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Aggregate Investment and Political Instability: An Econometric Investigation

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Although in theory the long-run effect of uncertainty on investment is ambiguous, available econometric evidence widely supports a negative association between aggregate investment and political instability. A shortcoming of this body of evidence is that it has failed to investigate the existence and direction of causality between these two variables. This paper fills this gap by testing for such causal and negative long-run relationship between political instability and investment. We find there is a causal relation going from instability to investment, but it is positive and particularly strong in low-income countries. This finding is robust to various sensitivity checks.

INTRODUCTION

Much recent literature has investigated the consequences of social and political instability (hereafter, SPI) as a source of uncertainty in macroeconomics. Conceptually, this literature postulates that SPI increases uncertainty, undermines the incentives for the accumulation of physical capital and reduces the rate of economic growth. Empirically, this argument seems to receive ample support.[1] Yet recent theoretical contributions from the investment literature highlight irreversibility and the conditions under which uncertainty has a positive effect on investment.[2] Since empirical support for the latter has been lacking, it generates a rare situation in economics: a broad consensus on empirics coupled with wide disagreement on the theoretical link. This seems to call for, *inter alia*, a re-examination of the evidence and, in particular, a closer look at an issue overlooked in the empirical literature, namely the existence and direction of a causal relationship between SPI and investment.

Another motive for the present study is that, despite the negative association between SPI and economic growth having acquired the status of 'stylized fact',[3] a recent paper by Campos and Nugent (2002) reports no evidence of a causal relationship between SPI and growth. The authors suggest that the relationship might be an indirect one, operating through investment.

The objective of this paper is to investigate the existence and direction of a causal relationship between SPI and investment. In order to have a setup as comparable as possible with the rest of the literature, we choose a similar SPI index and similar country and time coverage. The major difference between the present study and the rest of the literature is the issue of causality: for this, we use the Granger causality framework and report Anderson–Hsiao–Arellano instrumental variable estimates.

Our main finding is that, for the full sample, there is indeed a (robust) causal relationship going from SPI to the rate of investment, and it is positive. In other words, an increase in political instability Granger-causes an increase in

investment. Three possible explanations are: (i) that uncertainty in the form of SPI delays investment; (ii) that SPI destroys at least partly the capital stock, causing a big increase in replacement investment; and (iii) that SPI causes changes in government and government policies that are beneficial in the long run.[4] We believe that our results provide support for these more recent models of investment in that we find that, although uncertainty (SPI) is contemporaneously associated with lower investment, uncertainty (SPI) leads to (or causes) greater investment in the future.

The paper is organized as follows. In Section I we discuss methodological and data issues. In Section II we present our Granger causality results and, in Section III we subject them to sensitivity analysis. Section IV goes beyond Campos and Nugent (2002) to investigate the growth implications of our key results. Section V presents our conclusions and suggestions for further research.

I. Data and Methodology

This section has two objectives: (i) to present the data used to construct our SPI index, and (ii) to discuss the conceptual and econometric advantages (and disadvantages) of the Granger causality framework.

To be consistent in our measure of SPI with other studies,[5] we draw upon three indicators: the numbers of political assassinations, revolutions, and successful *coups d'etat*.[6] The first, measured as the yearly number of assassinations per million people, is especially important because it captures a magnitude dimension that is largely missing from the other (frequency) measures.

To be consistent in country and time coverage, we use data from 1960 for 94 developing countries. Studies on this topic often choose a cross-sectional design based on long—say, 25-year—periods. This is not only far too long a period for capturing instability, but also an impediment to the study of causality. On the other hand, annual data would seem too short in duration to reflect underlying factors other than mere productive time lost because of the disruptive influences themselves. For these reasons, in this study we settle on five-year, non-overlapping periods, where the observations on SPI are the averages over each five-year interval.

In accordance with most of the literature, we use the method of principal components to construct our SPI index. We believe this method is best because it minimizes the inherent arbitrariness in aggregation. For our index of SPI, the weights resulting from this procedure are 0.3162 for assassinations, 0.6909 for revolutions and 0.6502 for coups.

The data on investment rates are the average share of investment in GDP, by five-year period and by country, from Summers and Heston (1994). For SPI and investment, time series data covering the period 1960–95 are collected for an unbalanced panel of 94 developing countries.[7] Included are 15 countries from Asia, 21 from Latin America, 17 from the Middle East and North Africa and 41 from sub-Sahara Africa. Table 1 shows basic statistics and a correlation matrix.

Below, we present results by region as well as by level of per capita income. In order to divide our sample of developing countries in per capita income

TABLE 1
BASIC STATISTICS AND CORRELATION MATRIX[a]

Variable	Mean	Standard deviation	Min	Max
Investment	14.51	7.318	1.02	39.5
Socio-political instability (SPI)	− 0.047	1.215	− 0.907	4.89
Per capita income	2013.68	1563.45	322	7777
Population growth	2.53	0.774	0.149	6.95
Trading partners' growth	2.52	1.288	− 2.239	6.438

Correlation matrix

Variable	Investment	SPI	Per capita income	Population growth
SPI	− 0.2237			
Per capita income	0.5013	− 0.1080		
Population growth	0.0189	− 0.0665	− 0.0511	
Trading partners' growth	0.0512	− 0.0149	− 0.1583	0.0297

