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by

John M. Litwack and Yingyi Qian
Stanford University

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Center for Economic Policy Research
Stanford University
Stanford, CA  94305
(415) 725-1874

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Special Economic Zones as Catalysts for Transition

John M. Litwack and Yingyi Qian

Department of Economics
Stanford University
Stanford, CA 94305-6072

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One of the early strategic decisions in Chinese reform was the establishment of several special economic zones. These areas received both relatively high levels of investment and favorable tax treatment. We interpret this strategy as an appropriate response to two critical problems facing the reformers at that time: (1) A limited ability to commit due to the lack of institutions to constrain the state from expropriation, and (2) a political constraint to meet significant basic requirements in social policy. The interaction between these two problems can cause the economy to be caught in a low-equilibrium trap if limited resources are spread too thinly. By concentrating resources in special economic zones, this trap might be avoided in at least some areas of the economy, which could also eventually generate important spillover effects elsewhere. Thus, in the presence of important commitment and political problems, special economic zones can serve as catalysts for transition, despite of the resulting (inefficient) diversion of resources and growth in regional inequality.
Special Economic Zones as Catalysts for Transition

1. Introduction

One of the strategic decisions made in the early stage of Chinese reforms was the establishment of several special economic zones.¹ These areas gained considerable autonomy, received relatively high levels of resources, and enjoyed preferential tax treatment. Policy strategies that focus on special economic zones to promote economic transition and development remains highly controversial, however. Important potential drawbacks of such a strategy include an inefficient diversion of resources, increased regional inequality, and the possibility that other lagging regions or sectors could obstruct the process of economic development as a whole.

This paper builds a positive theory of special economic zones that derives from the consideration of a few problems in China and some other transition economies that have been neglected in most debates on this subject: (1) The lack of institutions to constrain the state from expropriation, and (2) a political constraint to service basic social expenditures for a large segment of the population. The combination of these two constraints represents a central dilemma of economic transition. The latter constraint implies significant needs in tax revenue during the transition period. But, if high taxes are associated with substantial tax evasion and low profits due to depressed incentives and the absence of developed fiscal institutions, the state will find itself pressured to increase taxes still further ex-post, depressing incentives even more. Consequently, many transition economies today, such as Russia, Ukraine, and Bulgaria, appear in a sort of trap of continual budgetary pressures, high and unstable taxation, significant tax evasion, and low incentives for investment in the economy as a whole.²

¹ In this paper "special economic zones" refers to all the areas in China that enjoyed special treatment in investment and taxes in the early 1980s; this definition is broader than that used by the Chinese.

² Thus, the economies in transition face a particularly acute form of the common dilemma in the history of economic development, as summarized by Barry Weingast (1995): "The need for immediate revenue during a crisis implies that taxes will be raised or regulatory policies changed in a way that inevitably burdens those firms or sectors of the economy that have been most successful. This in turn has a critical feedback effect.
In our model, strategic complementarities (Cooper and John, 1988, Milgrom and Roberts, 1990) between firms, regions, or other economic organizations can arise as follows: If most units restructure and submit taxes, the government will procure enough revenue to be able to satisfy the political constraint and not increase taxes ex post with high probability. On the other hand, if only a few units restructure and the rest do not, revenue will be so low that the government will succumb to pressure and increase tax rates with high probability. In this situation, multiple equilibria can exist in general, and the prospect of a bad equilibrium trap emerges.  

This problem, however, is not independent of policies that affect the allocation of investment in the economy. This involves not only resources for direct state investment, which remains important during the transition period, but policies that affect the allocation of private domestic and foreign investment. By creating special economic zones, which receive a high concentration of infrastructural investments that are complementary to local efforts in restructuring, the bad equilibrium trap described above can potentially be avoided. The advantage of investment relative to tax incentives in this context is its relatively irreversible nature, which can support commitment. At the same time, special tax treatment for economic zones can also be important supporting policy in these circumstances, even if commitment is imperfect. This raises the possibility that an optimal transition strategy might coordinate its investment policies with fiscal policies to strengthen economic incentives when commitment is difficult. A special economic zone is precisely one type of such coordination.  

