8 Political Uncertainty, the Formation of New Activities and Growth

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1 INTRODUCTION

The traditional neoclassical model has played down the role of uncertainty in explaining investment and growth. This attitude stems from two observations – first, the direction of the impact of uncertainty on investment is ambiguous. Second, the magnitude of this effect is of a second-order importance – proportional to the variance of shocks. In neoclassical models concavity/convexity arguments ultimately determine the impact of uncertainty on investment. As Abel (1983) showed, in a competitive environment volatility increases investment at a rate proportional to the variance of shocks, whereas Caballero (1991) showed that market power weakens (and may even reverse) the impact of volatility on investment. Allowing for non-reversibility of investment does not resolve the ambiguity of the predicted effects of volatility on investment, as has been illustrated by Pindyck and Solimano (1993) and Dixit and Pindyck (1994). A logical consequence of these considerations is that uncertainty, driven by policy or nature, has been played down as an explanatory factor by the neoclassical investment and growth models. Instead, the focus has been on the first moment (the mean) and not the second moment (the volatility) of policies and shocks.

Recent empirical studies have repudiated the above presumption, showing that volatility of policies and of shocks have large adverse effects (proportional to the coefficient of variation of shocks) on growth and investment in developing countries. Any attempt to evaluate the impact of uncertainty on investment and growth presents a measurement challenge – there are no obvious statistics that define the relevant uncertainty. In order to deal with this issue the literature took indirect approaches. One line of investigation, invoked by Ramey and Ramey (1995), was to correlate the volatility in real GDP and average rate of growth. They found a strong negative correlation. A second approach was to evaluate a degree to which volatility 'accounted' for investment and growth after controlling for other relevant variables. Such an approach was adopted by Aizenman and Marion (1993 and 1995) and Hausmann and Gavin (1995). First, they fitted auto-regressive processes to various macro variables (typically defined as shares), and used the standard deviation of the regressions' residuals to measure volatility. Next, they evaluated the degree to which these measures are significant in 'explaining' investment and growth after controlling for other variables. A third approach was to construct indices measuring political instability – focusing on their role in accounting for growth and investment after controlling for other relevant variables, and identifying the adverse growth effects of political instability, in line with the work of Alesina *et al.* (1992) and Borner, Brunetti and Weder (1995).

This chapter argues that policy uncertainty and low growth are causally related. Obviously, correlations do not indicate causality, and one would have to go further than the above finding to make a convincing case. A necessary condition for the causal argument to be credible is to have a structural model that explains this causality. The purpose here is to contribute to this end. We assume that industrialization must involve exposure to new activities, and design a framework where volatility leads to *first-order* losses caused by the induced drop in the formation of new activities.

Specifically, we show in a generalized expected utility framework that uncertainty inhibits the formation of new activities, leading to large costs that are proportional to the standard deviation of the underlying shocks. We illustrate this point by extending Romer's (1994) model to the case where agents are disappointment averse, as modelled first by Gul (1991). Our agent is disappointment averse, and dislikes downside risk. The key assumption is that the agent uses the certainty equivalent consumption as a benchmark to evaluate disappointment. If the realized consumption falls below this benchmark the agent is disappointed. This leads to a disutility proportional to the disappointment aversion times the disappointment (measured by the gap between the certainly equivalent and realized consumption). This adjustment is one-sided – it applies only in states of nature where the consumer is disappointed.

It is useful to place the discussion in its proper context. The expected utility-maximization model outlined by Savage (1954) has proved a useful model, yet there have been difficulties in explaining various ‘anomalies’ and models of behaviour that do not correspond well to Savage’s assumptions. For example, the excess volatility of stock prices reported by Shiller (1981) and the equity risk premium puzzle identified by Mehra and Prescott (1985) raised questions regarding the appropriateness of Savage’s approach. The empirical evidence inspired by the Allais paradox reviewed in Harless and Camerer (1994) suggests that there are interesting situations where the presence of ‘certainty bias’ has an impact on decision-making in ways that are not modelled well in Savage’s environment. These concerns have led to the development of generalized expected utility approaches, relaxing Savage’s axioms. Gul’s disappointment aversion is an example of one possible extension.[1] While debate regarding these developments continues, the new approaches offer a useful alternative research agenda. This chapter focuses on these issues in the context of investment in new activities in developing countries.