[a]See text for details.

levels, we took the ranking provided by the World Bank's first published *World Development Report*, in 1978.[8] We first compared the list of countries assigned to the 'low-income' group in that report with our sample ranked by per capita income level in 1976–80. There were surprisingly few mismatches, and we took Sri Lanka's income level as the one dividing the low and middle-income groups. Then we ranked our sample according to per capita income in 1960–65, again finding Sri Lanka near the border separating the bottom 40% of countries from the 60% above it. This done, we used the same apparent rule as the World Bank to divide the remaining richer countries into two equal size groups, the middle lower and the middle upper-income countries. Finally, we re-did this exercise every time a 'new' country appears in our sample (that is, a country for which we have no data for 1960–65). This is usually the case for countries that gained political independence after that date. As a result, our 94 developing countries are divided in 46 low-income countries, 28 lower middle-income countries and 20 upper middle-income countries. The Appendix shows these groups, as well as their per capita income levels in 1960–65.

We selected the Granger causality framework to investigate the existence and direction of a causal relationship between SPI on the one hand, and the accumulation of physical capital on the other. This framework has endured the test of time because of its elegance and strong intuitive appeal: the notion that an event in the future cannot cause one in the past.[9] Consider two time series, x_t and y_t. Series x_t is said to Granger-cause series y_t if, in a regression of y_t on lagged ys and lagged xs, the coefficients of the lagged xs are jointly significantly different from zero.

Two critical issues have to be addressed in conducting Granger causality tests.[10] The first concerns the length and frequency of the time lags. On their length, Granger admonishes that 'using data measured over intervals much wider than actual causal lags can also destroy causal interpretation' (Granger

1987, p. 49). The use of five-year periods is short enough to allow us to investigate the effects of lagged variables and hence to undertake proper (Granger) causality tests, and yet is also long enough to be meaningful for studying the long-run effects of SPI on investment, and vice versa. As for frequency, there are a number of tests to determine the 'optimal number of lags', but because ours is a short panel we experimented with this issue to evaluate the robustness of the results presented below.

The second issue to be dealt with lies in the information set. The Granger test depends on the assumption that the cause contains unique information about the effect, in the sense that it is exhaustive and not available elsewhere. If the information set underlying the test is composed solely of two series, both of which may be affected by a third variable, the test can be rendered useless. In what follows, we present Granger causality results that are unaffected after being enlarged by variables that could potentially play this disruptive role.

Finally, we must attend to the econometric issue that arises from the inclusion on the right-hand side of the (lagged) dependent variable, referred to in the econometric literature as the *dynamic panel problem*: unless the time dimension of the panel is very large, parameter estimates will be inconsistent and biased.[11] While the best solution to this problem is still an object of debate in the econometrics literature,[12] in one of the few studies focusing on 'short and wide' panels (like ours), Kiviet (1995) finds that the instrumental variable approach pioneered by Anderson and Hsiao (1982) performs as well as any other alternative. On this basis, we use this method, which requires first-differencing all variables and using second-lag differences as instruments. We also follow Arellano's (1989) recommendation by using the twice lagged levels instead of the twice lagged first differences as instruments, and in Section III we show that the results are robust to the use of alternative estimators.

II. Empirical Results

We present the results obtained for the causality patterns between SPI and investment in Tables 2 and 3. In Table 2 we ask whether SPI Granger-causes investment. For our complete sample of 94 developing countries there is indeed such a causal relationship, as indicated by the statistical significance of the effect of the lagged SPI term on the investment rate for the current period. Strikingly, it shows that the relationship is positive rather than negative. While, as noted above, this is not inconsistent with theory—which is essentially ambiguous on the sign of the relationship—it is certainly inconsistent with the vast majority of empirical studies to date. Although the coefficients of the lagged SPI terms are no longer significant in the regional subsamples, they remain consistently positive and do not oscillate very far from the value of 0.5 obtained for the full sample. Breaking down the sample according to income groups proves important, showing that it is precisely in the poorer countries of our sample that this causal and positive relationship is strongest. Note that the coefficient on SPI is also positive, but not statistically significant, for the lower middle-income countries, suggesting that only for the richer countries does this relationship definitely not hold.

In Table 3 we turn to the reverse question, that is to whether investment Granger-causes SPI. In this case there is clearly no causal relationship, either in

TABLE 2
DOES POLITICAL INSTABILITY GRANGER-CAUSE INVESTMENT? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a] (ENDOGENOUS VARIABLE IS ΔINV_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	n
All LDCs	0.894***	0.503**	323
	(0.246)	(0.237)	
Asia	0.509*	0.589	49
	(0.265)	(0.427)	
Latin America	0.987***	0.324	83
	(0.315)	(0.445)	
Middle East & North Africa	0.482	0.543	53
	(0.331)	(0.721)	
Sub-Saharan Africa	0.951***	0.398	138
	(0.337)	(0.337)	
Low-income countries	0.691**	0.457*	162
	(0.273)	(0.267)	
Lower middle-income countries	1.01**	0.673	96
	(0.465)	(0.421)	
Upper middle-income countries	0.872**	− 0.008	88
	(0.396)	(0.784)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

the full sample or in any of the region or income groups. The coefficient is essentially zero for the full sample and is between a positive 0.053 and a negative 0.01 in both sub-regions and income groups.