In our model, a U-shaped relationship emerges between commitment power by the government and the effectiveness of special economic zones. A balanced investment strategy (absence

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Because the possibility of confiscation during hard times is known in advance, entrepreneurs and potential investors facing this risk will discount the potential returns from their investment by the probability they will be diminished in a future crisis.  

3 Kornai (1995) discusses "transformational recession." Multiple equilibria and coordination failure are also features of the models of privatization by Laban and Wolf (1993) and Roland and Verdier (1994).

4 There are possible other considerations for establishment of special economic zones such as the need of learning through experimentation, see, for example, Qian and Xu (1993).
of special zones) will be optimal if the commitment power of the government is either very strong or very weak. In the former case, special economic zones are not needed to strengthen fiscal policy. In the latter case, investment resources are not sufficient to strengthen fiscal policy enough to eliminate the potential for coordination failure. Special economic zones can be optimal in the intermediate case, particularly if there is a high degree of complementarity between resources sensitive to state investment policies and local restructuring efforts, and the attitudes of the population are pessimistic. In certain circumstances, due to spill-over effects, it may even be possible to convert a bad equilibrium trap into a unique equilibrium with global restructuring. But such an equilibrium will still remain "second best" as the ex post allocation of investment will be distorted due to the presence of the special economic zones.

We further identify two qualitatively different types of special economic zones, the relative expedience of which depends on particular circumstances. A type-1 strategy combines high investment with very low taxes in order to maximize the incentive effect in special areas of the economy. A type-2 strategy combines high investment with significant taxation in special areas to exploit spill-over effects into the rest of the economy. We derive results to identify when one of these two types of strategies might be optimal.

Our theory seems to fit well with the Chinese experience with special economic zones. In the 1980s, domestic and most foreign investment was concentrated in special economic zones and areas which also received special tax treatment. Only in the 1990s, as the population becomes more optimistic about the reform, a more balanced strategy of investment between coastal and inland areas is being adopted. Viewed in isolation, special economic zones induce inefficient resource diversion and regional disparity. As our theory indicates, however, this may be a necessary price to pay for escaping a bad equilibrium trap. As special economic zones can potentially reduce the costs of the institutional and political constraints, they can be viewed as catalysts for transition.

Although our paper addresses somewhat different issues, it is, nevertheless, related to the classical debate in economic development concerning the relative efficacy of "balanced" as opposed to "leading sector" investment strategies (Rosenstein-Rodan (1943), Nurkse (1953), and Scitovsky
(1954), Hirschman (1958) and Murphy, Shleifer, and Vishny (1989)). Although these theories also emphasize interdependencies and complementarities between sectors, they are all based on considerations associated with technology. In contrast, in the context of this paper, we deliberately avoid issues associated with heterogeneity between regions or sectors, basing our theory instead on institutional and political constraints to successful economic transition. The goal of our paper is to provide a positive theory of special economic zones deriving from these considerations alone. The integration of our theory with the concerns of the classical literature, such as heterogeneity in endowments, and increasing returns to scale, will be a project for future research.

The paper is organized as follows. Section 2 introduces the model. Section 3 studies balanced investment. Section 4 analyzes the role of special economic zones, including type-1 and type-2 strategies. Section 5 examines the experiences of China. Section 6 comments on the conditions in Russia and Eastern Europe in the context of the presented theory.

2. The Model

We model firms in the economy on a [0,1] continuum and assume that they are identical. A "firm" in our model represents a (state or private) unit with genuine restructuring or start-up potential. Other firms with no such potential only make themselves felt through the political constraint considered below. The absence of heterogeneity among firms or increasing returns to scale serves to rule out other reasons than those considered in this paper as to why a special economic zones, involving unbalanced investment, might be optimal.