We consider the example of where policy uncertainty is caused by a volatile tax on capital income. Section 2 considers the case where multinationals own that capital. In Section 3 we identify the factors explaining political uncertainty. In our model, taxing capital income in a time consistent manner cannot be supported by efficiency considerations *even if* the capital is owned by foreigners. This follows from the observation that domestic labour gets a significant share of the surplus attributed to capital in order to nullify the gains associated with taxing capital. Hence the explanation of a capital tax is the administration’s attempt to capture the short-term ‘quasi rents’. Such an administration ignores the long-term costs associated with reducing foreign investment in favour of immediate revenue gains, as is the case when the administration represents a narrow pressure group. Section 3 also identifies the second-best optimal investment subsidy invoked by a welfare-maximizing administration that faces political risk. This result may provide an interpretation of the tax concessions offered to multinationals in recent years by developing countries, two decades after the widespread nationalization of foreign capital.[2] Section 4 concludes with a discussion.

2 AN OPEN-ECONOMY MODEL

In this section we review the preferences, the technology and the equilibrium in an open economy.

2.1 Preferences

The preferences of a disappointment-averse agent may be summarized by $[u(c), \beta]$, where c is consumption, u is a conventional utility function, $[u' > 0, u'' < 0]$, and $\beta \geq 0$ is a number that measures the degree of disappointment aversion. We define implicitly the disappointment-adverse expected utility by describing its key features. In the absence of risk, the agent's utility level is simply $u(c)$. Let us denote by $V(\beta)$ the expected utility of a disappointment-averse agent (whose disappointment aversion rtae is β). Suppose that our agent faces risky consumption $\{c_s\}$ in n states of nature, $s = 1, \ldots n$. Let μ denote the certain consumption that yields the same utility level as the risky consumption: $V(\beta, \{c_s\}) = u(\mu)$.[3] Our consumer is revealing disappointment aversion if extra disutility is attached to circumstances where the realized consumption is below μ. The disappointment-averse expected utility equals the conventional expected utility, adjusted downwards by a measure of disappointment aversion (β) times the 'expected disappointment'. A convenient way to define V is:

$$
\begin{aligned}
V(\beta;\{c_s\}) &= \int u(c)f(c)dc - \beta \int_{\mu>c} [u(\mu) - u(c)]f(c)dc \\
&= E[u(c)] - \beta E[u(\mu) - u(c) \mid \mu > c]Pr[\mu > c] \qquad (1)
\end{aligned}
$$

where f is the density function, E is the expectation operator, and $Pr[z]$ is the probability of event z, and $E[u(\mu) - u(c) \mid \mu > c]$ the expected value of $u(\mu) - u(c)$, conditional on the realized consumption being below the certainty equivalent consumption. The term $E[u(\mu) - u(c) \mid \mu > c]$ measures the average 'disappointment', being defined by the expected difference between the certainty equivalent utility and the actual utility u in states of nature where the realized consumption is below the certainty equivalent consumption.

Gul (1991) establishes the equivalence of strict disappointment aversion (that is, $\beta > 0$) and of Allais Paradox-type behaviour – the tendency to overweight outcomes that are considered certain relative to outcomes that are merely probable (the 'certainty effect'). The term 'Paradox' stems from the observation that such preferences are not consistent with expected utility maximization, yet their presence has been established in numerous controlled experiments, such as, Harless and Camerer (1994). The 'certainty effect' may be of special interest in explaining investment in new activities in a developing country, as such investment may expose agents to new risk relative to the more certain outcome in the status quo equilibrium. Hence, it is natural to apply Gul's approach in studying the formation of new activities. Yet it is useful to note that the results derived in this chapter are applicable to other generalized expected utility approaches sharing the property of 'first-order' risk aversion, as defined by Segal and Spivak (1990).