In sum, the main result of this exercise is that there is a Granger causality relationship going from SPI to investment, and it is positive. This obtains for our full sample, but not for any of the four regional subsamples. Although one could easily blame this discrepancy on the smaller number of observations (in each region), there may be other explanations. Since there are broad similarities among regions of developing countries but also very considerable heterogeneity in institutional and other background characteristics among countries of each region, it would seem quite plausible that the time lags needed for the relationship to change from negative (as in the contemporary relationship between SPI and investment) to positive when SPI is lagged could well vary from one country to another within a given region. The same reasoning applies for the different income groups.[13] Before exploring further, however, we turn to robustness checks in the next section.

III. SENSITIVITY ANALYSIS

In our tests for the robustness of our results, we are particularly concerned with the aforementioned potential problems of omitted variables and the number of lags.

TABLE 3
DOES INVESTMENT GRANGER-CAUSE POLITICAL INSTABILITY? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a] (ENDOGENOUS VARIABLE IS ΔSPI_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	n
All LDCs	0.179	0.009	232
	(0.111)	(0.021)	
Asia	0.242	0.053	36
	(0.336)	(0.063)	
Latin America	0.051	−0.006	62
	(0.227)	(0.004)	
Middle East & North Africa	0.188	0.014	37
	(0.148)	(0.032)	
Sub-Saharan Africa	0.216	−0.00004	97
	(0.205)	(0.004)	
Low-income countries	0.273	0.012	117
	(0.194)	(0.037)	
Lower middle-income countries	0.051	0.018	69
	(0.162)	(0.041)	
Upper middle-income countries	0.215	0.041	46
	(0.197)	(0.033)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

As noted above, one concern in applying the Granger framework is the content of the information set, in particular as to whether or not there might be omitted variables that could affect both investment rates and SPI, thereby giving rise to potentially serious biases in Granger causality results.[14] The most natural candidate for such an omitted variable is the level of real per capita income. In Tables 4 and 5, therefore, we wish to evaluate how and to what extent including the level of real GDP per capita would affect the results of the causality tests reported above. More specifically, our hypothesis is that, in a given country, both the level of SPI and the investment rate would be negatively related to the (previously) omitted level of income per capita. Hence we might expect to find effects of levels of per capita income on both investment and SPI.

From the results reported in Table 4, it can be seen that the effects of the level of the GDP per capita term are generally negative but not statistically significant. More importantly, however, is the fact that our conclusion concerning the positive causal effect of lagged SPI on investment does not change once we take initial per capita income into account. Once again, there is evidence that this relationship is driven by the subsample of low-income countries.

Notice also that in Table 5 there is no evidence of causality going from investment rates to SPI as shown (for either regions or income groups). Once again, and still in contrast with much of the existing empirical literature on the

TABLE 4
CONTROLLING FOR INITIAL INCOME, DOES POLITICAL INSTABILITY GRANGER-CAUSE INVESTMENT? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a]
(ENDOGENOUS VARIABLE IS ΔINV_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	$\Delta GDP0_{t-1}$	n
All LDCs	1.091***	0.570**	− 0.0008	318
	(0.027)	(0.252)	(0.0006)	
Asia	0.479	0.566	− 0.001	49
	(0.347)	(0.419)	(0.001)	
Latin America	0.876***	0.325	− 0.002*	83
	(0.280)	(0.412)	(0.001)	
Middle East & North Africa	0.592	0.885	0.0006	49
	(0.506)	(0.776)	(0.0009)	
Sub-Saharan Africa	1.02***	0.416	0.0004	137
	(0.335)	(0.353)	(0.001)	
Low-income countries	0.667***	0.442*	− 0.029	160
	(0.227)	(0.253)	(0.021)	
Lower middle-income countries	0.815***	0.545	− 0.025	96
	(0.296)	(0.359)	(0.009)	
Upper middle-income countries	1.14*	0.099	0.002	62
	(0.593)	(0.814)	(0.008)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

relation between SPI and investment, the causal relationship is positive, even if in these cases not statistically significant.

Table 6 shows our main results now controlling for the growth rate of the country's main trading partners.[15] We believe this is important because this is the avenue through which trade shocks can affect both investment and political instability. Controlling for this variable, the results are even stronger than before: not only are the coefficients remarkably stable, but SPI now has a positive and causal effect on investment in the full sample and the two lowest income groups of countries.

Table 7 shows that there are still no signs of reverse causality.

A second important robustness check is with respect to the number of lags in the relationship. As noted above, the issue refers both to the length and to the number of lags controlled for. We believe that the use of five-year periods is short enough to allow us to investigate the effects of lagged variables and hence to undertake proper (Granger) causality tests, and yet at the same time long enough to be meaningful for studying the long-run effects of SPI on investment, and vice versa. As for the number of lags, given that our panel is short (well less than ten five-year time periods), the use of standard tests to determine the 'optimal number of lags' is not justifiable, so we must resort to a grid search. Tables 8 (for investment) and 9 (for SPI) show that the use of two lags does not change our overall conclusion. There is still a positive and causal

