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1400 16th Street, NW / Suite 350
Washington, DC 20036
(202) 939 - 3450

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The Price of Power: Commodity Prices and Political Survival in Africa

Angus Deaton

Princeton University

and

Senior Research Fellow
Institute for Policy Reform

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This paper makes a modest attempt to disentangle the causality between political and economic events within the context of the effects of the rate of economic growth on the probability of leaders' survival in Africa, variables that are significantly positively correlated in the data. However, the correlation cannot tell us whether it is the economic success that enhances the likelihood of survival, or whether economic growth is itself the outcome of the political events, through successful manipulation of the economy by the incumbent, or because economic growth is more rapid in the absence of the political turmoil that often precedes a change in leadership. Fluctuations in the world prices of African countries' exports provide an "instrument" that can help untangle the causality. Increases in commodity prices favor economic success, but are plausibly unaffected by political events in the countries themselves, so that the economic growth associated with commodity price booms is free from feedback from political events. Previous evidence that economic growth enhances political survival is confirmed with commodity-driven growth, thus providing (weak) evidence in favor of the economics to politics interpretation rather than the reverse.

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EXECUTIVE SUMMARY

There are literatures in both economics and political science that investigate the relationship between political arrangements and economic growth. Development economists have investigated whether measures of political and civil liberties enhance the rate of economic growth, while political scientists have asked whether democracy is itself a luxury good, something that can only be afforded by wealthy nations. There is a literature on the effects of political instability on various economic outcomes, on public finance and debt, as well as on the rate of economic growth, and there is a literature on economic growth inhibiting the transfer of power, whether constitutional transfers such as elections, or unconstitutional transfers, such as *coups d'états*. In all of these studies, it is difficult to know whether the causality typically flows from economic to political events, or *vice versa*. Many studies simply assume a particular direction of causality, while others make use of timing, assuming that earlier events are causally prior. While some such assumption is likely to be necessary, it will be controversial in any context where agents look to the future. Incumbents often know the dates of future elections, or can engineer economic changes in anticipation of troubles ahead, so that it is quite possible for events to occur in advance of their ultimate causes.

An empirical investigation of causality requires an instrumental variable, something that affects economics, but not politics, or *vice versa*. For example, if variable x affects the growth rate of national income, but is plausibly unaffected by the political events in question, x should help predict the politics if economics causes politics, but it should be uncorrelated with political events if the correlation between politics and economics flows from the former to the latter. This paper proposes that fluctuations in the world prices of primary commodity exports be used as such an instrument in the context of Africa, and uses it to investigate one particular type of political phenomenon, the survival of leaders. For many African countries, a large share of GDP—and an even larger share of exports—is accounted for by exports of primary commodities. The world prices of these commodities are (in)famously volatile, and since they are typically set in world markets, to which African producers contribute only a share, they are not likely to be affected by political events in the African countries themselves. Increases in commodity prices increase producers' incomes—not only through the direct effects of higher prices —but also by stimulating government expenditure and domestic investment and, through a multi-

prices —but also by stimulating government expenditure and domestic investment and, through a multiplier-accelerator process, gross domestic product. Fluctuations in world prices thus fulfil the conditions for an instrument; they are exogenous to the domestic political process, and they help predict economic outcomes.

The paper's first empirical task is to establish the links, first between political survival and the growth rate of GDP, and second, between the growth rate of GDP and fluctuations in the world prices of the commodities exported by African countries. In both cases, significant relationships are found, in confirmation of the previous literature. It is therefore possible to use the commodity prices to construct measures of economic growth that are free from feedbacks from political events, and to investigate whether they, like the raw measures of economic growth, appear to prolong leaders' survival. The answer is in the affirmative, and the study uncovers no evidence of important feedbacks from political turnover to economic growth. However, the results are weakened by the fact that, although commodity price growth has a strongly significant effect on economic growth, it predicts it quite poorly, so that the two-step link from prices to growth to survival is quite attenuated. As a result, the parameter estimates are imprecise, and are consistent with a number of different interpretations. Matters can be improved a good deal at the cost of assuming that at least some prior variables are also causally prior. In particular, if it is accepted that, conditional on the growth of GDP, political survival is unaffected by the earlier growth rates of GDP and its components, the results become much more precise, and once again are in favor of the original position, that economic growth helps leaders remain in power.

D

0. Introduction: politics and economics

There are two different literatures concerned with the relationship between political factors and economic growth. One, in economics, looks at the determinants of economic growth while the other, in political science, is concerned with the determinants of political structure and political change. The literature on economic growth, although mostly concerned with economic determinants, often includes a number of political variables such as the level of political or civil freedom, the extent to which the political system is democratic, and measures of political instability such as political violence or frequent or irregular changes of regime. The other literature, often working with much the same data, looks for the economic determinants of political structure, whether democracy is a luxury good, whether irregular transfers of power are confined to poor countries, and the extent to which transfers of power are inhibited by successful economic performance.

While the empirical evidence is clear on the existence of correlations between economic and political variables, it is quite opaque as to even the major directions of causality, whether the important effects run from political structure to economic performance, or *vice versa*. While there are a few studies that have recognized the simultaneity, and have made an attempt to sort out cause and effect, I shall argue in the next section that little progress has been made. This is unfortunate, since it is hard to imagine an empirical issue with greater implications for policy. If economic performance is the inevitable precursor of political change, growth in East Asia will lead to political liberalization, and international policy should be directed towards encouraging that growth, leaving political structures to look after themselves. Similarly, the key to growth and democracy in Africa is economic reform, not direct political reform. If causality flows the other way, there is little hope for economic progress in Africa until political structures are addressed, something that would require a quite different set of policies by the international community, policies that might well inhibit economic growth, at least temporarily. Of course, the world may not be so simple, and causality may flow in both directions—the incumbent who stimulates the economy prior to an election presumably does so in the belief that economic growth will help him—and it may run in different directions in different times and circumstances.

Using the evidence to establish the direction of causality is hampered by both

theoretical and empirical obstacles. Causality is not easily investigated except within an agreed upon and empirically tested theoretical structure, in this case of the determinants of economic growth. In spite of the recent revival of interest in the topic, or perhaps because of it, that goal seems further away than ever. The problem is not lack of theory, but multiplicity of theories, none of which seems to explain more than a fraction of the historical and geographical variation in growth rates, nor does any one theory appear to have a decisive empirical advantage over the others. None of these theories provides precisely what we need to test causality, which is some variable or set of variables that are either determine economic outcomes but are not influenced by political structure, or determine political events, but are unaffected by economics. For example, if x affects the growth rate of national income, but is plausibly unaffected by the political events in question, x should help predict the politics if economics causes politics, but it should be uncorrelated with political events if the correlation between politics and economics flows from the former to the latter. This paper proposes such an 'instrument' in the context of Africa, and uses it to investigate one particular type of political phenomenon, the survival of leaders.