We restrict our attention to the simplest example – of two states of nature. Suppose that the agent consumes c_i in state i ($i = 1, 2$), where $c_1 > c_2$, with probabilities (α, $1 - \alpha$), respectively. Applying Equation (1), the disappointment-averse expected utility is defined by:

$$V(\beta) = \alpha u(c_1) + (1 - \alpha)u(c_2) - \beta(1 - \alpha)[V(\beta) - u(c_2)] \qquad (2)$$

Thus,

$$V(\beta) = \frac{\alpha}{1 + (1 - \alpha)\beta} u(c_1) + \frac{(1 - \alpha)(1 + \beta)}{1 + (1 - \alpha)\beta} u(c_2) \qquad (2')$$

Note that for $\beta = 0$, V is identical to the conventional expected utility. A more revealing way of writing the disappointment averse expected utility is:

$$V(\beta) = \left[\alpha - \frac{\alpha(1 - \alpha)\beta}{1 + (1 - \alpha)\beta}\right] u(c_1) + \left[1 - \alpha + \frac{\alpha(1 - \alpha)\beta}{1 + (1 - \alpha)\beta}\right] u(c_2) \qquad (3)$$

If the agent is disappointment averse ($\beta > 0$), s/he attaches extra weight to 'bad' states of disappointment (relative to the probability weight used in the conventional utility), and attaches a lighter weight to 'good' states. Note that for $\beta > 0$, the weight attached to the 'good' outcome (c_1) is convex with respect to probability (α). Hence, a small increase in the probability of the 'good' state increases utility much more when the chance of getting the price is already high, as is suggested by the 'certainty effect' discussed above.

One may apply our analysis to provide an interpretation to the risk premium in the presence of disappointment aversion. Suppose that the disappointment averse agent described above faces income [$Y + \varepsilon$, $Y - \varepsilon$]. We define the risk premium ϕ by:

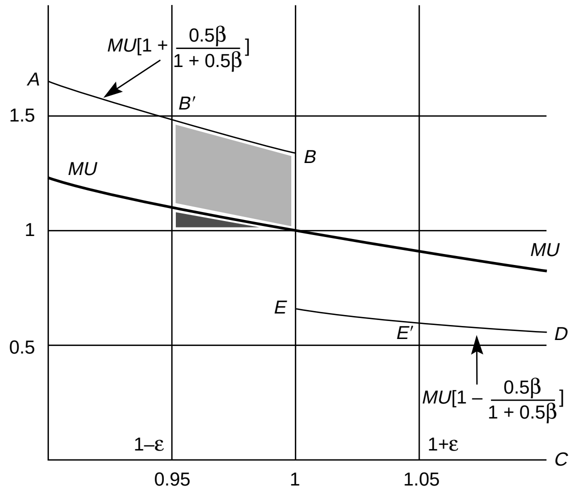
$$u(Y - \phi) = \frac{0.5}{1 + 0.5\beta} u(Y + \varepsilon) + \frac{0.5(1 + \beta)}{1 + 0.5\beta} u(Y - \varepsilon) \qquad (4)$$

Applying the conventional Taylor approximation leads to the following risk premium:

$$\frac{\phi}{Y} \approx \frac{0.5\beta}{1 + 0.5\beta}\sigma_y + 0.5R[\sigma_y]^2 \qquad (5)$$

where R, σ_y are the coefficient of relative risk aversion and the coefficient of variation of income, respectively: $R = -Y\frac{u''}{u'}$, $\sigma_y = \frac{\varepsilon}{Y}$. Note that the risk premium increases with the degree of disappointment aversion times the coefficient of variation. Furthermore, for 'reasonable' volatility the risk premium is determined mainly by the disappointment aversion, whereas the relative risk aversion R is playing only a secondary role (as the impact of R is proportional to the variance, while the impact of β is proportional to the standard deviation). Hence the addition of disappointment aversion may modify substantially all the results that hinge on calculations involving a risk premium. Equation (5) is an example of a 'first-order' risk premium (that is, a risk premium proportional to the standard deviation).[4]