TABLE 5
CONTROLLING FOR INITIAL INCOME, DOES INVESTMENT GRANGER-CAUSE POLITICAL INSTABILITY? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a]
(ENDOGENOUS VARIABLE IS ΔSPI_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	$\Delta GDP0_{t-1}$	n
All LDCs	0.166	0.013	− 0.0001	229
	(0.110)	(0.025)	(0.0002)	
Asia	0.314	0.071	− 0.0003	36
	(0.356)	(0.074)	(0.0006)	
Latin America	0.043	0.003	− 0.0002	62
	(0.224)	(0.053)	(0.0004)	
Middle East & North Africa	0.154	0.032	− 0.0002	35
	(0.156)	(0.052)	(0.0002)	
Sub-Saharan Africa	0.177	− 0.001	0.0001	96
	(0.192)	(0.037)	(0.0004)	
Low-income countries	0.225	0.093	0.002	115
	(0.187)	(0.038)	(0.008)	
Lower middle-income countries	0.065	0.021	− 0.0004	69
	(0.163)	(0.044)	(0.003)	
Upper middle-income countries	0.208	0.013	− 0.001	45
	(0.201)	(0.051)	(0.001)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

relationship going from SPI to investment. However, it is less clear now what are the driving forces. Maybe one reason for this is that the use of two lags results in a substantial reduction in the number of observations.

In summary, we find there is a causal relation going from instability to investment, but it is positive and particularly strong in low-income countries. This finding remains after robustness checks for additions to the information set (initial income and growth of trading partners) and for the use of additional lags.

IV. GROWTH IMPLICATIONS

The previous section established that our data support the conclusion of a casual relationship between SPI and investment, and that this relationship is positive. We believe that this result encourages caution in interpreting what is a somewhat trivial short-term relationship between SPI and growth as a long-term one. In other words, it is quite obvious that SPI can have a negative contemporaneous impact on growth and investment owing to the destruction of some capital stock and the interruption of production processes during episodes of social and political instability. But our results show that, over the somewhat longer run, this relationship is much subtler than previously thought. However, our main finding of a positive causal relationship between

TABLE 6
CONTROLLING FOR GROWTH OF TRADING PARTNERS, DOES POLITICAL INSTABILITY GRANGER-CAUSE INVESTMENT? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a] (ENDOGENOUS VARIABLE IS ΔINV_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	ΔGTR_{t-1}	n
All LDCs	0.919***	0.495**	0.219	294
	(0.259)	(0.235)	(0.226)	
Asia	0.469	0.592	−0.019	45
	(0.329)	(0.442)	(0.412)	
Latin America	0.792***	0.315	−0.748	83
	(0.269)	(0.401)	(0.555)	
Middle East & North Africa	0.401	0.576	0.763*	50
	(0.282)	(0.618)	(0.452)	
Sub-Saharan Africa	1.02***	0.362	0.401	116
	(0.352)	(0.344)	(0.372)	
Low-income countries	0.649**	0.441*	−0.035	137
	(0.277)	(0.241)	(0.257)	
Lower middle-income countries	0.941**	0.691*	0.338	92
	(0.442)	(0.415)	(0.393)	
Upper middle-income countries	0.776**	−0.132	0.596	65
	(0.362)	(0.751)	(0.583)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

SPI and investment is robust. Despite being driven by the poorer countries in our sample, this result could still be read (against the authors' will) as suggesting that a government could increase investment some five years later by fostering SPI. This calls attention to the need for further consideration of the implications for long-term growth.

To this end, we examine the direct and indirect effects of SPI to determine whether or not the causal positive effect of SPI on investment counteracts, or possibly even eliminates, the negative (contemporaneous) effect of SPI on growth. One way to deal with this is to estimate a growth equation that has both contemporaneous SPI and investment, the latter instrumented by lagged SPI. In such specification, the contemporaneous SPI captures the direct effect on growth while investment carries the indirect effect of SPI on growth.

Table 10 shows estimates for growth equations, using the same estimator as before for comparability.[16] Note that, to incorporate our previous results in these specifications, we instrument investment (both contemporaneous and lagged) by lagged SPI and lagged investment. There are a number of interesting results. One is that of conditional convergence. The negative coefficient on initial income suggests catch-up: poorer countries seem to grow faster. More important for our concerns, however, are the results for investment and SPI. We find that the contemporaneous effect of SPI on growth is negative and statistically significant, even after controlling for the positive indirect (through

TABLE 7
CONTROLLING FOR GROWTH OF TRADING PARTNERS, DOES INVESTMENT GRANGER-CAUSE POLITICAL INSTABILITY? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a] (ENDOGENOUS VARIABLE IS ΔSPI_t)

	ΔINV_{t-1}	ΔSPI_{t-1}	ΔGTR_{t-1}	n
All LDCs	0.166	0.023	−0.096	212
	(0.117)	(0.025)	(0.098)	
Asia	0.299	0.058	0.046	32
	(0.387)	(0.075)	(0.214)	
Latin America	0.034	−0.016	−0.241	62
	(0.225)	(0.052)	(0.279)	
Middle East & North Africa	0.171	0.011	0.092	35
	(0.154)	(0.036)	(0.171)	
Sub-Saharan Africa	0.257	−0.032	−0.293	83
	(0.243)	(0.051)	(0.204)	
Low-income countries	0.278	−0.097	−0.241	100
	(0.222)	(0.052)	(0.162)	
Lower middle-income countries	0.051	0.024	0.119	66
	(0.173)	(0.044)	(0.185)	
Upper middle-income countries	0.208	0.042	−0.095	46
	(0.199)	(0.034)	(0.179)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

investment) effect of SPI on growth. Indeed, it seems to be the case that the direct (negative) effect of SPI on growth counterbalances the positive indirect effect of SPI on growth (through investment). This result is not inconsistent with the finding from Campos and Nugent (2002) of no long-term causal relation between SPI and growth.