In Deaton (1993) and Deaton and Miller (1993), it is shown that fluctuations in the world prices of primary commodities help determine changes in gross domestic product in African countries. For many of these countries, a large share of GDP—and an even larger share of exports—is accounted for by exports of primary commodities. The world prices of these commodities are (in)famously volatile, and provide major problems of macroeconomic management for policy makers in the continent. Since these prices are typically set in world markets, to which African producers contribute only a share, they are not likely to be affected by political events in African countries. Increases in commodity prices increase producers' incomes—not only through the direct effects of higher prices —but also by stimulating government expenditure and domestic investment and, through a multiplier-accelerator process, gross domestic product. Fluctuations in world prices thus fulfil the conditions for an instrument; they are exogenous to the domestic political process, and they help predict economic outcomes.

The paper is laid out as follows. In Section 1, I provide a brief review of some previous literature, and use it to explain why causality is so difficult to test, and why previous attempts have been unconvincing. Section 2 establishes a baseline for

the experiments in the paper. It presents the data on leadership, on commodity prices, and on economic growth, re-establishes earlier results in the literature on economic growth and political survival, and establishes the link between commodity prices and economic growth. Section 3 is the crucial one. It tests the link between fluctuations in commodity prices and the survival of leaders, and presents instrumental variable estimates of the relationships established in Section 2.

The results require careful interpretation and are not readily summarized without repeating the material in Section 3. They certainly confirm the difficulty of testing causality; commodity prices affect economic growth, and economic growth affects leadership, but neither of the links is strong enough on its own to prevent the effect of commodity prices on political events being quite attenuated. Even so, the results do not provide any evidence of the feedback from leadership changes to economic growth that would call for a reevaluation of the main result that economic growth inhibits the political exit of leaders. These results are strengthened and reinforced if we admit a wider range of instruments, particularly the lags of the components of national income that are known to predict income change. In all cases, the causality appears to run from the economic to the political events.

The evidence of this paper concerns only one type of political event, political exit, and considers only one economic variable, the rate of economic growth. Its contribution to the broad questions is therefore a modest one, and is made more so by the ambiguity of a good deal of the evidence. But untangling causality is genuinely difficult, and the results should be treated as a first step in that process.

1. Economic and political interactions: some recent literature

There has been a large recent empirical literature in economics that examines the correlates of economic growth, typically using the international national income data from the Penn World Table, Summers and Heston (1991), merged with a range of other data on political, social, and economic variables. Most of these studies use averaged growth rates over the period from 1960 to 1985, and treat each country as a separate (single) observation. Several have investigated the effects of various measures of democracy on growth—including for example the Gastil (1987) (or Freedom House) measures of civil and political liberties—with mixed results. Scully (1988, 1992), Kormendi and Meguire (1985), Grier and Tullock (1989),

Johnson, McMillan, and Rausser (1991), Dasgupta (1993) and DasGupta and Weale (1992) all find a positive effect of democracy on growth, while Sirowy and Inkeles (1990) review a dozen more studies that either show negative or no effects. Helliwell (1992), who also provides a review of the literature, finds no effect of democracy on growth when democracy is added to the predictors in the education-augmented version of the Solow growth model proposed and estimated by Mankiw, Romer, and Weil (1992). Barro (1991*a*, *b*) regresses growth rates on *inter alia*, measures of political instability, including war, assassinations, and revolutions, dummies for socialist versus mixed and capitalist systems, and the Gastil measure of political liberties, all of which, in one specification or another, are found to reduce the rate of economic growth.

To the extent that these studies concern themselves with simultaneity—and several do not—the main 'treatment' is timing, with attempts whenever possible to date the political observations earlier than the growth that they are intended to explain. This is not always possible; for example, the Gastil indices are only available from 1976, a problem that Helliwell deals with by instrumentation using all the economic variables in the growth model and the 1960 value of Bollen's (1980) index, with which the 1976 value of the Gastil index is positively correlated. It is important to note that the identification of causality by timing, the *post hoc propter hoc* method, is far from uncontroversial. In particular, political events will often cause economic changes that occur *before* the political events themselves; the political business cycle in developed countries is the classic example, where incumbents attempt to manipulate the economy in anticipation of a forthcoming election.

Nor are revolutions, coups, nor political violence random and causeless events, but are often the result of conditions that may themselves have had a prior and long-standing positive (*e.g.* Iran of Pahlavi) or negative (*e.g.* USSR) effect on economic growth. More generally, whenever there are country specific 'fixed effects,' factors that vary from country to country but that are either constant or that change only slowly over time, there will be a feedback from lagged variables to current variables. If some countries are blessed with traditions of entrepreneurship and hard work, and some are not, the former will grow faster than average whatever other factors are at work. Hence, if there is positive feedback from economic growth to political stability in the same period (say), economic growth will be positively predicted by political stability in all earlier periods. In the presence of

simultaneity at *any* lag, the omission of any constant or slowly changing omitted variable will affect apparent causality at *all* leads and lags. Hence unless we can be sure that all such variables have been accounted for—which is an assurance that is hard to come by—it is not possible to resolve causality questions by timing alone.

Helliwell's instrumentation procedure is exactly the right technique, but is nevertheless always likely to be controversial in practice. It is certainly correct that the effects of democracy should be tested within a well-specified model of economic growth, and Mankiw, Romer and Weil's is such a model. But the identification of that model is itself extremely controversial; for example, expenditure on schooling appears as an exogenous variable to explain the rate of growth of output, a specification that is not obviously to be preferred to the older 'demand for education' models in which the causality runs in the opposite direction. A well-specified model is relatively little help if its own identification is inherently controversial.

If economists tend to treat political variables as exogenous, political scientists frequently reciprocate by treating economic variables as exogenous. There is a literature in political science dating back many years that considers the question of whether democracy is a 'luxury good,' something that can only be afforded by relatively wealthy countries. These studies, which are also reviewed by Helliwell (1992), tend to endorse the view that democracy is bad for growth, but are typically supported by evidence that rich countries are indeed more democratic, a correlation that, according to Helliwell, is quite robust. There is also strong evidence from Londregan and Poole (1990) that 'irregular transfers of powers,' or *coups d'état*, are characteristic of poor countries and are almost unknown in the developed world.