Further insight regarding the welfare consequences of volatility can be gained with the help of Figure 8.1. Consider the case where consumption fluctuates between $(1 - \varepsilon)$ and $(1 + \varepsilon)$, and the probability of each state is 0.5. The bold curve (MU) traces the marginal utility of consumption for a risk-averse, disappointment-neutral agent [$R > 0$, $\beta = 0$].[5] We normalize units such that the marginal utility at $c = 1$ is 1. If $\beta = 0$, volatility reduces expected utility by (approximately) the dashed triangle, ($\cong 0.5\varepsilon[R\varepsilon] = 0.5R\varepsilon^2$, drawn for $\varepsilon = 0.05$). If $\beta > 0$, the relevant 'marginal utility' is $MU\left[1 + \frac{0.5\beta}{1 + 0.5\beta}\right]$ in the state of nature where the agent is disappointed [for $c < 1$], and the marginal utility is $MU\left[1 - \frac{0.5\beta}{1 + 0.5\beta}\right]$ for $c > 1$.[6] The modified marginal utility is traced by curve $AB'BEE'D$, and is non-continuous at $c = 1$. For $\varepsilon = 0.05$, the utility of a disappointment-averse agent attributed to the 'good' state exceeds $U(1)$ by the trapezoid [E, E', 1.05, 1]. The utility attributed to the 'bad' state of nature falls short of $U(1)$ by the trapezoid [B', B, 1, 0.95]. Hence volatility reduces the expected utility of



Notes:
1. Drawn for the case where consumption fluctuates between $(1 - \varepsilon)$ and $(1 + \varepsilon)$, the probability of each state is 0.5, $\varepsilon = 0.05$.
2. Curve *MU* is the marginal utility of consumption for $R = 2$, $\beta = 0$.
3. Curve $AB'BEE'D$ is the modified marginal utility of consumption for $R = 2$, $\beta = 1$.

Figure 8.1 Volatility and marginal utility

a disappointment-averse agent by half the difference between these two trapezoids, as is depicted by the dotted trapeze $\left(\cong \dfrac{0.5\beta}{1 + 0.5\beta}\varepsilon\right)$. The resultant loss is proportional to the disappointment aversion, as a higher β increases the discontinuity.

2.2 Technology

We adopt the technology assumptions of Romer (1994). He considered the case of a developing country where the final good (Z) is produced using the services of labour (L) and N capital goods:

$$Z = [L]^{1-\alpha} \sum_{i=1}^{N} [x_i]^{\alpha};\ 0 < \alpha < 1 \tag{6}$$

The term x_i denotes the capital i (alternatively, intermediate input i) used in the production of the final good.[7] Suppose, first, that all the capital goods are produced by multinationals located in industrial countries.[8] Introducing a new capital good into the developing country (that is, increasing N to $N + 1$ in Equation (6)) requires an upfront capacity investment by the multinational. While the upfront cost may differ across multinationals, the marginal cost of all the capital goods equal ω.

Adding capital good n requires a sunk cost specific to that good.[9] For simplicity, we assume that the dependence of the sunk cost on n is linear. Suppose, for example, that the cost of installing a capital good n is θn. There are two periods, denoted by $t = 0, 1$. The foreign producer commits his foreign direct investment at the beginning of Period 0. Establishing the capacity in Period 0, the foreign producer imports in Period 1 the capital good at a cost of ω. Production of the final good Z takes place in Period 1 by domestic producers who purchase capital good i at price $p_i (1 \leq i \leq N)$.

2.3 The Equilibrium

Standard cost minimization for domestic producers implies that their demand for capital good i is:

$$(x_i)^d = \left[\frac{\alpha}{p_i}\right]^{1/(1-\alpha)} L \tag{7}$$

Hence, each foreign producer faces a demand the elasticity of which is $1/(1 - \alpha)$. A representative foreign producer follows a mark-up rule, charging:

$$p_i = \frac{\omega}{\alpha} \tag{8}$$

for its input.

