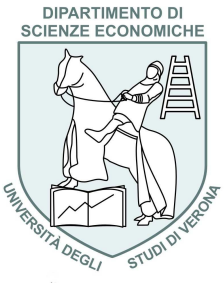

Working Paper Series
Department of Economics
University of Verona

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WP Number: 35 December 2012

ISSN: 2036-2919 (paper), 2036-4679 (online)

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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. 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: D74, P48, Q34.

1. Introduction

Military regimes in 2010 ruled 7.5% of the world countries, with a concentration of almost 50% of them in Africa (Wahman et al., 2013). These figures describe a highly uneven distribution of the phenomenon. In 1972 military dictatorships accounted for 24.6% of the world countries, with 45.7% concentrated in Africa. At the same time the share of democracies increased from 28.2% to 54.0%. We therefore observe 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 keep military dictatorships concentrated in Africa. This second effect may be the result of a 'local diffusion process' opposite to the one usually considered in the political science literature. In the context of a country bordering with other countries, we claim that the probability that the targeted country becomes a military regime increases as the share of neighbors governed by a military rule gets larger.

Li and Thompson (1975) summarize four types of influences can be extracted from this literature: (i) model, (ii) disinhibitor, (iii) negative example, and (iv) reference group. The first one refers to the emulatory example that a coup may exert for another country's coup leader. Disinhibitor usually refers to a coup that demonstrated that a coup can be successful without high costs. Negative examples are situations to be avoided. A coup may also serve as a negative example as in the cases where senior officers have acted to preempt the replication of another state's junior officer revolt. Finally, the reference group term has been restricted to regional groups of

individuals in which the action of one group member creates new status aspirations for the other members.

In what follows we consider 48 African countries for the 1972-2007 period to answer the following research question: is there a diffusion effect of military dictatorship? Needless to say, 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.

In such a context, the mechanism of diffusion develops as a domino. As an example, neighboring states j might contest the land rights, the use of natural resources, or be involved in ethnical conflicts with state i. As j's governments are more prone to the use of the force, and more organized for military operations rather than diplomacy, the demand for national defense raises in country i and makes it more likely to delegate the power to the army. A large share of military rules in the neighborhood, moreover, might generate emulation or imitation in country i and increase the probability that an armed group stages a coup and takes power. 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".

The paper proceeds as follows: in Section 2 we review the literature and discuss the model underlying the diffusion of military

dictatorships, 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 study relates to the recent literature that analyses the relationship between the civil undemocratic government and the military one. The theoretical models describe an agency problem: 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. 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. Caruso et al. (2013) empirically supported the impact of economic variables and political factors on the probability of a military rule.

The diffusion of democratic institutions, on the other hand, is the focus of a wide literature. Stemming from the evidence of waves of democratization described by Huntington (1991), political scientists investigated the presence of spatial patterns of

democracy. Once the democratization process is triggered in one previously non-democratic region (e.g. Eastern Europe), information spills over, democracy starts being perceived as a possibility and enters the spectrum of political alternatives. The establishment of democratic institutions in nearby countries changes political expectations, crowd behavior, and relations of power within the regime.

When in neighboring countries the balance of power shifts from one group to another, this could give support to different groups in a foreign country empowering them in a way that make it possible to change the government. Schelling (1971) “tipping model” suggests that small changes in external context may suffice to yield cascades that can generate a critical mass in political contestation. Such processes were probably in place in Eastern Europe, where the initial political changes in Poland and Hungary spurred subsequent changes in Czechoslovakia and East Germany at the time of the demise of socialism, and in the Middle East starting in Tunisia and moving towards Egypt, Libya, Morocco and Yemen. Tipping effects could lead to a clustering of transitions, with one transition increasing the like likelihood of subsequent transitions in connected states.

