probit with the inclusion of interdependence in the latent-variable, that is also the most applied in empirical research (Franzese and Hays, 2009).

The military nature of the government is reasonably influenced by the military nature of neighboring governments, as a consequence of contagion caused by an exasperate demand for defense that gives power to the army, emulation or fomentation. Formally, this implies that the military nature of one observation is correlated with the one of nearby units. The interaction between the latent variables induces heteroscedasticity and interdependence of the residuals of the probit specification, which cause the parameter estimates to be inconsistent (McMillen, 1992). As a consequence, the spatial nature of our binary dependent variable suggests applying a spatial model. The use of a panel specification, moreover, would properly account for the longitudinal dimension of the dataset and exploit all the available information. Unfortunately, an econometric theory for the estimation of spatial panel probit has not been developed yet, being the sketched model of Kakamu and Wago (2005) the unique contribution to the topic. Nonetheless, scholars proposed several estimators for cross sectional spatial probit. The limitation of this procedure is in the loss of information and cross-sectional variation.

[5] Some of the autocratic measures we have not used in our analysis cover longer periods of time, but we are limited by the availability of economic data, which is very poor before the '70s.

In the light of these methodological considerations, we estimate a non-spatial panel probit that corrects the unobserved heterogeneity in the data and avoids the inconsistency by substituting the spatial lag term with its time lag. The variable *Military around*$_{it-1}$, in fact, is exogenous to the model since it is already realized at time *t*. The estimated model is:

$$Military_{it} = \alpha_1 + \alpha_2\, Military\ around_{it-1} + \alpha_3 \mathbf{X}_{it} + \alpha_4 \mathbf{Z}_{it} + \alpha_5 \mathbf{W}_{it} + \alpha_6 \mathbf{P}_{it} + \alpha_7 \mathbf{S}_{it} + \alpha_8 \mathbf{C}_{it} + \varepsilon_{it} \quad (1)$$

The dependent variable is a dummy equal to one if the ruler is a military junta and zero otherwise. Data are taken from The Authoritarian Regime Dataset version 5 (Hadenius and Teorell, 2007; Wahman et al. 2013). *Military around* is calculated as the ratio between the number of neighbors (countries sharing the same border) ruled by a military dictatorship and the total number of neighbors.

The vector $\mathbf{X}_{it}$ includes GDP per capita, drawn from Penn World Tables 6.3[6] (Heston et al., 2009), and the added value of the agricultural, manufacturing and mining sectors[7] as percentage of GDP, are drawn from the UNCTAD database.[8] GDP per capita is an indicator of development central in theories of modernization and, as Gleditsch and Ward (2006) pointed out, there are clusters of relatively developed countries that may experience democratization that we can wrongly attribute to diffusion of democracy. Power tends to be more dispersed among group in economically developed countries with a more advanced division of labor with respect to societies in which land is the primary source of income (Boix, 2003). Sectoral shares of GDP are included following the theoretical insights presented in Caruso

[6] The database is available at http://pwt.econ.upenn.edu/.

[7] Original data include "Mining, manufacturing and utilities" from which we subtract the item "Manufacturing". Utilities create some noise in the measurement of the mining sector, however its size is small.

[8] The database is available at http://unctadstat.unctad.org.