The profits are subject to a tax δ, the magnitude of which is determined by the realization of the political process at time 1. For simplicity of exposition we normalize δ to be either low or high:

$$\delta = \begin{cases} \delta_0 + \varepsilon \text{ probability } 0.5 \\ \delta_0 - \varepsilon \text{ probability } 0.5 \end{cases}$$

where δ_0 is the expected tax rate, and ε is the standard deviation of the tax rate. Foreign direct investment by entrepreneur n will lead to gross profits of:

$$\pi_n(\delta) = [1 - \delta](p_n - \omega)x_n = [1 - \delta][\omega]^{-\alpha'} kL, \tag{9}$$

where $a' = \alpha/(1 - \alpha)$ and $k = \frac{1 - \alpha}{\alpha}(\alpha)^{2/(1 - a)}$

Entrepreneurs maximize a disappointment-averse generalized expected utility $u(c_0) + \frac{V(\beta;\{c_{1,s}\})}{1 + \rho}$ where c_0; $c_{1,s}$ are the consumption at Periods 0 and 1 (in state of nature s), and ρ is the subjective rate of time preferences. The expected utility of entrepreneur n is:

$$u\{Z_0 - \theta n\} + \frac{0.5}{1 + \rho}\left[1 - \frac{0.5\beta}{1 + 0.5\beta}\right] u\{[1 - \delta_0 - \varepsilon][\omega]^{-\alpha'} kL + Z_1\}$$

$$+ \frac{0.5}{1 + \rho}\left[1 + \frac{0.5\beta}{1 + 0.5\beta}\right] u\{[1 - \delta_0 + \varepsilon][\omega]^{-\alpha'} kL + Z_1\} \tag{10}$$

where Z_t is the entrepreneur's 'outside' income in period t from all the other activities ($t = 0, 1$). To simplify, suppose that the only source of uncertainty is the direct foreign investment. The multinational faces a risk-free investment opportunity in the form of a bond yielding a risk-free interest rate r. The investment is warranted if Equation (10) exceeds $u\{Z_0\} + \frac{u\{Z_1\}}{1 + \rho}$; alternatively if:

$$\frac{0.5}{(1 + \rho)(1 + 0.5\beta)} [u\{[1 - \delta_0 + \varepsilon][\omega]^{-\alpha'} kL + Z_1\}$$

$$+ (1 + \beta)u\{[1 - \delta_0 - \varepsilon][\omega]^{-\alpha'} kL + Z_1\}]$$

$$- \frac{1}{1 + \rho} u\{Z_1\} > u\{Z_0\} - u(Z_0 - \theta n\} \tag{11}$$

Assuming that Z_t is large relative to the investment project, we use a first-order approximation of Equation (11) around the outside income, inferring that the investment will be warranted if:[10]

$$\left\{\left[1 - \delta_0 - \varepsilon \frac{0.5\beta}{1 + 0.5\beta}\right] [\omega]^{-\alpha'} kL\right\} \frac{u'(Z_1)}{1 + \rho} > \{\theta n\} u'(z_0) \tag{12}$$

Alternatively,[11]

$$\left[1 - \delta_0 - \varepsilon \frac{0.5\beta}{1 + 0.5\beta}\right] \frac{[\omega]^{-\alpha'} kL}{1 + r} > \theta n \tag{12'}$$

If all multinationals have the same disappointment aversion, the number of capital goods (N) is:

$$N \cong \left[1 - \delta_0 - \varepsilon \frac{0.5\beta}{1 + 0.5\beta}\right] \frac{[\omega]^{-\alpha'} kL}{(1 + r)\theta} \tag{13}$$

In the absence of uncertainty, the number of capital goods is:

$$\tilde{N} \cong (1 - \delta_0) \frac{[\omega]^{-\alpha'} kL}{(1 + r)\theta} \tag{13'}$$

where $\tilde{x}$ denotes the value of x in the absence of uncertainty (x any variable).