The government distributes a fixed amount of investment, I, among these firms. If \( I_i \) is the investment received by firm \( i \), then the constraint of the government is \( \sum I_i = I \).\(^5\) The government also chooses a planned tax scheme that links tax obligations to the output of an individual firm: \( t(y) \).

\(^5\) This particularly simple investment constraint and distribution could be augmented, for example, with a set of policies that affect the distribution of foreign investment in the economy. Although such a model would involve more complications, the basic message and results would be the same. Certainly, an important practical consideration might be to choose areas for special zones that are relative attractive to foreign investors for various reasons.
For the present, we assume that the government sets tax rates only as a function of output and not of the index of firms. As will be demonstrated, this assumption has no effect on the primary conclusions of this paper. Given the investment strategy and tax rates announced by the government, each individual firm chooses whether or not to restructure (or provide start-up investment). No restructuring leads to low net revenue (output) $y \geq 0$ and restructuring leads to higher net revenue (output) $> y$. We adapt the notation $t(y) = \bar{t}$, and $t(\bar{y}) = \check{t}$, and assume $0 \leq \check{t} \leq y$, and $0 \leq \bar{t} \leq \bar{y}$.

The political constraint is modelled as a reduced form representation of various groups lobbying for welfare support and other state expenditures (defense, administration, etc.), which we refer to as the "social safety net."\textsuperscript{6} The government channels all initial tax revenue $\int t(y)\,dy$ into the social safety net to reduce the social pressure. After receiving the amount $\int t(y)\,dy$, the social groups pressure the government to increase subsidies through increased taxation. An important assumption is that the degree of social pressure is decreasing in social contributions by the state. We also assume, for simplicity, that funds for initial investment, $I$, are in a separate account and cannot be transferred to the social safety net.\textsuperscript{7}

Institutional imperfection in the model is reflected in a limited degree of commitment of the government to uphold the chosen tax schemes, as opposed to adjusting taxes upward ex post.\textsuperscript{8} In the event that the government is able to uphold its commitment, firms receive the difference between revenue $y$ and planned taxes $t(y)$. If not, all revenue $y$ is confiscated by the government. We model the commitment ability of the government as a probability, $\rho$, that the government will be able to resist the pressure and uphold its initial fiscal commitment to a tax scheme. $\rho$ is assumed to be an increasing (and continuous) function in initial tax revenue, $\int t(y)\,dy$, which captures the idea that the government's ability to commitment increases with the amount of revenue it collects.

\textsuperscript{6} Roland (1994) emphasized the importance of political constraints in transition strategies and Gordon and Li (1996) discussed the government's distributional concerns in the context of China's reforms.

\textsuperscript{7} If the government could commit part or all of the investment funds to the safety net in order to increase the probability of upholding commitment, our main results continue to hold with small modifications.

\textsuperscript{8} This kind of lack of commitment by the government has been extensively discussed, for example, Kornai (1986) and Litwack (1990).
The sequence of the game is as follows:

\[
\{I_i\} \quad (\tilde{y}, y) \quad \int t(y_i) \quad \rho \quad (\pi_n, \pi_g)
\]

investment tax schemes restructuring tax collection confiscation resistance payoffs

The above structure defines the expected payoffs of the firms and the government. If \(C(y_i, I_i)\) is the cost function for firm \(i\), given the allocated investment \(I_i\), the expected payoff to firm \(i\) is:

\[
\pi_n = \rho(\int t(y_i)) \left[ y_i - t(y_i) \right] - C(y_i, I_i)
\]  

(1)

The payoff to the government is the social surplus, which puts equal weight on consumer and producer surplus:

\[
\pi_g = \int (y_i - C(y_i, I_i)) \, di
\]

(2)

By this formulation, the government has no other motive in generating tax revenue than to resist the pressure from the social groups. In the extreme case that the government had full commitment power at all levels of social contribution (\(\rho = 1\)), the government could optimize by setting taxes at zero. This treatment keeps the problem analyzed in this paper separate from other distributional issues which, given our assumption of complete information, would not propose any additional problems.