(2010). The vector $\mathbf{Z}_{it}$ includes variables concerned with ethnic fragmentation, distinguishing between polarization and fractionalization, we use the data from Reynal-Querol.[9] A larger heterogeneity is commonly considered a risk factor for social peace; in particular, the degree of ethnic polarization is associated to an increase in the incidence of civil wars (Montalvo and Reynal-Querol, 2005). Regarding the link with military regimes, the sign is once again ambiguous depending on the repression potential of the military junta. $\mathbf{W}_{it}$ is a vector including variables concerned with the external sector: openness (the sum of imports plus exports over GDP, from the Penn World Tables 6.3) and the intensity of external treat,[10] defined as level of hostilities on a 0-to-5 scale, taken from the database Militarized Interstate Disputes 3.10 (Ghosn et al., 2004).[11] According to Acemoglu, Ticchi and Vindigni (2010) when there is an external threat, the incentives of the civilian government and of the military are aligned, making it less likely to have a coup. The vector $\mathbf{P}_{it}$ includes the Agricultural Raw Price, taken from Free Market Price Index, and the Crude Oil Price, derived from Free Market Price Index (calculated as the average of Dubai/Brent/Texas equally weighted ($/barrel)) from UNCTAD. In this way we want to check whether high international commodity prices can lead to civil strife, which in turn could influence the army to take action. Because changes in oil price can have different effects in countries that are either exporters or importers of oil, we include a dummy variable that is equal to 1 if the share of oil export exceeds 10% and 0 otherwise.[12] $\mathbf{C}_{it}$ is a vector of dummy variables describing the past colonial rule of a country. Finally, ε_{it} is a random error.

[9] The dataset is available at http://www.econ.upf.edu/~reynal/data_web.htm.

[10] We have also used a variable for internal conflict, since one can expect that a military dictatorship arises as a response to social turmoil. However, this variable never turned out to be significant. Details are available upon request.

[11] The dataset is available at http://www.correlatesofwar.org/.

[12] CIA Factbook.

Our analysis first estimates equation (1) with a probit regression model, then we follow the recent literature (Gleditsch and Ward, 2006) and estimate a Markov chain transition model, in which the probability distribution of a variable y_{it} for observation i at time t is modeled as a function of i's prior history or state at previous time periods t - 1, t - 2, …, t – T. If the observations are conditional only on the previous observations, we have a first-order Markov chain. The transition matrix for a first-order Markov chain with a binary outcome is

$$\begin{pmatrix} p_{00} & p_{01} \\ p_{10} & p_{11} \end{pmatrix} \qquad (2)$$

where p_{01} indicates the probability of change from 0 to 1, that is $y_{it} = 1$, $y_{it\text{-}1} = 0$, and p_{11} indicates the probability of remaining at 1 from t - 1 to t, that is $y_{it} = 1$, $y_{it\text{-}1} = 1$. We can estimate the conditional transition probabilities given some set of covariates of interest $\mathbf{x}_{it}$ by

$$\Pr\left(y_{it} = 1 \middle| y_{i,t-1}, \mathbf{x}_{it}\right) = F\left[\mathbf{x}_{it}'\beta + y_{i,t-1}\mathbf{x}_{it}'\alpha\right] \qquad (3)$$

where F is a probit. The β parameters indicate the effects of covariates on the probability of a 1 at time t given a 0 at time t - 1, that is, $\Pr(y_{it} = 1 \mid y_{it\text{-}1} = 0)$. The effects on the probability of a 1 at time t given a 1 at time t - 1, $\Pr(y_{it} = 1 \mid y_{it\text{-}1} = 1)$, are given by the parameters $\gamma = \alpha + \beta$ if a state i is a military dictatorship at time t and $y_{it} = 0$ if it is a democracy. In this case, the estimated $\hat{\beta}$ coefficients can be interpreted as indicating the effects of a covariate on the likelihood that a democracy will become an autocracy; $\hat{\gamma}$ indicates a covariate's effect on the likelihood that autocracies will remain autocracies. Since the probability for all the possible outcomes at time t given $y_{it\text{-}1} = 1$ must sum to unity, the likelihood that a military dictatorship at time t - 1 will become a democracy at time t is $1 - \hat{p}_{11}$, or 1 minus the

probability that a military dictatorship will endure. This model is estimated together with the covariates of eq. (1).

Table 1 reports the summary statistics.[13] Military dictatorships are widely spread in our dataset, since they account for about 43% of our observed regimes; the potential for a contagion effect is roughly suggested by the fact that the mean lagged neighboring military dictatorships is sizable, so it is possible that a military government is geographically close to other similar dictatorships. Figure 1 maps military and civilian regimes in 1975, 1985, 1995, and 2005. In 1975 we observe one large cluster of military regimes in the central area of sub-Saharan Africa, and over time this area shrinks, with minor differences from 1975 to 1985, but faster afterwards, as the smaller areas of civil governments tend to progressively expand from the three original poles in which they were confined.