The GNP is the sum of labour income (y_1) and the income attributed to the tax imposed on multinationals. Applying Equation (6) and (8), the labour income equals:

$$y_1 = (1 - \alpha) NL \left[\frac{\alpha^2}{\omega}\right]^{\alpha'} \tag{14}$$

In the absence of uncertainty, the labour income equals:

$$\tilde{y}_1 = (1 - \alpha) \tilde{N} L \left[\frac{\alpha^2}{\omega}\right]^{\alpha'} \tag{15}$$

from which we infer that uncertainty reduces labour income by:

$$\frac{y_1}{\tilde{y}_1} - 1 = \frac{N}{\tilde{N}} - 1 \cong - \frac{1}{1 - \delta_0} \frac{0.5\beta}{1 + 0.5\beta} \varepsilon \tag{16}$$

Uncertainty reduces the number of new activities. Labour captures part of the rents associated with capital deepening, hence the drop in investment impacts on labour income directly. The drop in welfare is proportional to the first-order risk premium identified in Equation (5), measuring the uncertainty embodied in the investment. It is determined by the standard deviation of the tax rate multiplied by a measure of the disappointment aversion. The drop in labour income is also proportional to $\frac{1}{1-\delta_0}$. Hence a given volatility will induce a greater drop in labour income in a more distorted economy; that is, where the average tax rate is higher.

For a disappointment-averse agent, volatile tax rates reduce investment considerably. The magnitude of the resultant drop is comparable to the drop in investment induced by raising the expected tax rate. Formally, if $y_{1,0}$ denotes labour income in the zero tax regime, the drop in labour income induced by taxes relative to the zero tax economy ($y_{1,0}$), is the sum of the expected tax rate and the first order risk premium:

$$\frac{y_1}{y_{1,0}} - 1 \cong -\left[\delta_0 + \varepsilon \frac{0.5\beta}{1+0.5\beta}\right] \tag{17}$$

The above discussion applied a first-order approximation. Figure 8.2 plots a simulation of the GDP/[undisturbed GDP] ratio as a function of volatility, drawn for varying degrees of disappointment aversion for a consumer whose coefficient of relative risk aversion is 1.5. The top curve corresponds to a disappointment-neutral agent (who is risk averse in the conventional sense). Notice that for such a consumer, large volatility has negligible effects. As the above analysis predicts, volatility has large, first-order effects for disappointment-averse agents.

The income associated with the tax on capital (*T*) is (see Equation 9):

$$T = \delta[\omega]^{-\alpha'} kLN. \tag{18}$$

The GNP (*y*) is the sum of labour income plus the tax revenue. Applying Equations (14) and (18) we infer that:

$$y = (1-\alpha)NL\left(\frac{\alpha^2}{\omega}\right)^{\alpha'}[1+\alpha\delta] \tag{19}$$

Without further information regarding the party that gets the tax income we cannot assess the precise welfare effects of volatility. Instead, we proceed by finding the impact of volatile taxes on the expected

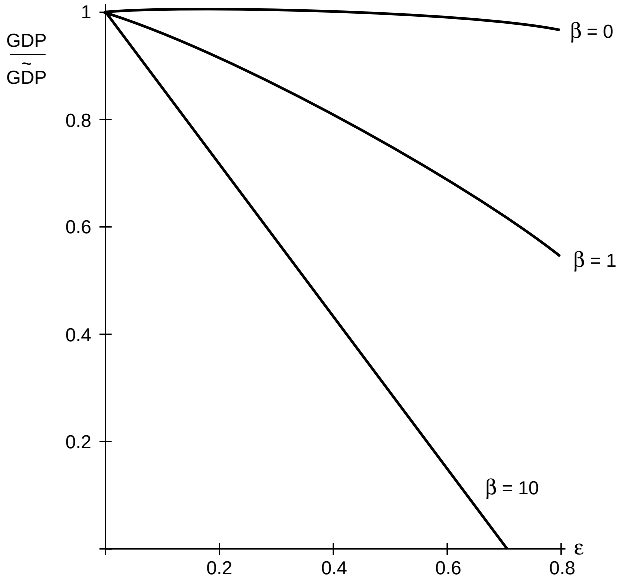


Figure 8.2 Volatility and the GDP/(undisturbed GDP) ratio

Note: 1. Drawn for $\alpha = 0.5$, $\bar{L} = 200$, $\delta_0 = 0.4$, $\omega = 0.5$, $\rho = 0.1$, $R = 1.5$, $Z_0 = Z_1 = 1000$.