Without a loss of generality, we order firms by index \(i\) according to the amount of investment that they receive, i.e. the smaller the index, the higher the investment. We can therefore limit the government to the consideration of \(I_i\) schemes that are non-increasing in \(i\). We denote \(C(\tilde{y}, I_i)\) as \(C(I_i)\), which is decreasing and convex in \(I_i\). To simplify our analysis, we assume that \(C(y, I_i)\) is
independent from \( I \), and is normalized to 0.\textsuperscript{9} It is also assumed that restructuring is always efficient in the sense that \( \tilde{y} - C(I) \geq y, \forall I \geq 0. \)

In this game, any given choice of \( \{I, \tilde{t}, t\} \) by the government defines a continuation game in a simultaneous choice by firms of whether or not to restructure. A pure strategy Nash equilibrium of this continuation game, which we will refer to as a "continuation equilibrium," is a strategy profile \( \{y_i=\tilde{y}, \text{ for } i < \alpha \text{ and } y_i = y \text{ for } i > \alpha\}, \alpha \in [0,1] \), such that:

\[
\rho(\alpha \tilde{t} + (1-\alpha)t)[\tilde{y} - y - (\tilde{t} - t)] \geq C(I) \text{ for all } i < \alpha; \tag{3a}
\]

\[
\rho(\alpha \tilde{t} + (1-\alpha)t)[\tilde{y} - y - (\tilde{t} - t)] \leq C(I) \text{ for all } i > \alpha. \tag{3b}
\]

**Proposition 1:** If \( I \) is a continuous (non-increasing) function of \( i \) and \( \rho \) is a continuous and decreasing function of \( t \), then for any given \( \{I, \tilde{t}, t\} \) there exists a continuation equilibrium in pure strategies. Furthermore, if the tax schedule is decreasing \( (\tilde{t} < t) \), the continuation game features strategic substitutes and there exists a unique continuation equilibrium. If the tax schedule in increasing \( (\tilde{t} > t) \), the continuation game features strategic complementarity and there may exist multiple continuation equilibria.

Proposition 1 indicates the government can always eliminate strategic complementarities, and the potential for coordination failure, by offering a tax schedule that is decreasing in output. The reason for this follows directly from the nature of the objective function of a firm, (1). Since \( \rho \) is an increasing function, the perceived benefits from restructuring for a single firm will be increasing or decreasing in the restructuring decisions of other firms, depending on whether \( t(y) \) is an increasing or

\[\text{We have performed the entire analysis under the assumption that } C(y, I) \text{ is also decreasing and convex in } I, \text{ and obtained slightly modified, but more complicated, conditions for the optimality of balanced or unbalanced investment strategies. As long as we maintain the condition that restructuring and investment are complements, it will still be optimal to reallocate investment to restructuring firms at the margin as a deviation from balanced investment. If the reallocation of investment to make (5) on page 11 hold is very large, however, then second-order cost effects could potentially change the relative optimality of various investment policies. The corresponding necessary and sufficient conditions are included in an earlier version of this paper, and can be made available from the authors on request.}\]
decreasing function. Thus, an interesting feature of this game is that the government can choose whether or not to create strategic substitutes or complements among the firms.

We will refer to an equilibrium for a given allocation of investment, \{I_i\}, as a strategy profile \{\tilde{t}, \tilde{t}^*; y(\tilde{t}, \tilde{t})\} such that, (a) \{y(\tilde{t}, \tilde{t})\} is a continuation equilibrium for any given \(\tilde{t}, \tilde{t}\), and, (b), \((\tilde{t}^*, \tilde{t}^*)\) maximizes the government’s payoff \(\pi_g\), given \{y(\tilde{t}, \tilde{t})\}. Thus, an equilibrium involves both strategies by the firms that choose a continuation equilibrium for any chosen tax scheme, and tax scheme chosen to maximize the government’s payoff, given these strategies.