A recent literature in political science, Bienen and van de Walle (1991, 1992), and Bienen, Londregan and van de Walle (1993) investigates transfers of power from one leader to the next, and it is this work that provides the starting point for the investigations here. Bienen and van de Walle link the (conditional) probability of a leader's survival to his or her age, to time in power, and to whether or not the leader assumed power constitutionally. In Bienen, Londregan and van de Walle, the leader-based analysis, in which each leader is a single observation, is extended to an analysis based on time-series cross-section data of countries, in which each observation is for a given country in a given year, thus allowing an investigation of the role of ethnicity and of economic factors. The study finds that current and lagged economic growth inhibit the transfer of power, so that leaders who are

apparently successful in handling the economy, or are otherwise economically fortunate, are more likely to survive, a result that is in line with the literature on democracies in the developed world. The authors recognize the possible simultaneity between transfers of power and the *current* rate of economic growth, and instrument the latter using lagged national income, a measure of openness to trade, and a world business cycle variable that is weighted by openness to trade. As always, the exogeneity of these instruments is controversial, as is the use of lags to generate exogenous instruments.

Bienen and Londregan's causality, from economic growth to political survival, is the same as that in Londregan and Poole (1990), who look only at *coups d'état*. Londregan and Poole construct a two equation model of *coups* and growth, and directly confront the simultaneity issue, recognizing that their model cannot be identified without explicit assumptions. On the assumption that there is no instantaneous relationship either from income growth to the probability of a coup, nor from the probability of a coup to the current rate of growth of income, and that the past history of *coups* has no effect on income, they estimate a model in which income growth is estimated to inhibit *coups*. Since there are more identifying assumptions than strictly necessary, the over-identification can be tested and the results give no indication of model misspecification. Even so, the identification itself cannot be tested, and Londregan and Poole's results are conditional on the validity of their assumptions, which impose a causal structure on the correlations.

Closely related to the literature on political turnover is a set of three recent papers. Cukierman, Edwards, and Tabellini (1992), Özler and Tabellini (1991), and Alesina, Özler, Roubini, and Swagel (1992) that are concerned with the economic effects of political instability, *defined* as the probability of a change of leadership. All of these studies recognize potential simultaneity between political instability and economic variables, and all use a two stage procedure that models the probability of a transfer of power at the first stage, and then uses the estimated probability of change as a measure of political instability in the subsequent analysis. Cukierman *et al* look at the effects of political instability on public finance, particularly on the propensity to finance government by seigniorage. Özler and Tabellini examine whether political instability induces myopia and thus increases the demand for debt by developing countries, while Alesina *et al* follow Londregan and Poole in estimating a fully-fledged simultaneous model of growth and political change. The

first-stage estimation of the probability of change uses all of the exogenous variables, and as in the rest of the literature, lagged economic and political variables are treated as exogenous.

In their simultaneous equations model, Alesina at al choose not to follow Londregan and Poole in explicitly justifying their identifying assumptions, but instead use the unusual procedure of excluding exogenous variables based on their insignificance in the reduced form. The standard exclusion methodology of simultaneous equation estimation requires that variables be excluded *a priori* from the structural equations, not the reduced form, and absence from the former is no guarantee of absence from the latter. Nor can identification be achieved by the exclusion of irrelevant variables; indeed it is the prior exclusion of *significant* variables from one or other of the equations that identifies the structure. From the point of view of the current study, the major finding of Alesina *et al* is that, in the simultaneous equation model, neither current nor lagged economic growth have any effect on the probability of a transfer of power. It is tempting to attribute this result to the failure of identification, particularly as their final structural equation for power change has no role whatever—current or lagged, direct or indirect—for economic growth in affecting the transfer of power, a result that contradicts not only the rest of the literature, but seemingly also their own reduced form estimates, in which lagged growth has an important and statistically significant inhibiting effect on political exit.

Lest this section end on an unduly negative tone, I should emphasize the basic intractability of the identification issue with which all these authors have had to deal. Without something that comes from outside the political and economic system of each country, these political economy models are essentially not identified, so that the best that can be done is to demonstrate that it is possible to use the data to tell one story or another. If one author uses the political variables to explain the progress of the economy, that is just as valid as another story based on the opposite causality. The papers discussed in this section have made major contributions by providing alternative models of the relationship between political and economic events, and by showing how to interpret the correlations in the data in terms of these models. What none has managed to do is to demonstrate which interpretation is correct.

2. Establishing the baseline models

2.1 Political exit and economic growth

In this section, I use data from Africa to establish, on the one hand, the same sort of single equation results on the relationship between political exit and economic growth that were earlier obtained for a wider sample by Bienen, Londregan and van de Walle (1993), and on the other, to establish a link between the rate of economic growth and fluctuations in the world prices of primary commodities. The next section combines the two sets of results into a model of political change that expressly accounts for simultaneity.

The data on political change come from Bienen and van de Walle's (1991, Appendix) compilation of world leaders. This data set covers 2,256 leaders and includes information on the number of years in power, the date of entry to power, whether the leader came to power constitutionally or non-constitutionally, age at entry, whether the exit from power was constitutional, non-constitutional, or from death from natural causes. As updated by Bienen, Londregan, and van de Walle there are 44 African countries in the data, with observations running from 1962 (or from the date of independence, whichever is later) through to 1989. In this paper, as in Bienen *et al.* the data are converted so that each observation relates to a specific country in a specific year, not to a leader. Although the data will be further curtailed to match the availability of national income and commodity price data, we have in principle up to 28 observations on each of 44 countries. From these, I use a dummy variable that takes the value 1 if there is a 'political exit' in that country in that year, where a political exit includes constitutional and non-constitutional exits, but excludes exit by death from natural causes. Multiple exits in a single year are also treated as if they were a single exit. In order to capture the main results in Bienen and van de Walle, I also use data on the time the leader has been in power, and whether that leader's entry was or was not constitutional.

The data on national income and output are taken from the Penn World Tables, Summers and Heston (1991), which provide internationally comparable data for individual countries with currency conversion at purchasing power parity rather than at official exchange rates. To test the sensitivity of the analysis to the use of these data, the experiments below have been rerun using the 'official' data taken from

International Financial Statistics or the World Bank's *African Economic Indicators*. Although the two sets of accounts are far from identical, especially for African countries, the differences do not have a material effect on the results of the analysis. The version of the Penn World Table that I use provides data for 37 African countries—all of which are included in the Bienen–van de Walle data—for the years 1965 through 1985. I use the chained output measure for gross domestic product; this measures real output, not income, and so excludes the direct effects on national incomes of fluctuations in the prices of commodity exports. I also use the corresponding data on real consumption, investment, and government expenditure.