[Table 1 about here]

4. Results

Table 2 shows the marginal coefficients for model (1)[14] with one lag in the contagion variable (as in Brinks and Coppedge, 2006). The coefficient of *Military around* (*t*-1) is significantly positive at the highest level, confirming a strong dynamic contagious effect of military dictatorships. The value of the coefficient is 2.087; since *Military around* (*t*-1) is a standardized measure between 0 and 1, it indicates that a one hundredth variation, e.g. from 0.30 to 0.31, increases the mean expected probability of a military rule by about 0.021. However, if a country has four adjacent neighbors ruled by civil governments, if one of them becomes a military dictatorship, the share of military dictatorship neighbors is 25%, and this leads to an increase in the probability of becoming a military by 0.521, which is sizable. This result

[13] A correlation matrix is available upon request from the authors.

[14] The estimations have been obtained by using the command *margins(dydx)* after *xtprobit* in *Stata*.

seems reasonable since we can expect that the internal or external pressure to establish a military regime in a given country as a result of the establishment of such a regime in neighbor countries takes a while to be effective.[15] Overall, these results provide evidence in favor of Hypothesis 1.

[Table 2 about here]

The coefficient of *Manufacturing share of GDP* and *Primary share of GDP* are both significantly positive. To understand the former effect, we need to point out that the manufacturing sector in Africa is small and needs the support of the government to avoid expropriation. Moreover, in Sub-Saharan African countries, a large share of manufacturing sector descends from foreign direct investments, and these investors may support non-democratic (and possibly military) regimes to avoid the nationalization of their business. In the period 1990-2010 the annual contribution of FDI inflows to gross capital formation in West Africa rose from 13.8% to 26.8%, in central Africa from 0 to 40.8%, in east Africa from 1.7% to 12.9% and in southern Africa from 0 to 14.5%. On average in 1990 in sub-Saharan Africa the contribution of FDI to gross capital formation was 3.9 in 1990 and 23.75% in 2012 (UNCTAD, 2010). It seems understandable in agrarian economies in which large owners tend to support conservative political parties (and possibly the military) against the possibility of land reforms. *Openness* shows a significantly positive effect on the existence of a military regime.

Instead, the coefficient of the *Mining share of GDP* is always significantly negative, which is somehow related with the results for the *Oil producer* dummy that are significantly negative only in a few estimates (and insignificant in the others). Also the *Agriculture raw price* has a

[15] We have also estimated equation (1) with two lags of the variable *Military around*; the results are similar, although the marginal effect is slightly smaller. Results are available upon request from the authors.

significantly negative association with military regimes, although at the lowest significance level. This confirms the idea that rising agricultural prices may fuel instability in developing countries. The *British colonial origin* is also associated with lower likelihood of military dictatorships, which is in line with the results of Acemoglu et al. (2001).

Table 3 report the results of the transition model specified in (3). Due to the presence of independent variables interacted with the one period lag of the dependent variable, the panel version of the probit regression model is not feasible. We exploit the result of the LR test of $\rho = 0$ in table 2, which suggests that the use of a pooled estimation is equivalent to the random effects one, and we apply a pooled probit model to the estimation of equation (3). To control for unobserved heterogeneity, we cluster the errors at the country level. The marginal effects are presented in two different tables. Table 3 reports the non interacted variables, while Table 4 reports the results of the interacted one. The results of Table 3 can be interpreted as marginal effects of the transition to a military rule, while those in Table 4 concern its persistence.

The results of the non-interacted variables confirm the presence of positive geographical association across military governments; its coefficient is always positive and significant, although the magnitude is lower than in Table 2. Among the other covariates, only *GDP per capita* is significant and, unexpectedly, it shows the negative sign. *Fractionalization* becomes significant and negative; larger ethnic heterogeneity seems to hamper military rule, probably because it is costly to take control over a population that is highly fragmented, and possibly structured in military support organizations. The *Agriculture raw price* once again has a significantly negative association with military regimes as in Table 2.