3. Equilibrium Under the Balanced Investment Strategy

We first consider possible equilibria under the "balanced investment" strategy \((I_i = I \forall i, \text{absence of special economic zones})\). Three distinct cases are possible, depending on both the absolute commitment power of the government and the degree to which that commitment power is increasing in tax revenue. An equilibrium is regarded as unique if it features identical outputs and expected payoffs for the government and the firms.

**Proposition 2:** Under balanced investment:

Case 1) If there exists a \(\tilde{t}^* \leq y\), with \(\rho(t')[\tilde{y} - \tilde{t}'] > C(I)\) (strong government commitment power at all levels of revenue), then there exists a unique equilibrium in which every firm restructures \((y_i = \bar{y} \forall i)\).

Case 2) If there exists a \(\tilde{t}^* > y\), but not a \(\tilde{t}^* \leq y\) with \(\rho(t')[\tilde{y} - \tilde{t}'] \geq C(I)\) (weak commitment power at low revenue but strong commitment power at high revenue), then there exists an equilibrium such that every firm restructures \((y_i = \bar{y} \forall i)\). There also exists at least one other equilibrium such that only a proportion \(\alpha\) of firms restructure and a proportion \((1-\alpha)\) do not where \(\alpha < 1\).

Case 3) If there does not exist a \(\tilde{t}^*\) with \(\rho(t')[\tilde{y} - \tilde{t}'] \geq C(I)\) (weak commitment power at all levels of revenue), then there exists a unique equilibrium in which a proportion \(\alpha\) firms restructure and a proportion \((1-\alpha)\) firms do not where \(\alpha < 1\).

Furthermore, in case (1) and (2), there exists an equilibrium in which no firm restructures \((y_i = y \forall i)\) if and only if \(\rho(y) \bar{y} \leq C(I)\).
Case 1 corresponds to strong government commitment power, even at low levels of revenue. Full commitment, or $\rho(t) = 1 \forall t$, is an extreme example of this case. The government can always set $t = y$ to guarantee a maximum amount of revenue, and thus a minimum amount of social pressure if firms produce $y$. The condition of case 1 indicates that there exists a non-increasing tax schedule, $\{\tilde{t} = t^*, \tilde{t} = y\}$, such that, at an equal allocation of investment, social pressure is low enough that every firm can be guaranteed a positive marginal expected gain from restructuring. The declining tax schedule eliminates strategic complementarities, and thus potential for multiple equilibrium, and restructuring can be made a dominant strategy for every firm in the continuation game. Notice that this condition is quite restrictive, since the government is actually procuring less revenue at $t^*$ from a restructuring equilibrium than in the case that no firms are restructuring.

Case 2 corresponds to the situation where the probability that the government will uphold its fiscal commitment is low at low levels of revenue, but high at high levels of revenue. That is, $\rho$ is very responsive to social pressure and significantly increasing in government revenue. In order for $y_i = \breve{y}, \forall i$ to be incentive-compatible, the government must generate tax revenue above what is possible at low output, $y$. The fact that there exists a $t^* \geq y$, that satisfies the above inequality implies that such a "good equilibrium," where all firms are restructuring, does indeed exist. But such a tax scheme will induce restructuring only in the case that expectations of firms are "optimistic" concerning the behavior of other firms. Due to strategic complementarities from an increasing $\rho$, multiple continuation equilibria will always exist in case 2 under balanced investment.

The final case 3 corresponds to the situation where $\rho$ is small at all levels of revenue. As in case 1, equilibrium here will always be unique. But $y_i = \bar{y} \forall i$ will no longer be an equilibrium. In case 3, as in case 2, the condition $\rho(y)\bar{y} \leq C(I)$, indicating particularly weak commitment ability at revenue, $y$, is necessary and sufficient for the existence of an equilibrium where no firm restructures.