Bienen and van de Walle specify the conditional probability of losing power through the hazard function and employ the standard methods of survival analysis to estimate the parameters of their model. Londregan and Poole, in their study of *coups d'état*, use probit analysis, an alternative to survival analysis for handling binary dependent variables. In this paper, I follow the simpler approach of Bienen, Londregan and van de Walle (1993) and work with the linear probability model, in which the dichotomous structure of the dependent variables is essentially ignored, and standard regression methods applied. The predictions of the linear probability model can be interpreted as the probability of an exit, and its coefficients as the effects of the explanatory variables on that probability. The standard regression structure also makes possible the use of fixed effect estimators, which allow the intercept of the regression to differ from country to country. Given the timing and exogeneity issues discussed in the previous section, it is important to be able to allow for such effects even if, in some cases, the relevant results can only be identified from the cross-country variation in the data. Clearly, the functional form of the linear probability model is less satisfactory than one that guarantees that probabilities lie between one and zero, but the problem hardly seems decisive in an exercise such as this where the model is not tightly specified, and where we are concerned with little more than detecting correlations, measuring their significance, and interpreting them within a causal framework.

The linear probability results for leader exit are given in Table 1. The left hand and right hand sides of the table show results without and with country specific intercepts, and in each half, I show results for a specification containing only the growth rate of real output and for a specification containing growth, time in power, the non-constitutional entry dummy and an interaction term between the last two.

The timing of the growth rate in Table 1 is contemporaneous with the possible exit; I am comparing an exit or no-exit in year t with the growth of real output from $t-1$ to t. The results are consistent with those obtained by Bienen and van de Walle and by Bienen *et al.* There is a strongly significant negative relationship between the current rate of growth of the economy and the probability of exit; in the simplest regression, raising the growth rate from zero to five percent a year reduces the predicted probability of exit by two and a half percent. The effect is somewhat less in the regressions with country fixed effects, but its significance survives the addition of the 36 additional explanatory variables. The estimated growth effect is essentially unaffected by the inclusion of the variables relating to the leader currently in power. In the model without fixed effects, I find, as did Bienen and van de Walle, that non-constitutional leaders are more likely to exit in the early years, but that the effect wears off with time, so that after eight years, a leader who came to power non-constitutionally is no more likely to exit than one whose entrance was made in the recommended manner. The precise size of these effects should not be taken too seriously given the crudeness of the specification, but the result accords exactly with Bienen and van de Walle's findings for a much larger sample of leaders. What is not consistent with their findings is the fact that, for these African countries, time in power seems not to enhance the probability of exit, except for leaders whose entrance was non-constitutional. In Africa, many of the constitutional leaders are the first leaders of the new nation, and their tenure is likely to be different from other leaders. The estimates of the effects of the leadership variables are very similar whether or not fixed effects are included, although none are significantly different from zero in the expanded specification. Even so, the fact that the parameters do not change by much is itself important in the light of possible causal feedbacks that might be exposed by the inclusion of the fixed effects. There is no evidence in Table 1 that the pooled estimates on the left-hand side of the Table are generated by the existence of country-specific effects that are conducive to both political stability and economic growth.

Several possible variants of these results are worth considering. In particular, it is possible that the growth of national income is acting as a proxy for other variables that have a more direct impact on the probability of political survival. For example, it is consumption, not output, that most directly contributes to constituents' welfare, and an increase in output that reflects an increase in investment for

the future might not be as popular as a direct increase in consumption. It is also true that it is government expenditure that is most directly under the control of the incumbent, so an argument could also be made for the use of government expenditure in place of or in addition to output. The regressions in Table 1 were rerun with the growth of income replaced in turn by the growth of investment, the growth of consumption, and the growth of government expenditure. In all cases, the coefficients are negative and either statistically significant or close to it, although they are all smaller, between –0.1 and –0.2, than the coefficients on the growth of output in Table 1. None of these equations fits as well as the original, and none of the alternate variables attracts a *t*-value as large as those in Table 1. I also investigated the use of the growth rates of consumption, investment, and government expenditure in addition to the growth rate of output. In the regressions without fixed effects, the growth rate of output always remains negative and significant, although the effect is somewhat smaller than in Table 1, and it is never possible to reject the hypothesis that the additional variable is irrelevant once we have allowed for output growth. When country fixed effects are included, *t*-values are further reduced, although the growth rate of income continues to have a negative effect that is both larger and attracts a larger *t*-value than the additional components of output growth. On the basis of these results, I conclude that output growth performs better than the obvious alternatives, and that there is no evidence of additional explanatory power once overall growth has been taken into account.

The other extension investigated here is the presence of lagged growth rates. Table 2 presents the results of rerunning the basic regressions including the first and second lags of GDP growth. As with the current growth rate, the estimated effects of lagged growth rates are negative, inhibiting political exit, but in none of the four regressions is it possible to reject the hypothesis that, once current growth has been accounted for, earlier lags have no effect. The coefficient on current GDP growth is not much affected by the presence or absence of the lags. Given these results, it is not surprising that there is also little improvement in these regressions from adding lagged values of the growth rates of other components of GDP. In a regression with current and once lagged values of the growth rates of GDP, consumption, investment, and government expenditure, no single parameter estimate is statistically significant and once again, it is not possible to reject the hypothesis that only current growth matters.

2.2 Growth and commodity prices

Having reaffirmed the single-equation link between leadership turnover and economic growth in the African data, I now need to establish the relationship between economic growth and fluctuations in the world prices of primary commodities. In this I draw on the results in Deaton (1993) and Deaton and Miller (1993) who construct time-series for commodity prices for 35 African countries and use them to study the dynamic effects of prices on gross domestic product and its components. Since the details are given in the earlier papers, I give only a brief discussion here.

Annual average prices on 20 primary commodities are taken from *International Financial Statistics* or *African Economic Indicators*; the commodities (bauxite, cocoa, coffee, copper, cotton, gold, groundnuts, iron, manganese, oil, oil-palm products, nickel, phosphates, rubber, sisal, sugar, tea, tobacco, uranium, and wool) are selected because of their importance in African exports, and because data are available on their prices. For some important exports such as diamonds in Botswana, it is difficult or impossible to obtain a satisfactory price index. For each country, a commodity price index is constructed by weighting these prices (geometrically) using their 1975 shares in total exports of the 20 commodities, and then deflating by the index of import prices for developing countries taken from *African Economic Indicators*. Note that, although the prices vary from year to year, the weights are constant as they must be to avoid the endogeneity that would arise if they changed with economic events in each country. Table 3, reproduced from Deaton and Miller (1993, Table 2,) lists the countries together with the weights of the commodities in each price index. Neither Somalia and Lesotho export perceptible amounts of any of the 20 commodities and are excluded from the analysis.