[Table 3 about here]

These results are better interpreted in the light of their Table 4 counterparts. The most striking result is the lack of significance of the spatial lag of the dependent variable, whose magnitudes are also close to zero. This supports our Hypothesis 2. This effect can be interpreted in the light of Geddes (1999, 2003) who found that military regimes show the lowest persistence. She explains this feature claiming that military dictatorships have often weak roots in the society, therefore they are not able to control popular dissent and protest. In fact, as noted above Fjelde (2010) finds that military regimes exhibit a higher risk of civil armed conflict than other autocracies. Moreover, after the demise of the political power the military has an outside option: it can return to the barracks, which makes it easier to relinquish the government. Therefore, the diffusion effect found in Tables 2 and 3 tends to fade away over time.

GDP per capita is now positive and significant as expected: the effect found in Table 2 seems to be the mix of the transition and persistence effects, and the level of economic development of a country affects the persistence of a military rule rather than its emergence. In other words, if military governments experience an increase of the *GDP per capita*, their probability of survival increase, while a higher level of economic development is associated with a lower probability of transition to a military regime. Similarly, *Manufacturing share of GDP* is now negative and significant: if manufacturing decreases, persistence is more likely. The results suggest that entrepreneurs are likely to seek protection from military. In particular, as noted above, this might be true with regard to foreign direct investments. In fact, in Sub-Saharan African countries, a large share of manufacturing sector descends from foreign direct investments.

External hostility is positively associated with persistence of a military rule, as expected. *Crude oil price*, finally, is negative. In fact, most developing countries are dependent on oil imports. Therefore, when international price of oil rises, such countries experience severe short-term

economic downturn as well as a significant decrease of purchasing power of citizens so feeding dissent and protest.

[Table 4 about here]

5. Conclusions

In this paper we have documented the existence of a diffusion process of military dictatorships in Sub-Saharan Africa from 1972 through 2007. We empirically investigated this issue by applying a panel probit regression, and eventually a Markov chain transition model as presented in Gleditsch and Ward (2006). In sum the main result we would claim for this work is:

(1) *there is a robust spatial autocorrelation between military governments. Put differently there is a strong dynamic contagious effect of military dictatorships*;

With regard to the economic covariates, interestingly, we found that:

(2) *there is a positive association between current GDP per capita and the existence of a military rule*;

(3) *productive sectors as manufacturing and agriculture are associated with a higher probability of a military rule.*

Then, a dynamic contagious effect of military dictatorships is confirmed. In particular, we find that such domino effect takes some time to be effective. Secondly, in the transition model the presence of positive geographical association across military governments is confirmed. In other words, there is some diffusion effect of military regimes in Africa.

Moreover, what we claim as another significant finding is a broad picture of the relationship between the diffusion of military rule and some economic correlates. Above all, the relationship with GDP per capita as

measure of economic development deserves attention. First, the existence of a military rule is positively associated with GDP per capita. This is reasonably explained in the light of the interactions between foreign investors and military dictators. It is well documented that FDI in Africa have been increasing on the latest years so constituting a significant quota of GDP. Therefore, foreign investors can be supposed to seek protection from existing military regimes in order to avoid expropriation.

In the same vein it is explained why we found a positive relationship between the existence of a military rule and both manufacturing share of GDP and primary share of GDP. On the other hand, transition to military is negatively affected by GDP per capita.

In sum, our paper shed light on the geographical diffusion of military regimes in Africa by unpacking the relationship between such phenomenon and economic development and its structural aspects.