Therefore, under the balanced investment strategy, either very significant or very insignificant absolute commitment power will lead to a unique equilibrium. If commitment power is significant at high levels of revenue and insignificant at low levels of revenue, there will exist multiple equilibria, the set of which always includes $y_i = \bar{y} \forall i$. 
To what degree can the government solve this problem through differentiating tax rates among enterprises, without reallocating investment? In practice, of course, different regions or different sectors of the economy often operate under different tax schedules. The following proposition indicates that, as long as investment remains balanced, differentiated fiscal instruments alone will be insufficient to solve the problems suggested by cases 2 and 3 above:

**Proposition 3:** Suppose the game is altered such that the government, after choosing a balanced investment allocation, can partition the firms into n subintervals \( \{\gamma_j\} \) (\( j=1, \ldots, n \)) and choose a separate tax scheme \((\bar{t}_j, t_j)\) for each interval \( j \). Then Proposition 2 remains valid.

Figures 1, 2, and 3 illustrate the three possible cases under balanced investment for \( \rho(t) = a + bt, \bar{y}=1, \bar{y}=0 \), where \( a>0, b>0 \), and \( a+b \leq 1 \). This requires \( t = 0 \) and \( 0 \leq \bar{t} \leq 1 \). Define \( h(\alpha) \) as the marginal benefit that a firm will receive from restructuring as opposed to not restructuring, given a fraction \( \alpha \) firms restructure. Then

\[
h(\alpha) = \rho(\alpha \bar{t} + (1-\alpha)\bar{y}) = (a+b\alpha)(1-\bar{t}).
\]

(4)

A given firm will have an incentive to restructure, given a share \( \alpha \) of firms is restructuring, if and only if \( h(\alpha) \geq C(I) \).

4. **The Role of Special Economic Zones**

We now turn to the question of when creation of special economic zones in which the government allocates investment unequally among the firms, is superior or inferior to a balanced investment strategy. The first simple result states that, as long as the government has significant commitment power even at low levels of revenue, balanced investment always dominates any unbalanced strategy. This is because, by Proposition 2, a balanced investment allocation will generate a unique equilibrium in which \( y_i = \bar{y} \forall i \). By the assumed strict convexity of \( C(I) \) in \( I \), any other
investment strategy would generate a strictly lower social payoff, regardless of the induced continuation equilibrium.

**Proposition 4:** In case 1 of Proposition 2, a balanced investment strategy \((I_i = I \lor i)\) yields a strictly higher social surplus (government payoff) than any unbalanced investment strategy.

For the case of potential multiple equilibria, we define notions of "optimistic" and "pessimistic" equilibrium selection:

**Definition 1:** An equilibrium under optimistic (pessimistic) selection for a given investment profile, \(\{I_i\}\), corresponds to strategies by the firms, \(\{y_i(I, i)\}\), that select the continuation equilibrium that maximizes (minimizes) the social surplus (government payoff) for any given \((I, i)\).

Optimistic and pessimistic selection coincide only if all continuation equilibria generate an identical social surplus. This will of course be true when continuation equilibrium is unique.

**Proposition 5:** In case 2 of Proposition 2:

(a) under optimistic equilibrium selection, balanced investment always leads to a strictly greater social surplus than unbalanced investment.