V. CONCLUSIONS

The objective of this paper was to investigate the existence (and direction) of a causal relationship between SPI and investment. We constructed an index of SPI (based on the number of political assassinations, revolutions and successful *coups d'etat*) for non-overlapping five-year periods between 1960 and 1995 for a large sample of developing countries. We used the Granger causality framework with Anderson–Hsiao–Arellano instrumental variable estimates. We found that the evidence in support of the hypothesis that a high level of SPI can cause a decrease in the rate of investment is much weaker than generally believed. Despite verifying the negative *contemporaneous* relationship between SPI and the investment rate, we find evidence of a positive causal relationship going from SPI to the investment rate. Further, this conclusion is robust to various sensitivity checks.

TABLE 8

CONTROLLING FOR INITIAL INCOME, DOES POLITICAL INSTABILITY GRANGER-CAUSE INVESTMENT? ANDERSON--HSIAO–ARELLANO IV ESTIMATES, 1960–1995 (TWO LAGS)[a] (ENDOGENOUS VARIABLE IS ΔINV_t)

	ΔINV_{t-1}	ΔINV_{t-2}	ΔSPI_{t-1}	ΔSPI_{t-2}	$\Delta GDP0_{t-1}$	$\Delta GDP0_{t-2}$	n
All LDCs	0.849***	− 0.113	0.575**	− 0.218	0.0001	− 0.002**	229
	(0.209)	(0.088)	(0.277)	(0.252)	(0.0005)	(0.0006)	
Asia	0.772	0.537**	− 0.108	− 1.05	− 0.005	0.004	36
	(0.666)	(0.212)	(0.513)	(0.681)	(0.006)	(0.006)	
Latin America	0.741***	− 0.329*	0.293	− 1.29**	− 0.002**	0.0009	62
	(0.273)	(0.194)	(0.499)	(0.517)	(0.001)	(0.002)	
Middle East & North Africa	1.52*	− 0.408	2.06	− 0.756	0.00002	− 0.002	35
	(0.871)	(0.302)	(1.71)	(0.864)	(0.001)	(0.002)	
Sub-Saharan Africa	0.794***	− 0.049	0.867**	0.611	0.0002	− 0.002*	96
	(0.241)	(0.122)	(0.408)	(0.384)	(0.001)	(0.001)	
Low-income countries	0.664***	0.005	0.399	0.126	− 0.0004	− 0.00005	115
	(0.227)	(0.105)	(0.312)	(0.307)	(0.003)	(0.003)	
Lower middle-income countries	0.614	− 0.153	0.799*	− 0.657	− 0.002	− 0.0005	69
	(0.298)	(0.158)	(0.455)	(0.417)	(0.001)	(0.002)	
Upper middle-income countries	1.14*	− 0.263	0.575	0.028	0.0006	− 0.0002	45
	(0.612)	(0.317)	(1.09)	(1.03)	(0.0008)	(0.001)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

TABLE 9

CONTROLLING FOR INITIAL INCOME, DOES INVESTMENT GRANGER-CAUSE POLITICAL INSTABILITY? ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995[a] (TWO LAGS) (ENDOGENOUS VARIABLE IS ΔSPI_t)

	ΔSPI_{t-1}	ΔSPI_{t-2}	ΔINV_{t-1}	ΔINV_{t-2}	$\Delta GDP0_{t-1}$	$\Delta GDP0_{t-2}$	n
All LDCs	0.558**	0.175	0.041	0.033	−0.0004	0.0001	146
	(0.261)	(0.127)	(0.038)	(0.041)	(0.0004)	(0.0004)	
Asia	0.056	−0.043	0.005	0.042	0.0002	−0.0009	23
	(0.417)	(0.279)	(0.097)	(0.151)	(0.003)	(0.0003)	
Latin America	0.147	−0.081	0.029	−0.016	−0.0008	0.0005	41
	(0.586)	(0.295)	(0.072)	(0.097)	(0.0008)	(0.0009)	
Middle East & North Africa	0.256	0.207	0.028	0.043	−0.00006	−0.00006	22
	(0.388)	(0.174)	(0.092)	(0.097)	(0.0006)	(0.0006)	
Sub-Saharan Africa	0.666	0.272	0.047	0.0435	0.00006	−0.0005	60
	(0.463)	(0.248)	(0.062)	(0.067)	(0.0006)	(0.001)	
Low-income countries	0.518	0.131	0.025	0.075	−0.0002	−0.002	72
	(0.373)	(0.199)	(0.056)	(0.062)	(0.001)	(0.0017)	
Lower middle-income countries	0.467	0.168	0.078	−0.106	−0.0008	0.0003	45
	(0.391)	(0.172)	(0.061)	(0.083)	(0.0007)	(0.001)	
Upper middle-income countries	0.393	0.165	0.073	0.043	−0.0003	−0.00005	29
	(0.728)	(0.349)	(0.099)	(0.124)	(0.0007)	(0.0007)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