GNP. Applying Equations (13) and (19), we find that volatile taxes reduce the expected GNP relative to the zero tax GNP by:

$$\frac{E[y]}{y_0} - 1 \cong -(1-\alpha)\delta_0 - \alpha[\delta_0]^2 - \varepsilon \frac{0.5\beta}{1+0.5\beta}(1+\alpha\delta_0) \quad (20)$$

As with the income of labour, the drop in GNP is proportional to both the expected tax rate and the standard deviation of the tax rate – the second determining the first-order risk premium. This section has focused on the case in which capital goods were imported by multinationals. The damaging effect of uncertainty, however, does not depend on the existence of international trade and foreign direct investment, and the logic of our discussion carries over to a closed economy as well. This can be shown by extending Romer's model to a closed economy, where we take into account the income of both labour and entrepreneurs, and we specify the domestic production of capital goods.

3 SOURCES OF UNCERTAINTY AND INVESTMENT POLICIES

The purpose of this section is to identify the possible source of uncertainty and the role of policies. We can use the above framework to infer several results. First, the time-consistent optimal tax on foreign capital (that is, the tax that maximizes the expected welfare) is zero. The optimal policy is obtained by finding the time-consistent tax rate that maximizes the expected GNP. Applying Equations (13) and (19) it can be verified that the optimal time-consistent tax in the absence of uncertainty is a *subsidy*.[12] Consequently, the only incentive in our model for imposing a foreign capital tax is for the purpose of 'revenue seeking' by narrow interest groups.[13] While our model was framed as a two-period example, it can be extended to a dynamic model that allows one to focus on the time-inconsistency issue.

We can use our model to address the following problem. Suppose that at time zero a 'benevolent' administration has the capacity to subsidize investment, recognizing that it faces political uncertainty. With a given probability (0.5 in our example) it will be re-elected for Period 1 – and thus it will set the capital tax at rate zero. With a probability of 0.5, the administration will be replaced by a high tax administration, representing the narrow interests of a 'revenue-seeking' group. The high-tax administration will set the tax at rate 2ε (hence, in our example, $\delta_0 = \varepsilon$). We would like to identify the 'optimal' investment subsidy for an administration which attempts to maximize the expected welfare in Period 0 for the exogenously given tax uncertainty. The administration is putting a zero value on the tax revenue raised by the 'special interest' administration, and attaches a shadow cost of λ for financing the subsidy. We generalize the assumptions of the previous sections by assuming that the capital cost of capital good n is θn^{φ} (φ was assumed to be 1 in previous sections). The problem facing the administration is to find the subsidy rate s that solves:

$$\underset{s}{\text{MAX}}\left[(1-\alpha)NL\left(\frac{\alpha^2}{\omega}\right)^{\alpha'} - \sum_{i=1}^{N} s\theta n^{\varphi}(1+\lambda)(1+r)\right] \tag{21}$$

The first term is labour income, and the second is the cost of the subsidy scheme (in terms of Period 1). The optimal subsidy can be approximated by:

$$s \cong \frac{1 + \varphi - \alpha(1 + \lambda)\left(1 - \varepsilon \dfrac{1 + \beta}{1 + 0.5B}\right)\varphi}{1 + \varphi + \alpha(1 + \lambda)\left(1 - \varepsilon \dfrac{1 + \beta}{1 + 0.5\beta}\right)} . \tag{22}$$

The investment subsidy depends positively on the volatility of future taxes and on disappointment aversion, and negatively on the shadow cost of public funds.[14]

4 CONCLUDING REMARKS

This chapter has illustrated that policy uncertainty has large adverse effects on the formation of new activities in developing countries. The study focused on the incidence of a random profit tax. In our model, taxing capital is a welfare-reducing policy. Hence such a policy would be enacted by an administration driven by a short-term 'revenue-seeking' motive, supporting narrow interest groups, and ignoring long-term costs. In the absence of a commitment mechanism guaranteeing a 'no future tax' promise, the economy is characterized by under-investment. The adverse effects of policy uncertainty can be partially overcome by a proper investment subsidy. Obviously, this is a second-best solution, but it may be the only viable policy as long as policy uncertainty hovers above. This result may provide an interpretation for the tax concessions offered to multinationals in recent years by developing countries. In closing the chapter it is useful to emphasize that disappointment aversion was used here because of its relative tractability, yet the main points of the chapter can be advanced using alternative formulations of generalized expected utility agents.