Deaton and Miller run an extended vector-autoregression (VARX) with the logarithms of GDP, consumption, investment, and government expenditure as the dependent variables, and with three lags of each, country specific intercepts and time trends, and the contemporaneous and first three lagged values of the (logarithmic) commodity price index as right-hand side variables. The logarithms of the commodity price index are weighted by the country's share of the 20 commodities in GDP in 1975, which amounts to measuring commodity price booms in terms of the income they generate as a share of GDP, rather than as a percentage change in prices.

Since my concern here is not with the dynamics of GDP and its structure, and only with predicting its rate of growth, I work here with only one equation of that system, and I use a differenced specification with and without country specific intercepts but without the time trends. Table 4 reports a variety of results. The first two columns show that the rate of growth of commodity prices is significantly related to the contemporaneous rate of growth of GDP, and that lagged commodity price growth—at two lags rather than one—adds modestly to the explanatory power. In these regressions, as well as in the other specifications, the coefficient is around 0.4, so that a commodity price boom that generates an income windfall that is worth (say) two percent of GDP, will raise the growth of GDP by 0.8 percent *in addition to* the direct income effects of the commodity boom (which show up in national income not national product.) The regressions with lags suggest that the effect will be larger if the price boom is maintained for more than two periods, a result that is in accord with the dynamics revealed by the full VARX specification.

The two right hand columns of the two panels of the Table show the results of adding lagged income growth rates, and finally the lagged growth rates of consumption, investment, and government expenditure. These lags add substantially to the predictive power of the regressions, although when only lags of income growth are included, they are insignificant in the fixed effects specification, illustrating once again the interaction between fixed effects and estimated dynamics in panel data. However, the lagged growth rates of consumption and of investment have substantive predictive power for current GDP growth whether or not fixed effects are included. Table 4 shows that an attempt to instrument the rate of economic growth using commodity prices is likely to be more successful if lagged rates of growth of components of GDP are also added to the instrument list. Of course, such an addition comes at a price, since these lags may themselves have direct effects on political exits—and their insignificance in the exit regressions may itself reflect simultaneity bias—and because it is much easier to defend the exogeneity of world commodity prices with respect to domestic political events than it is to defend the exogeneity of lags of consumption and investment. As will be seen in the next section, the results in Table 4 present us with a trade-off between 'clean' instruments with imprecise estimates, or greater precision at the price of less defensible instruments.

3. Commodity prices, economic growth, and political exits

Political exits in Africa appear to be retarded by high rates of economic growth, and high rates of economic growth are helped by commodity price booms. What then is the relationship between commodity prices and political exits, and can we use commodity prices, which are plausibly determined outside the domestic economy, as an instrument to determine whether the direction of causality is from economic growth to political exits, or from political exits to economic growth? If commodity price growth makes African economies grow more rapidly, and if more rapid growth retards the turnover of leaders, we ought to be able to observe a direct link between commodity price change and political exits.

Figures 1 and 2 plot the two variables and the relationship between them. Figure 1 shows the average growth rate over all the African countries of the real commodity price series; since the series are weighted by the share of commodity exports in GDP in 1975, the scale can be interpreted as showing the equivalent increase or decrease in national income associated with the change in prices. From the late 1960s through to the early 1970s, the prices of these primary commodity exports were generally rising in real terms and at the peak in 1973, these African countries received on average the equivalent of around 2.5 percent of national income in price increases. The late 1970s showed considerable volatility in the growth rate, but since 1980, real prices have generally been falling. The growth rates in Figure 1 are averaged over all the commodities shown in Table 3, and the volatility reflects, not only the volatility of each commodity price, but also the fact that commodity prices are far from perfectly correlated, and that different countries export different commodities.

Figure 2 shows the average rate of political exit (or the empirical probability of exit) averaged over countries and years according to the rate of growth of real commodity prices. There are 900 country-year observations where there are no missing data, and I have grouped these into ten groups of 90 according to the price growth, so that each bar in Figure 2 corresponds to a decile of commodity price growth, negative growth to the left and positive growth to the right. With some imagination, it is possible to see a negative correlation here, but it is clearly extremely weak.

Table 5 shows that the weakness of the relationship is replicated in more formal analyses. With or without country fixed effects, the pooled cross-country time-series

regressions of exits on price growth fail to show significant results. Although the coefficients are negative on the contemporaneous and first lags, and on the sum of the lags, for none of these regressions is it possible to reject the hypothesis that political exits are unaffected by changes in commodity prices. However, it is important to note that, although these weak results can hardly be taken as support for the basic hypothesis, neither do they cast any doubt on it. In Table 1, the coefficient of GDP growth on the probability of exit is –0.5, while Table 4 shows that the coefficient of commodity price growth on GDP is 0.4, so that, by substitution, the effect of commodity price growth on the probability of exit ought to be –0.2, as opposed to the –0.1 in Table 5. And although the coefficients in Tables 1 and 4 are both significant, both regressions have low explanatory power, which will be further attenuated in the regression of exits on prices. I shall return to this issue in the context of the instrumental variable estimates below.

If the growth in commodity prices is to be used as an instrumental variable to study the effect of economic growth on political exits, two conditions have to be satisfied. First, commodity price growth must be unaffected by political exit, and second, commodity price growth should not affect political exits directly, but only through its effect on the growth of output. Although it is possible to think of exceptions—a strike or other political instability in Zaire might affect the world price of copper, for example, and see Gersovitz and Paxson (1990) for discussion of the general issue—the first condition will hold for most of these countries. For most of the commodities used to construct the indices, African countries are price takers, and even in those cases where individual countries have a large share of the market, they have limited ability to affect the price. The second condition is more problematic; especially in countries with tax systems that channel fluctuations in commodity price incomes to the government, there may be political repercussions even when the rate of economic growth is unaffected.

As we shall see, it is possible to conduct some (limited) tests to see whether commodity prices work separately from their effect on output. However, the models of political economy that we are considering are hardly well-enough developed to draw a sharp distinction between the political effects of economic good fortune in the form of enhanced growth of the economy, or economic good fortune in the form of windfall income from commodity prices. What is of most concern is whether it is economic good fortune that determines political success or *vice versa*.