TABLE 10

DIRECT AND INDIRECT IMPACTS OF POLITICAL INSTABILITY ON GROWTH ANDERSON–HSIAO–ARELLANO IV ESTIMATES, 1960–1995 (TWO LAGS)[a]
(ENDOGENOUS VARIABLE IS $\Delta GROWTH_t$)

	ΔSPI_t	ΔSPI_{t-1}	ΔINV_t	ΔINV_{t-1}	$\Delta GDP0_t$	$\Delta GDP0_{t-1}$	n
All LDCs	−0.586*	−0.008	0.511*	−0.617*	−0.005***	0.0008	148
	(0.335)	(0.414)	(0.301)	(0.351)	(0.0006)	(0.0008)	
Asia	0.007	−0.011	0.353	0.092	−0.008	0.007	23
	(0.664)	(0.612)	(0.349)	(0.404)	(0.005)	(0.006)	
Latin America	−0.904*	−0.207	0.477**	0.161	−0.007**	0.002	41
	(0.522)	(0.645)	(0.218)	(0.306)	(0.001)	(0.002)	
Middle East & North Africa	−1.72	1.98	0.362	0.186	−0.004*	−0.002	23
	(2.22)	(3.19)	(1.04)	(0.877)	(0.002)	(0.004)	
Sub-Saharan Africa	−0.168	0.269	0.803**	−0.421	−0.006***	−0.0006***	61
	(0.454)	(0.455)	(0.405)	(0.398)	(0.001)	(0.0001)	
Low income countries	−0.144	0.244	0.644*	−0.299	−0.01***	0.011***	74
	(0.322)	(0.389)	(0.345)	(0.352)	(0.003)	(0.003)	
Lower middle income countries	−1.32**	−0.025	0.258	−0.066	−0.007***	0.002	45
	(0.579)	(0.584)	(0.314)	(0.312)	(0.002)	(0.002)	
Upper middle income countries	−1.83	0.551	0.741	−0.846	−0.005***	−0.00002	29
	(1.75)	(1.78)	(0.743)	(0.913)	(0.001)	(0.002)	

[a]Standard errors are in parentheses.
*Statistically significant at the 10% level
**Statistically significant at the 5% level
***Statistically significant at the 1% level.

One interesting policy implication that can be derived from these results is that there is less reason to believe that SPI, by itself, constitutes such a severe barrier to medium or long-term economic growth and investment than has often been advocated. The negative effects seem to be limited to the short run and offset by the present finding of a positive effect on investment over the medium term. Certainly, the results strongly contradict the notion that lower levels of SPI should be achieved at virtually any cost.

The findings of this paper also raise interesting new questions. First, might there be additional omitted variables, especially those of an institutional nature, which could be related to both SPI and the rate of investment. Numerous institutional variables may be relevant, such as the fairness and effectiveness of the judicial system, the stability of property rights and the quality of the bureaucracy. Note, for example, that in a purely cross-sectional framework Keefer and Knack (1995) found that, once these are taken into account, the negative effect of SPI on growth vanishes. Another important candidate for such an omitted variable role, following Persson and Tabellini (1992, 1994) and Alesina and Perotti (1996), might be the level of income inequality. It should be noted, however, that the data (on income distribution and institutions) for the period of time and the sample of countries used in the present study are currently unavailable. Another interesting question raised by these results, which has also received little attention in the literature, is whether or not the relationship could be between political instability and precautionary savings (instead of investment). Finally, considering that the measure of SPI used in this and most other studies captures only major disruptions, it might be useful to experiment with somewhat finer measures of more ordinary instances of both political and policy instability, and once again to examine the robustness of our present findings.

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APPENDIX

This appendix groups the sample of countries by income level (in parentheses: region, per capita income in US dollars for 1960–65). For region: *ssa* is Sub-Saharan Africa, *asia* is Asia, *mena* is Middle East and North Africa, and *lac* is Latin America and Caribbean. When per capita income in 1960–65 is 'na' (not available), it means that the country was classified in that income group using information for a later date (in general because it was not yet an independent state in 1960–65).

Low-income countries

Ethiopia (*ssa*, 263), Tanzania (*ssa*, 303), Burma (*asia*, 312), Lesotho (*ssa*, 315), Togo (*ssa*, 368), Malawi (*ssa*, 412), Burkina Faso (*ssa*, 415), Congo (DR) (*ssa*, 458), China

(*asia*, 470), Guinea-Bissau (*ssa*, 489), Rwanda (*ssa*, 505), Mali (*ssa*, 511), Nigeria (*ssa*, 545), Botswana (*ssa*, 548), Kenya (*ssa*, 556), Niger (*ssa*, 560), Uganda (*ssa*, 569), Gambia (*ssa*, 572), Guinea (*ssa*, 601), Burundi (*ssa*, 606), Cameroon (*ssa*, 654), Pakistan (*asia*, 660), Indonesia (*asia*, 667), Central African Republic (*ssa*, 718), Chad (*ssa*, 741), Liberia (*ssa*, 741), India (*asia*, 763), Egypt (*mena*, 808), Mauritania (*ssa*, 847), Sierra Leone (*ssa*, 883), South Korea (*asia*, 911), Ghana (*ssa*, 931), Zambia (*ssa*, 947), Thailand (*asia*, 956), Bangladesh (*asia*, 959), Angola (*ssa*, 975), Morocco (*mena*, 1005), Zimbabwe (*ssa*, 1014), Honduras (*lac*, 1027), Senegal (*ssa*, 1084), Congo (Rep.) (*ssa*, 1104), Benin (*ssa*, 1108), Sri Lanka (*asia*, 1126), Laos (*asia*, na), Yemen (*mena*, na), Sudan (*ssa*, na).