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Table 1 – Summary statistics

	Mean	Std. dev.	Min	Max
Military	0.431	0.495	0	1
Military around t-1	0.381	0.304	0	1
GDP per capita (logged)	7.547	0.836	5.031	10.062
Manufacturing share of GDP (logged)	2.097	0.762	-3.432	3.703
Mining share of GDP (logged)	1.351	1.379	-3.971	4.526
Primary share of GDP (logged)	3.199	0.757	0.616	4.591
Polarization	0.537	0.190	0.020	0.840
Fractionalization	0.633	0.262	0.050	0.960
Openness	4.068	0.655	0.685	5.773
Intensity of external threat	0.823	1.623	0	5
Crude Oil Price (logged)	4.133	0.794	2.015	5.530
External threat	0.934	1.696	0	5
Agricultural raw price (logged)	4.621	0.319	3.683	5.101
Oil producer (dummy)	0.163	0.370	0	1
British colonial origin (dummy)	0.416	0.493	0	1

Table 2 – Estimates of model (1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Military around (t-1)	2.087***	2.153***	2.002***	2.080***	1.870***	1.889***	1.792***	1.806***	1.787***	1.804***
	(0.258)	(0.254)	(0.262)	(0.258)	(0.277)	(0.272)	(0.278)	(0.275)	(0.278)	(0.275)
GDP per capita	0.543**	0.501**	0.512*	0.447*	0.352	0.542*	0.28	0.479*	0.311	0.496*
	(0.273)	(0.253)	(0.273)	(0.253)	(0.29)	(0.283)	(0.292)	(0.287)	(0.291)	(0.287)
Agricultural share of GDP		1.182***		1.025***		1.513***		1.451***		1.415***
		(0.273)		(0.278)		(0.335)		(0.336)		(0.34)
Manufacturing share of GDP	0.454***	0.546***	0.424***	0.504***	0.371**	0.489***	0.375**	0.489***	0.379**	0.490***
	(0.138)	(0.151)	(0.139)	(0.152)	(0.148)	(0.166)	(0.148)	(0.165)	(0.149)	(0.166)
Mining share of GDP	-0.397***		-0.367***		-0.319***		-0.298***		-0.296***	
	(0.102)		(0.104)		(0.114)		(0.114)		(0.114)	
Polarization	1.259	0.984	1.188	0.941	1.111	0.799	0.79	0.53	1.272	0.772
	(2.472)	(2.043)	(2.486)	(2.077)	(2.316)	(1.94)	(2.182)	(1.923)	(2.188)	(1.957)
Fractionalization	-0.549	-1.622	-0.603	-1.536	-0.826	-1.846	-1.331	-2.165	-1.659	-2.324
	(1.831)	(1.485)	(1.832)	(1.509)	(1.69)	(1.407)	(1.602)	(1.398)	(1.606)	(1.423)
Openness	0.290**	0.257*	0.308**	0.271**	0.391**	0.426***	0.359**	0.398**	0.350**	0.391**
	(0.14)	(0.135)	(0.143)	(0.137)	(0.161)	(0.159)	(0.162)	(0.16)	(0.162)	(0.161)
External hostility					0.046	0.046	0.042	0.042	0.044	0.044*
					(0.04)	(0.04)	(0.041)	(0.04)	(0.041)	(0.041)
Crude Oil Price	0.664	0.346	0.738	0.383	1.308	1.384*	0.999	1.166	0.877	1.082
	(0.696)	(0.594)	(0.712)	(0.606)	(0.873)	(0.739)	(0.878)	(0.759)	(0.872)	(0.77)
Agriculture raw price							-0.702*	-0.685*	-0.696*	-0.683*
							(0.379)	(0.381)	(0.379)	(0.381)
Oil producer			-0.292***	-0.247**	-0.215*	-0.132	-0.108	-0.033	-0.109	-0.036
			(0.097)	(0.098)	(0.124)	(0.126)	(0.137)	(0.138)	(0.137)	(0.138)
Landlocked	0.046	-0.116	0.077	-0.078	0.268	0.127	0.137	0.03	-0.033	-0.057
	(0.795)	(0.666)	(0.801)	(0.678)	(0.763)	(0.643)	(0.72)	(0.638)	(0.729)	(0.652)
British colonial origin							-1.389**	-1.044*	-1.248*	-0.994*
							(0.672)	(0.592)	(0.665)	(0.596)
Intercept	-7.769**	-10.961***	-6.268**	-8.988***	-5.564*	-12.258***	-0.827	-7.760**	-1.003	-7.702
	(3.034)	(3.004)	(3.064)	(3.108)	(3.068)	(3.424)	(3.522)	(3.926)	(3.496)	(3.934)
Log-likelihood	-450.486	-448.737	-445.906	-445.529	-393.198	-386.359	-389.458	-383.147	-388.357	-382.629
Wald chi2	102.92***	105.75***	108.31***	109.99***	73.07***	82.83***	78.86***	87.28***	78.03***	85.43***
LR test ρ=0	280.56***	283.83***	281.97***	285.86***	197.61***	201.48***	195.44***	203.18***	196.92***	204.03***
Observations	1289	1290	1289	1290	1056	1057	1056	1057	1027	1028