Table 6 corresponds to the original Table 1, but with the growth rate of GDP instrumented by current growth of the commodity price index in the top panel of the table and by current and first and second lagged growth in the middle panel of the table. While the second lag of commodity price growth helps predict the growth of GDP in Table 4, the addition of the additional instruments is not guaranteed to generate more precise instrumental variable estimates, so that it is unclear which of the two top panels is to be preferred. (The bottom panel will be discussed below.) Parameters are shown with and without the inclusion of the characteristics of the leaders, and as always, with and without the country fixed effects. The last two lines of the Table report the Hausman-Wu test for the endogeneity of the economic growth rate; in this context, the test is a t-test for the hypothesis that the coefficient of economic growth is the same under instrumentation than it was when estimated by OLS. Also reported in the bottom half of the Table is the overidentification F-test. When there are more instruments than endogenous variables, as is the case when the lags of price growth are included, we can compare the fit of the model as estimated with the fit of an equation in which all the exogenous variables are included without restriction. The resulting test statistic is asymptotically distributed as an F-statistic with (numerator) degrees of freedom equal to the number of exogenous variables beyond those required for identification, in this case two.

These results are bedeviled by the same problem as in the direct comparison of commodity prices and political exits, that the two variables, although negatively correlated, are not significantly negatively correlated, so that none of the IV estimates of the effect of income growth are significantly different from zero. However, it should again be noted that the results are exactly what would be predicted if the baseline single-equation results in Section 2 were correct and thus unaffected by simultaneity bias. Especially in the top half of the Table 6, the IV estimates, although less precise than the OLS estimates in Table 1, are essentially the same numbers. Moreover, the loss in precision is also exactly what would be predicted if the single-equation models are correct. In the simplest case where there is one endogenous variable and one instrument—which is the case in the left-hand side of the top panel of the table—the ratio of the standard error of the OLS parameter estimate to the IV parameter estimate is the correlation coefficient between the instrument and the endogenous variable, in this case 0.18 (the square root of the R^2 statistic in the first column of Table 4.) Hence, the truth of the economics to politics

story predicts that the standard errors in Table 6 should be a little more than five times those in Table 1, which is exactly what they are. The insignificant Hausman tests give essentially the same message, that the IV estimate of the effect of economic growth on the probability of a political exit is the same as the OLS estimate. If there were important feedbacks from political exits to economic growth, we would expect the coefficient to change when these effects are removed by instrumenting economic growth with the exogenous commodity price variable.

Of course, the evidence in favor of the economics to politics version of the story would be a good deal more convincing if the parameter estimates were more precise. But without further instruments, or without a stronger correlation between commodity prices and economic growth, it is not possible to do better without weakening the identifying structure. However, if we are prepared to do so, and follow the literature in assuming that earlier events are not caused by later ones, we can introduce the lagged components of GDP as instruments. Specifically, I can use the GDP growth equation of the VARX in Deaton and Miller that appears in the fourth column of the two panels in Table 4. A good deal of attention must be paid to the overidentification tests in these experiments, since these tests are our only protection against the (quite reasonable) supposition that the lagged components of GDP growth should themselves appear as direct determinants of political exit.

The results are presented in the bottom panel of Table 6. Once again, they are not very different from the very first results in Table 1, although if anything the effects of growth on political exit are *larger*, which would suggest that, in the African context, any feedback from political exit is growth *enhancing*, an effect that in single equation estimation would mute the direct negative effect of economic success on leaders' survival. The additional instruments, which have substantial predictive power for the growth of GDP, result in much more precise estimates, so that the *t*-values are now much closer to those for the OLS estimates in Table 1. As in the rest of the Table, the Hausman tests do not show evidence of endogeneity, so that the increase in the estimated coefficient is no more significant than were the decreases in the top two panels. Most importantly, the overidentification test statistics are insignificant, so there is no suggestion that the instruments themselves belong in the main regression. This finding is perhaps not very surprising, given the insignificance of these variables in the single equation exit equation, but it still offers modest support for the results in the bottom panel.

4. Conclusions

The main conclusions have already been presented in the introduction. The use of commodity prices as instrumental variables for economic growth has no effect on the robust result that economic growth inhibits political exit in Africa; there is no evidence in these data in favor of the reverse position, that economic growth is enhanced by the absence of political exits. I make only modest claims for these results; the correlation between commodity prices and economic growth in Africa is real but insufficiently strong to allow precise inferences about parameters. Furthermore, the paper has addressed only one link in the political-economic nexus, that between economic growth and the leader's survival. Political exit is far from being the same thing as political instability, let alone democracy, and while the methods of this study can perhaps be applied to these issues, they are not addressed in this paper. However, it is hard to see how questions of causality can be addressed without the identification of variables that, like commodity prices, determine one set of variables, economic or political, without being affected by the other. Hence, even if progress has been slight, the simultaneity is directly addressed by a methodology that is capable of solving it without making arbitrary or patently incorrect assumptions.

More substantively, it would make sense to improve the study by extending it to a larger number of countries and a longer time period, something that is feasible at the cost of constructing the country-specific commodity price indices. It is perhaps also possible to find other variables, perhaps measures of world production that are focussed towards individual countries, that will allow the construction of instruments that are more highly correlated with economic growth.

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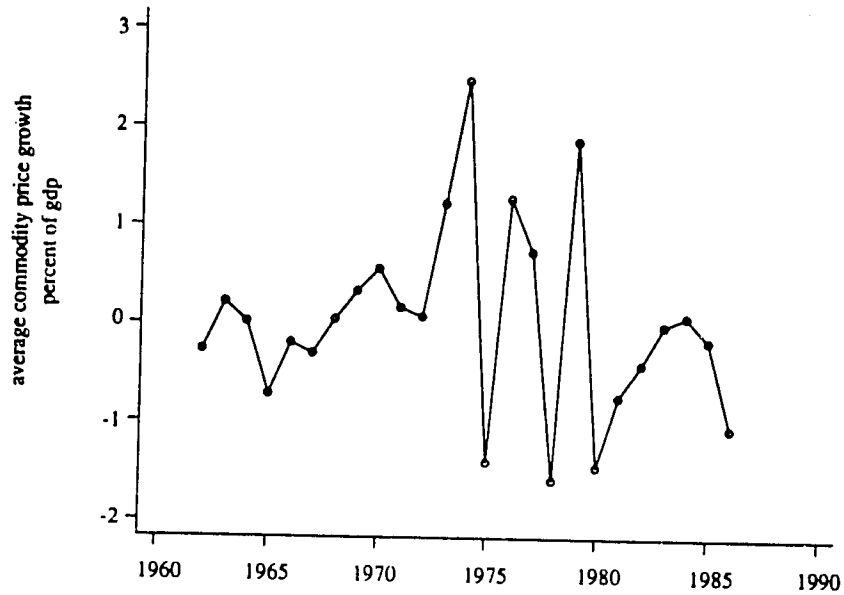