Lower middle-income countries

Tunisia (*mena*, 1130), Cote d'Ivoire (*ssa*, 1137), Bolivia (*lac*, 1137), Dominican Rep (*lac*, 1137), Mozambique (*ssa*, 1149), Somalia (*ssa*, 1150) Philippines (*asia*, 1153), Madagascar (*ssa*, 1178), Seychelles (*ssa*, 1187), Paraguay (*lac*, 1204), Taiwan (*asia*, 1294), Jordan (*mena*, 1300), El Salvador (*lac*, 1416), Ecuador (*lac*, 1462), Malaysia (*asia*, 1467), Swaziland (*ssa*, 1530), Algeria (*mena*, 1597), Syria (*mena*, 1607), Guyana (*lac*, 1615), Turkey (*mena*, 1625), Panama (*lac*, 1680), Guatemala (*lac*, 1689), Nicaragua (*lac*, 1703), Singapore (*asia*, 1707), Colombia (*lac*, 1735), Jamaica (*lac*, 1763), Brazil (*lac*, 1870), Mongolia (*asia*, na).

Higher middle-income countries

Gabon (*ssa*, 1969), Costa Rica (*lac*, 2112), Peru (*lac*, 2148), South Africa (*ssa*, 2211) Cyprus (*mena*, 2228), Mexico (*lac*, 2852), Iran (*mena*, 2875), Chile (*lac*, 3017), Mauritius (*ssa*, 3295), Iraq (*mena*, 3627), Uruguay (*lac*, 3907), Saudi Arabia (*mena*, 4238) Argentina (*lac*, 4790), Trinidad and Tobago (*lac*, 6113), Venezuela (*lac*, 6363), Bahrain (*mena*, na), Qatar (*mena*, na), United Arab Emirates (*mena*, na), Kuwait (*mena*, na), Oman (*mena*, na).

NOTES

1. See e.g. Gupta (1990), Londregan and Poole (1992), Perotti (1994), Alesina *et al.* (1996), Alesina and Perotti (1996), Ades and Chua (1997) and Fielding (2003 forthcoming). Another source of uncertainty is macroeconomic volatility, as discussed in Ramey and Ramey (1995) and Aizenman and Marion (1999).
2. See e.g. Caballero (1991), Dixit and Pindyck (1994), and Abel and Eberly (1999). For a survey see Caballero (1999).
3. Mankiw argues that 'political instability, as measured by the frequency of revolutions, coups, or wars, is negatively associated with growth' (1995, p. 302) in one of the most robust findings of the growth literature. Similarly, one of the 'stylized facts' that Persson and Tabellini (1999) identify is that 'political instability, as measured by more frequent regime changes, or political unrest and violence, is significantly and negatively correlated with growth in cross-country data'.
4. Formalizations of these three explanations can be found in Abel and Eberly (1999), Hirshleifer (1987), and Acemoglu and Robinson (2000), respectively.
5. See note 1.
6. The data source is Barro and Lee (1993). As mentioned, the data-set constructed for this paper is available from the authors on request.
7. The reason for choosing an unbalanced panel was to keep the exercise as comparable with the rest of the literature as possible. The sample we use differs only marginally from that of other studies. Notice also that the Penn World Table data end in 1992; thus, the averages for the last period are actually for 1990–92.
8. We found no explanations on the procedures used to rank countries into income groups by the World Bank. It seems, however, that as a rule the bottom 40% of developing countries are classified as 'low income'.
9. Notice that Granger himself calls attention to the limits of this concept of causality by remarking that 'causation is a non-symmetric relationship, and there are various ways in which asymmetry can be introduced, the most important of which are controllability, a

relevant theory, outside knowledge, and temporal priority' (1987, p. 49.) For discussion see e.g. Hsiao (1979), and Zellner (1988).

10. We are unaware of other studies that use the Granger framework in this context. The closest paper to ours in this respect is Blomstrom *et al*. (1996).
11. For a discussion see Hsiao (1986).
12. See e.g. Holtz-Eakin *et al*. (1988), Arellano and Bond (1991), Kiviet (1995), and Judson and Owen (1999).
13. It would be important to investigate under which lag length a causal relationship will appear (that is, whether using one, two, three or four-year lag lengths would change our conclusions). Gupta (1990) has annual series for a similar SPI index but only until 1982. He also mentioned (personal communication) that the updating of these series (until 1995) is not yet ready. We thus have to leave this important exercise for future work.
14. As noted above, our conclusions remain unchanged if, instead of the Anderson–Hsiao–Arellano estimator, we report OLS (levels), OLS (first differences), the Anderson–Hsiao estimator, the one-step GMM estimator proposed by Arellano and Bond (1991), the two-step GMM estimator proposed by Arellano and Bond (1991) and the GMM estimator proposed by Ahn and Schmidt (1995). These results are not reported for the sake of space, but are available from the authors on request.
15. Notice that our main conclusion remains also after including the rate of population growth. Although this is not entirely surprising, because we have both China and India in our sample of developing countries, we believe some reassurance in this regard is needed. These results are not reported for the sake of space, but are available from the authors on request.
16. The conclusions from Table 10 do not change in any meaningful manner if we use one lag instead of two, if we add population growth to these, or if we estimate these specifications with the fixed-effects estimator. These results are available from the authors upon request.