Notes

* This study is part of the NBER's research programme in International Trade and Investment. Any opinions expressed are mine and not those of the NBER, as indeed are any errors.

1. See Epstein (1992) for a useful review of the new approaches to modelling risk. The problem solved in this chapter could be addressed using alternative models of generalized expected utility, highlighting different aspects of volatility; see Aizenman (1997) for the effects of Knightian uncertainty on investment and development.

2. The incidence of nationalization of foreign investment peaked around 1975, and almost vanished in the early 1980s (Kobrin, 1984).
3. That is, the consumer is indifferent between the prospect of a safe consumption μ and a risky consumption c_s in n states of nature ($s = 1, \ldots n$).
4. Note that the conventional risk premium is second-order – it is proportional to the variance. See Segal and Spivak (1990) for a definition of a first-order risk premium in a general context.
5. Figure 8.1 is drawn for $\varepsilon = 0.05$. Curve *MU* is the marginal utility of consumption for $R = 2$, $\beta = 0$. Curve *AB′BEE′D* is the 'marginal utility' of consumption for $R = 2$, $\beta = 1$.
6. This follows from the fact that Equation (4) implies that:

$$u(1 - \phi) = \frac{0.5}{1 + 0.5\beta} u(1 + \varepsilon) + \frac{0.5(1 + \beta)}{1 + 0.5\beta} u(1 - \varepsilon) =$$

$$u(1) + \frac{0.5}{1 + 0.5\beta} [u(1 + \varepsilon) - u(1)] + \frac{0.5(1 + \beta)}{1 + 0.5\beta} [u(1 - \varepsilon) - u(1)] \cong.$$

$$u(1) + 0.5\left[\left\{1 - \frac{0.5\beta}{1 + 0.5\beta}\right\} u'(1)\varepsilon + \left\{1 + \frac{0.5\beta}{1 + 0.5\beta}\right\} u'(1)(-\varepsilon)\right]$$

7. Equation (6) follows the Dixit and Stiglitz (1977) and Ethier (1982) specification of a constant elasticity of substitution aggregator. A more general version of it is:

$$Z = [L]^{1-\alpha} \left\{\sum_{i=1}^{N} [x_i]^\gamma\right\}^{\alpha/\gamma}$$

   where the elasticity of substitution among the various capital goods is $1/(1 - \gamma)$. Equation (6) is obtained by setting $\gamma = \alpha$. For other applications of this specification in models with an endogenous number of activities, see Grossman and Helpman (1991) and Rivera-Batiz and Romer (1991).
8. The assumption that all the capital goods are produced by multinationals simplifies the aggregation and the presentation. The key results of our analysis hold for the more general case, where some of the capital goods are produced domestically.
9. This cost may reflect the cost of infrastructure needed to use the new capital good.
10. We approximate the right-hand side of (11) around Z_0, and the left-hand side of Equation (11) around Z_1.
11. Note that the existence of a risk-free bond yielding r implies that $(1 + r)\,\frac{u'(Z_1)}{1 + \rho} = u'(Z_0)$. Equation (12′) is obtained by applying this condition to Equation (12).
12. If the cost of public funds used to pay the subsidy is zero (that is, with lump-sum subsidies), the optimal subsidy rate is $0.5\,(1 - \alpha)/\alpha$.
13. See Olson (1965), Krueger (1974), Bhagwati (1988) and De Soto (1989) for further discussion on the political economy of pressure groups.
14. For example, suppose that the future tax rate fluctuates between 0 and

0.2, with probability 0.5 (hence $\varepsilon = \delta_0 = 0.1$), where $\beta = 1$, $\lambda = 0.5$, $\alpha = 0.5$, $\varphi = 2$. The optimal subsidy is approximately 47 per cent. If the standard deviation of the future tax rate doubles ($\varepsilon = 0.2$), the subsidy increases to 55 per cent.

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