Figure 1: Commodity price growth: income as a percent of GDP

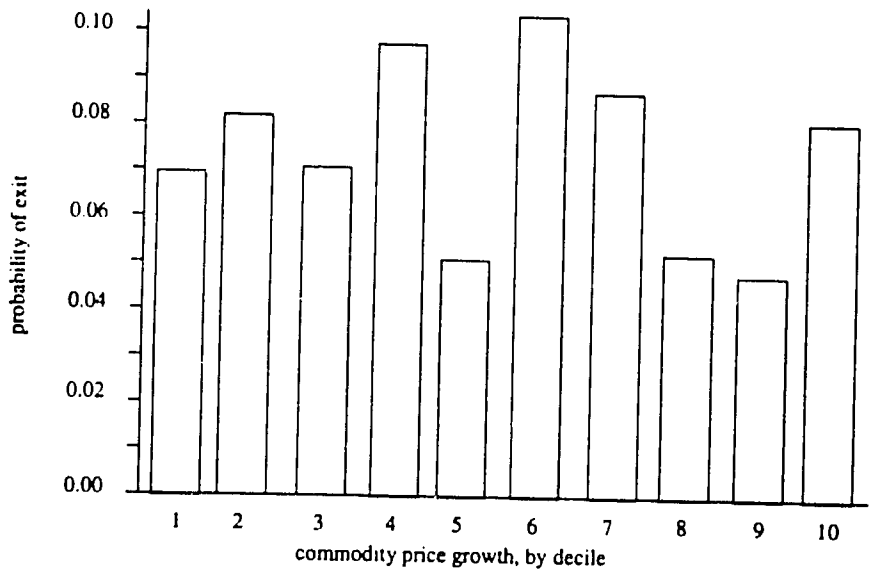

Figure 2: Fraction of leaders losing power in relation to commodity price growth

Table 1: Leadership survival regressions, 37 African countries 1965–85.

Dependent variable is 1 if leader makes a political exit, 0 otherwise

	no fixed effects		*with country fixed effects*	
GDP growth	–0.5128 (3.6)	–0.5207 (3.6)	–0.4216 (2.8)	–0.4459 (3.0)
time in power		–0.0011 (0.7)		–0.0064 (1.4)
non-constitutional		0.0685 (2.1)		–0.0606 (1.4)
time × non-const.		–0.0088 (2.2)		–0.0064 (1.4)
R^2	0.0184	0.0322	0.1121	0.1234

Note: The dependent variable refers to an exit in country i in year t, and GDP growth to the change in the logarithm of GDP from $t-1$ to t. Estimation is by ordinary least squares, with and without the inclusion of dummies for each of the 37 countries. Absolute t–values are given in parentheses.

Table 2: Leadership and output growth, 37 African countries 1967–85.

Dependent variable is 1 if leader makes a political exit, 0 otherwise

	no fixed effects		*with country fixed effects*	
GDP growth	–0.4534 (3.1)	–0.4152 (2.8)	–0.4050 (2.7)	–0.3998 (2.6)
lagged once	–0.2130 (1.5)	–0.1686 (1.1)	–0.1792 (1.2)	–0.1613 (1.1)
lagged twice		–0.2302 (1.5)		–0.2179 (1.4)
		$F(6,619)=1.41$		$F(6,585)=1.34$

Note: See Table 1.

Table 3: African countries and the distribution of their exports in 1975 across 20 primary commodities (percentages)

Algeria	coffee 0.0, copper 0.0, iron 0.5, oil 98.9, phosphates 0.6, tobacco 0.0
Benin	cocoa 9.4, coffee 2.6, cotton 62.5, groundnuts 3.9, oilpalm 12.7, tobacco 8.9
Botswana	copper 17.5, nickel 82.6
Burkina Faso	cotton 100.0, groundnuts 0.0
Burundi	coffee 93.7, cotton 3.0, tea 3.3
Cameroon	cocoa 40.9, coffee 44.6, cotton 4.4, groundnuts 0.0, oilpalm 3.6, rubber 4.2, sugar 0.1, tea 0.2, tobacco 2.0,
C.A.R	cocoa 0.4, coffee 38.6, cotton 56.0, groundnuts 0.3, tobacco 4.7
Congo	cocoa 2.2, coffee 0.7, copper 0.8, groundnuts 0.0, oil 92.1, oilpalm 0.2, sugar 3.0, tobacco 1.1
Egypt	cotton 70.0, oil 20.8, phosphates 3.9, sugar 5.3
Ethiopia	coffee 88.8, cotton 7.1, groundnuts 5.4, sugar 3.6
Gabon	coffee 0.0, manganese 13.8, oil 86.2, oilpalm 0.0, sugar 0.0
Gambia	groundnuts 97.7, oilpalm 2.3
Ghana	bauxite 5.4, cocoa 80.2, coffee 0.7, gold 13.6, oilpalm 0.0, tobacco 0.0
Ivory Coast	cocoa 38.2, coffee 48.5, cotton 2.4, groundnuts 0.0, oilpalm 9.6, rubber 1.4
Kenya	coffee 45.8, cotton 2.6, oilpalm 0.0, sisal 12.9, sugar 0.1, tea 38.5
Lesotho	wool 100.0
Liberia	cocoa 1.5, coffee 1.8, iron 79.9, oilpalm 0.2, rubber 16.7
Madagascar	cocoa 1.4, coffee 71.2, groundnuts 1.6, sisal 10.5, sugar 14.1
Malawi	coffee 0.2, cotton 2.4, groundnuts 0.3, sugar 11.0, tea 27.4, tobacco 58.7
Mali	cotton 87.8, groundnuts 11.0, tea 0.5, tobacco 0.8
Mauritania	copper 4.6, iron 95.4
Mauritius	sugar 98.7, tea 1.3
Morocco	copper 0.4, cotton 0.1, iron 0.5, manganese 0.9, phosphates 98.2
Niger	cotton 0.1, groundnuts 5.8, uranium 94.1
Nigeria	cocoa 4.1, coffee 0.0, groundnuts 0.0, oil 94.0, oilpalm 1.4, rubber 0.4
Rwanda	coffee 87.3, tea 12.7
Senegal	cotton 2.2, groundnuts 66.0, phosphates 31.7, sugar 0.0
Sierra Leone	bauxite 56.5, cocoa 7.9, coffee 8.2, iron 16.3, oilpalm 11.3
Sudan	cotton 92.1, groundnuts 7.9
Tanzania	cocoa 0.4, coffee 31.8, cotton 23.8, groundnuts 0.0, oilpalm 0.0, sisal 25.7, sugar 3.4, tea 6.3, tobacco 8.6
Togo	cocoa 21.0, coffee 9.0, cotton 1.6, groundnuts 0.2, oilpalm 2.5, phosphates 65.6
Tunisia	oil 74.8, phosphates 22.4, sugar 2.0, tobacco 0.0
Uganda	cocoa 0.1, coffee 78.3, copper 3.2, cotton 10.6, tea 7.1, tobacco 0.9
Zaire	cocoa 1.0, coffee 10.3, copper 79.6, cotton 0.2, gold 2.2, groundnuts 0.0, manganese 1.0, oilpalm 2.8, rubber 2.1, tea 0.9
Zambia	copper 98.5, tobacco 1.5
Zimbabwe	coffee 1.3, cotton 12.0, gold 34.5, nickel 15.9, tea 1.8, tobacco 34.5