Doorenspleet (2004) analyses the structural determinants of democracy during the Huntington's Fourth Wave (1989-1994) and 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. A global movement towards democracy has been verified even prior to the breakdown of the Soviet Union by Starr (1991). The author conducted 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.[1]

Przeworski and Limogi (1997) criticize modernization theory on the basis that it creates a cycle running from dictatorship (needed to implement economic reforms) to development and democracy, which is not supported by relevant empirical analysis. They build a transition model to map changes from dictatorship to democracy and find that the emergence of democracy is not a by-product of economic development. Democracy can be initiated at any level of development, and its chances of survival are greater when the country is richer or when there is GDP per capita growth starting from a low level of income.

Gleditsch and Ward (2006) provide an 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 and growth) are needed in order to that take into

[1] Diffusion effects have also been analyzed in the context of failed states (Iqbal and Starr, 2008) and international terrorism (Neumayer and Plümper, 2010), where the issue of common shocks and trends adds up to the problem of spatial dependence.

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. 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. De Groot (2011) focuses on development of political freedoms in Africa. The author analyzes several path-dependent variables, such as the history of political freedom and also the improvements emerged in neighboring countries finding the an 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[2] 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 effect 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 purpose of this replication is to establish whether Jackman's findings hold when continuous-time hazard models of event history data are used instead of the panel regression approach used by

[2] The assumptions of the Poisson process are: (1) the probability of occurrence of the number of events during each of a specified number of intervals depends only on the number of events and on the length of the intervals. When all of the intervals are shifted by the same amount, the probability of occurrence of an event is unaffected; (2) the probability of the occurrence of a given number of events is independent of how many events occurred during an earlier interval; (3) the occurrence of two or more events in a very small time interval is virtually impossible; (4) each event occurs at random, independently of all the rest; (5) the set of elements analyzed by the model is homogeneous.

Jackman. The event history approach focuses on the rate of coup d'état over time rather than some index of coup d'état. The 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, then increases up to some maximum point and starts to decline again. For the average country in this sample, the likelihood of a coup reaches its maximum after approximately 45 months.

3. Data and methodology

In choosing the military regime variable, we face the choice of a number of datasets. 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*

[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.

military) thus should not count as military."[4] 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.[5] 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 et al. (2009) consider a military regime as "an executive [that] has the power to use military force abroad without legislative approval," which seems too narrow for our purposes.

We analyze the diffusion of military dictatorships by estimating the interaction coefficients between the domestic regime

[4] The military category also includes *rebel regimes*, i.e., cases where a rebel movement (not formed from the regular armed force) has taken 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 group often seize power from existing regimes (Congo-Kinshasa from 1997 to 2003 is one example).

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

and the neighboring ones. Our dependent variables, the military nature of the government, is dichotomic. 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 quest for defense that gives power to the army, emulation or fomentation. Formally, this concept claims 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.

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, derived from Penn World Tables 6.3[6] (Heston et al., 2009), and the added value of the agricultural, manufacturing and mining sector[7] as percentage of GDP, using 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).

[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.

Sectoral shares of GDP are included following the theoretical insights presented in Caruso (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

[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/.

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.

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

$$\begin{pmatrix} p_{00} & p_{01} \\ p_{10} & p_{11} \end{pmatrix} \tag{2}$$

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

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

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 | $y_{it\text{-}1}$ = 0). The effects on the probability of a 1 at

[12] CIA Factbook.

time t given a 1 at time t - 1, Pr(y_{it} = 1 | $y_{it\text{-}1}$ = 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 presence of a contagion effect is roughly suggested by the fact that the mean lagged military dictatorships are a smaller share, 38.2%. Figure 1 maps military and non-military regimes in 1975, 1985, 1995, and 2005. In 1975 we observe one large clusters of military regimes in the central area of sub-Saharan Africa, and over time this area shrinks, 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]

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

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 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]

[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

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

[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.

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 significantly negative association with military regimes, although at the lowest significance level. 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 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 weak roots in the society, therefore they are not

able to control popular dissent and protest. In fact, as shown in Fjelde (2010) 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).

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 are likely to seek protection from existing military regimes in order to avoid expropriation. Eventually, 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. Put differently, economic growth can support existing military regimes but do not constitute an engine of autocracy. 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	0.324	0.468	0	1
Military around t-1	0.306	0.286	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