REFERENCES

Abel, A. and Eberly, J. (1999). The effects of irreversibility and uncertainty on capital accumulation. *Journal of Monetary Economics*, **44**, 339–77.

Acemoglu, D. and Robinson, J. (2000). Why did the West extended the franchise? Democracy, inequality and growth in historical perspective. *Quarterly Journal of Economics*, **115**, 1167–99.

Ades, A. and Chua, H. (1997). Thy neighbor's curse: regional instability and economic growth. *Journal of Economic Growth*, **2**, 279–304.

Ahn, S. and Schmidt, P. (1995). Efficient estimation of models for dynamic panel data. *Journal of Econometrics*, **68**, 5–27.

Aizenman, J. and Marion, N. (1999). Volatility and investment: interpreting evidence from developing countries. *Economica*, **66**, 157–79.

Alesina, A., Ozler, S., Roubini, N. and Swagel, P. (1996). Political instability and economic growth. *Journal of Economic Growth*, **1**, 189–211.

——— and Perotti, R. (1996). Income distribution, political instability, and investment. *European Economic Review*, **40**, 1203–28.

Anderson, T. and Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, **18**, 47–82.

Arellano, M. (1989). A note on the Anderson–Hsiao estimator for panel data. *Economic Letters*, **31**, 337–41.

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, **58**, 277–97.

Barro, R. and Lee, J. (1993). Data set for 138 countries (available by anonymous ftp from www.nber.org, at directory pub/barro.lee).

Blomstrom, M., Lipsey, R. and Zejan, M. (1996). Is fixed investment the key to economic growth? *Quarterly Journal of Economics*, **111**, 269–76.

Caballero, R. (1991). On the sign of the investment–uncertainty relationship. *American Economic Review*, **81**, 279–88.

Caballero, R. (1999). Aggregate investment. In J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics*. Amsterdam: North-Holland.

Campos, N. and Nugent, J. (2002). Who is afraid of political instability? *Journal of Development Economics*, **67**, 157–72.

Dixit, A. and Pindyck, R. (1994). *Investment under Uncertainty*. Princeton, NJ: Princeton University Press.

FIELDING, D. (2003). Modeling political instability and economic performance: Israeli investment during the Intifada. *Economica*, Forthcoming.

GRANGER, C. W. (1987). Causal inference. In *The New Palgrave: Econometrics*. New York: W.W. Norton.

GUPTA, D. (1990). *The Economics of Political Violence*. New York: Praeger.

HIRSHLEIFER, J. (1987). *Economic Behaviour in Adversity*. Chicago: University of Chicago Press.

HOLTZ-EAKIN, D., NEWEY, W. and ROSEN, H. (1988). Estimating vector autoregressions with panel data. *Econometrica*, **56**, 1371–95.

HSIAO, C. (1979). Causality tests in econometrics. *Journal of Economic Dynamics and Control*, **1**, 321–46.

——— (1986). *Analysis of Panel Data*. Cambridge: Cambridge University Press.

JUDSON, R. and OWEN, A. (1999). Estimating dynamic panel data models: a guide for macroeconomists. *Economic Letters*, **65**, 9–15.

KEEFER, P. and KNACK, S. (1995). Institutions and economic performance: cross-country tests using alternative institutional measures. *Economics and Politics*, **7**, 207–27.

KIVIET, J. (1995). On bias, inconsistency, and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics*, **68**, 53–78.

LONDREGAN, J. and POOLE, K. (1992). The seizure of executive power and economic growth: some additional evidence. In A. Cukierman, Z. Hercowitz and L. Leiderman (eds.), *Political Economy, Growth, and Business Cycles*. Cambridge Mass: MIT Press.

MANKIW, G. (1995). The Growth of Nations. *Brookings Papers on Economic Activity*, **1**, 275–310.

PEROTTI, R. (1994). Income distribution and investment. *European Economic Review*, **38**, 827–35.

PERSSON, T. and TABELLINI, G. (1992). Growth, distribution, and politics. In A. Cukierman, Z. Hercowitz and L. Leiderman (eds.), *Political Economy, Growth, and Business Cycles*. Cambridge Mass: MIT Press.

PERSSON, T. and TABELLINI, G. (1994). Is inequality harmful for growth? *American Economic Review*, **84**, 600–21.

PERSSON, T. and TABELLINI, G. (1999). Political economics and macroeconomic policy. In J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics*. Amsterdam: North-Holland.

RAMEY, G. and RAMEY, V. (1995). Cross-country evidence on the link between volatility and growth. *American Economic Review*, **85**, 1138–51.

SUMMERS, R. and HESTON, A. (1994). Penn world tables, Version 5.6 (available by anonymous ftp from www.nber.org, at pub/pwt56).

ZELLNER, A. (1988). Causality and causal laws in economics. *Journal of Econometrics*, **39**, 7–22.