Notes: The figures show the 1975 distributions by commodity for each country of total exports of the 20 commodities, so that, apart from rounding errors, the numbers add to 100. Several important commodities are excluded for data reasons; diamonds (Botswana, Sierra Leone), lumber (Cameroon, Ghana), gum arabic (Sudan), chrome (Sierra Leone), vanilla and cloves (Madagascar), beef (Botswana) and cobalt (Zaire). An entry of 0.0 indicates that the commodity is included for that country, but the fraction is less than a tenth of one percent.

Source: Deaton and Miller (1993, Table 2).

Table 4: Commodity prices and the growth of gross domestic product

Dependent variable is $\Delta \ln y_t$, the growth rate of GDP

	without fixed effects				*with country fixed effects*			
$\Delta \ln p_t$	0.3970	0.4045	0.4169	0.4228	0.3518	0.3677	0.3682	0.3733
	(4.8)	(4.9)	(5.1)	(5.3)	(4.3)	(4.4)	(4.4)	(4.5)
$\Delta \ln p_{t-1}$		0.0521	0.0131	0.0464		0.0133	–0.0023	0.0383
		(0.6)	(0.2)	(0.5)		(0.2)	(0.0)	(0.4)
$\Delta \ln p_{t-2}$		0.2087	0.1626	0.1042		0.1722	0.1509	0.1136
		(2.5)	(2.0)	(1.2)		(2.1)	(1.8)	(1.3)
$\Delta \ln y_{t-1}$			0.1080	0.1272			0.0260	0.0316
			(2.7)	(2.2)			(0.6)	(0.5)
$\Delta \ln y_{t-2}$			0.1029	0.2185			0.0276	0.1228
			(2.6)	(3.8)			(0.7)	(2.1)
$\Delta \ln c_{t-1}$				–0.0807				–0.0814
				(2.3)				(2.3)
$\Delta \ln c_{t-2}$				–0.1655				–0.1565
				(4.7)				(4.5)
$\Delta \ln i_{t-1}$				0.0252				0.0269
				(2.2)				(2.4)
$\Delta \ln i_{t-2}$				–0.0033				–0.0007
				(0.3)				(0.6)
$\Delta \ln g_{t-1}$				–0.0068				–0.0029
				(0.3)				(0.1)
$\Delta \ln g_{t-2}$				0.0130				0.0129
				(0.6)				(0.6)
R^2	0.0334	0.0430	0.0731	0.1326	0.1318	0.1376	0.1441	0.2110

Note: Regressions are run on pooled time-series cross-section data, with and without fixed effects for each country. y is GDP, c consumption, i investment, g government expenditure, and p commodity prices.

Table 5: Commodity price growth and political exits

Dependent variable is 1 if there is a political exit, 0 otherwise

	without fixed effects		*with country fixed effects*	
$\Delta \ln p_t$	–0.0860 (0.3)	–0.1178 (0.4)	–0.0693 (0.2)	–0.1048 (0.4)
$\Delta \ln p_{t-1}$		–0.3580 (1.1)		–0.3780 (1.2)
$\Delta \ln p_{t-2}$		0.1624 (0.5)		0.1502 (0.5)

Table 6: Economic growth and political exits: instrumental variable estimates

Dependent variable is 1 if leader makes a political exit, 0 otherwise

Using only $\Delta \ln p_t$ as instrument				
$\Delta \ln y_t$	-0.3325 (0.4)	-0.4649 (0.6)	-0.4207 (0.5)	-0.2392 (0.3)
time in power		-0.0010 (0.6)		0.0018 (0.8)
non-constitutional		0.0694 (2.0)		-0.0569 (1.2)
time × non-const.		-0.0088 (2.2)		-0.0063 (1.4)
Hausman t-test	-0.23	-0.07	-0.00	-0.24
With the addition of once and twice lagged $\Delta \ln p_t$ as instruments				
$\Delta \ln y_t$	-0.1725 (0.2)	-0.2954 (0.4)	-0.1589 (0.2)	0.0295 (0.0)
time in power		-0.0009 (0.5)		0.0021 (0.9)
non-constitutional		0.0723 (2.1)		-0.0521 (1.1)
time × non-const.		-0.0087 (2.2)		-0.0061 (1.3)
Hausman t-test	-0.50	-0.34	-0.33	-0.62
Overidentification F-test	0 82	0.88	0.93	0.81
With the addition of once and twice lagged $\Delta \ln p_t$, $\Delta \ln y_t$, $\Delta \ln c_t$, and $\Delta \ln g_t$ as instruments				
$\Delta \ln y_t$	-0.7125 (1.7)	-0.6891 (1.6)	-0.4290 (0.8)	-0.4048 (0.8)
time in power		0.0009 (0.5)		0.0038 (1.8)
non-constitutional		0.1148 (3.4)		0.0374 (0.8)
time × non-const.		-0.0126 (3.2)		-0.0079 (1.7)
Hausman t-test	0.79	0.74	0.18	0.15
Overidentification F-test	0.88	0.68	0.78	0.74

Notes: the instrumental variables are time in power, non-constitutional entrance, and their interaction (when they are included in the main regression) together with the identifying instruments (as indicated) the contemporaneous, or the contemporaneous plus first and second lags of commodity price growth measured in GDP equivalents. In the bottom panel, the instruments also include the lagged growth rates of the components of GDP shown in Table 4.