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 3 – Transition to military dictatorship.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Military around (t-1)	0.091**	0.084**	0.088**	0.083**	0.097**	0.088**	0.078*	0.075*	0.080*	0.077*
	(0.037)	(0.038)	(0.038)	(0.039)	(0.043)	(0.044)	(0.042)	(0.043)	(0.043)	(0.044)
GDP per capita	-0.050***	-0.036**	-0.054***	-0.041**	-0.054***	-0.039**	-0.051***	-0.041**	-0.051***	-0.042**
	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)	(0.017)
Manufacturing share of GDP	0.013	0.014	0.014	0.014	0.018	0.017	0.018	0.017	0.019	0.018
	(0.014)	(0.015)	(0.014)	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)	(0.015)	(0.015)
Agricultural share of GDP		0.022		0.016		0.028		0.014		0.012
		(0.022)		(0.022)		(0.023)		(0.023)		(0.026)
Mining share of GDP	-0.001		0.001		-0.004		-0.001		-0.001	
	(0.008)		(0.008)		(0.008)		(0.009)		(0.009)	
Polarization	0.071	0.07	0.065	0.068	0.064	0.065	0.057	0.056	0.061	0.06
	(0.062)	(0.063)	(0.063)	(0.062)	(0.074)	(0.076)	(0.076)	(0.076)	(0.078)	(0.079)
Fractionalization	-0.094**	-0.098**	-0.096**	-0.096**	-0.105**	-0.110**	-0.109***	-0.108***	-0.114***	-0.112***
	(0.046)	(0.044)	(0.045)	(0.044)	(0.042)	(0.043)	(0.036)	(0.037)	(0.037)	(0.038)
Openness	0.006	0.009	0.005	0.008	-0.001	0.004	-0.006	-0.003	-0.006	-0.004
	(0.015)	(0.016)	(0.015)	(0.016)	(0.017)	(0.018)	(0.017)	(0.018)	(0.018)	(0.019)
External hostility					-0.006	-0.005	-0.007	-0.006	-0.007	-0.006
					(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Crude Oil Price		0.036	-0.01	-0.006	-0.004	0.004	0.021	0.02	0.022	0.021
		(0.025)	(0.012)	(0.012)	(0.017)	(0.017)	(0.021)	(0.021)	(0.022)	(0.022)
Agriculture raw price							-0.128**	-0.098*	-0.132**	-0.101
							(0.058)	(0.06)	(0.06)	(0.062)
Oil producer	0.033		0.037	0.037	0.045	0.039	0.024	0.024	0.023	0.022
	(0.03)		(0.03)	(0.026)	(0.037)	(0.032)	(0.039)	(0.038)	(0.041)	(0.041)
Landlocked	-0.01	-0.01	-0.011	-0.01	0.002	0.001	-0.003	-0.002	-0.005	-0.003
	(0.022)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)	(0.02)	(0.019)	(0.021)	(0.02)
British colonial origin							-0.032	-0.032	-0.032	-0.031
							(0.021)	(0.021)	(0.021)	(0.021)

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 4 - Persistence of military dictatorships.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Military around (t-1)	-0.007	0.000	-0.006	-0.003	-0.011	-0.006	0.000	-0.001	0.001	-0.001
	(0.05)	(0.051)	(0.049)	(0.050)	(0.053)	(0.052)	(0.050)	(0.050)	(0.051)	(0.051)
GDP per capita	0.056***	0.055**	0.062***	0.061***	0.070***	0.068***	0.051**	0.066***	0.052**	0.067***
	(0.016)	(0.022)	(0.018)	(0.022)	(0.02)	(0.022)	(0.025)	(0.024)	(0.026)	(0.025)
Manufacturing share of GDP	-0.044**	-0.049**	-0.046**	-0.052**	-0.053**	-0.058**	-0.053***	-0.059***	-0.055***	-0.061***
	(0.021)	(0.024)	(0.021)	(0.023)	(0.021)	(0.023)	(0.018)	(0.02)	(0.019)	(0.02)
Agricultural share of GDP		0.003		0.01		0.018		0.036		0.04
		(0.022)		(0.021)		(0.024)		(0.032)		(0.034)
Mining share of GDP	0.008		0.008		0.011		0.012		0.012	
	(0.012)		(0.012)		(0.011)		(0.011)		(0.011)	
Polarization	-0.077	-0.086	-0.065	-0.08	-0.06	-0.069	-0.033	-0.033	-0.036	-0.036
	(0.068)	(0.07)	(0.07)	(0.072)	(0.08)	(0.081)	(0.085)	(0.087)	(0.088)	(0.09)
Fractionalization	0.057	0.061	0.06	0.059	0.05	0.044	0.043	0.038	0.046	0.04
	(0.051)	(0.049)	(0.053)	(0.05)	(0.05)	(0.05)	(0.044)	(0.043)	(0.046)	(0.045)
Openness	-0.014	-0.009	-0.01	-0.003	0.007	0.016	0.015	0.031	0.016	0.033
	(0.015)	(0.017)	(0.015)	(0.017)	(0.016)	(0.018)	(0.018)	(0.019)	(0.019)	(0.02)
External hostility					0.021**	0.020**	0.020**	0.020**	0.021**	0.020**
					(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Oil producer	-0.01	0.009	-0.018	0.006	-0.049	-0.011	-0.026	0.011	-0.024	0.014
	(0.039)	(0.035)	(0.041)	(0.038)	(0.043)	(0.041)	(0.045)	(0.05)	(0.047)	(0.053)
Crude Oil Price			-0.015	-0.02	-0.038	-0.053**	-0.055*	-0.056*	-0.057*	-0.058*
			(0.018)	(0.017)	(0.025)	(0.027)	(0.031)	(0.033)	(0.032)	(0.034)
Agriculture raw price							0.029	-0.028	0.031	-0.03
							(0.04)	(0.056)	(0.041)	(0.058)
Landlocked	0.024	0.021	0.027	0.022	0.003	-0.001	0.014	0.013	0.016	0.013
	(0.026)	(0.026)	(0.026)	(0.026)	(0.025)	(0.026)	(0.024)	(0.025)	(0.025)	(0.026)
British colonial origin							0.043*	0.048*	0.043*	0.049*
							(0.025)	(0.025)	(0.025)	(0.026)
Constant	1.665	-0.467	2.595**	0.335	2.363	-0.477	8.227***	5.206	8.162***	5.299
	1.121	2.033	1.298	2.251	1.485	2.536	2.814	3.621	2.819	3.630
Log-likelihood	-217.149	-216.838	-215.662	-215.329	-183.552	-182.548	-179.121	-178.453	-179.024	-178.373
Wald chi2	631.320***	579.310***	622.060***	537.670***	502.280***	476.290***	480.310***	440.370***	476.610***	435.930***
LR test ρ=0	0.00	0.03	0.00	0.29	0.00	0.01	0.00	0.18	0.00	0.18
Observations	1286	1287	1286	1287	1054	1055	1054	1055	1025	1026

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Figure 1 – Military and civil regimes in Sub-Saharan Africa in selected years