(b) under pessimistic selection, a necessary and sufficient condition for the existence of an unbalanced investment strategy that generates a higher social surplus (government payoff) than balanced investment is:

\[
\text{there exists } I^* > 0, \text{ such that } \rho(y)\bar{y} > C(I^*).
\] (5)

Part (a) of Proposition 5 holds since, under optimistic selection, the government can induce an efficient equilibrium, where all firms are restructuring and investment is equally allocated, which parallels case 1. Under pessimistic selection, however, unbalanced investment may be optimal. The
condition in (5) will hold if either $\rho$ is not too low in the event that firms do not restructure, or if the effect of additional investment on the costs of restructuring is significant enough. This condition can be interpreted as follows: There exists an investment level $I^*$, such that, if the government gives $I^*$ to a small subset of firms in special economic zones, together with a commitment of a low tax, $\bar{\tau} = 0$, restructuring will become a dominant strategy for these firms. These firms will restructure independently of the strategies of other firms. If such an $I^*$ exists, such a strategy for the government will dominate any strategy of balanced investment in case 2 under pessimistic selection.

**Proposition 6:** In case 3 of Proposition 2, (5) is a necessary and sufficient condition for the existence of an unbalanced investment strategy that generates a (unique) equilibrium that gives a strictly greater social surplus than the (unique) equilibrium under balanced investment.

It turns out that, in case 3, the government can also use a special economic zones strategy to improve incentives and realize a better equilibrium in the event that (5) is satisfied. Here, however, the government is not using the strategy to combat coordination failure as in case 2. As will be seen, the scope for the effectiveness of the strategy is enhanced in the event that $\rho$ is a rapidly increasing function.

Our results demonstrate an interesting U-shaped relationship between commitment power by the government and the effectiveness of unbalanced investment strategies. An unbalanced investment strategy will not be optimal in the case that commitment power is very strong (case 1) and in the case that it is very weak (case 3 without condition 5). In the former case, fiscal policy alone is enough to generate global incentives to restructure. In the latter case, fiscal policy is so weak, or investment opportunities are so weak, that even the two policy tools together are not sufficient to prevent a globally bad equilibrium.

To further our analysis, we distinguish between two qualitatively different types of unbalanced investment strategies (i.e., special economic zones) for the government. The first type involves a decreasing tax schedule, i.e., a low tax for restructuring firms. This combines preferential investment
with low taxes to provide as strong as possible an incentive for restructuring for those firms in special economic zones. We refer to this type strategy as a "type-1 strategy". The declining tax schedule, by Proposition 1, eliminates the strategic complementarities and generates a unique equilibrium. The role of the unbalanced investment is to lower the marginal costs of restructuring for some fraction of firms in order to induce them, and only them, to restructure. This may eliminate the bad equilibrium trap under balanced investment with pessimistic selection, as illustrated in Figure 4. However, $\alpha = 1$ (all firms restructure) cannot be an equilibrium under a type-1 unbalanced investment strategy with pessimistic selection because total investment resources are too limited.

A second type of unbalanced investment strategy involves an increasing tax schedule, which will be referred to as a "type-2 strategy." In this type of strategy, because $h(\alpha)$ is increasing, we have strategic complementarities and positive spillovers. The government jumps start the economy by exploiting the positive spillover effects. Firms with larger investments and lower marginal costs restructure, produce high output, and generate revenue that reduces social pressure, which in turn increases the incentive for some other firms with lower investment to follow suit. In the language of game theory, this second type of investment strategy works on the iterative elimination of dominated strategies. A small subset of firms in special economic zones is given very high investment to make restructuring a dominant strategy even at the high tax rate. The spillover effect from the implied additional tax revenue allows the government to make restructuring a best response for another subset of firms outside the special economic zones, even with a lower level of investment, and so forth.

As illustrated in Figures 5 and 6, as a result of high investment, restructuring is a dominant strategy for the first fraction $f_1$ firms. However, given that the first fraction $f_1$ firms restructure, the next $(f_2 - f_1)$ fraction firms also have incentives to restructure. This is because tax revenues generated from the first $f_1$ firms are high enough to significantly increase the probability that the government will maintain its fiscal commitment, which provides an additional incentive for the next $(f_2 - f_1)$ fraction firms. This process continues inductively and leads to an equilibrium where some fraction $\alpha > 0$ of firms restructure. But since $C(I)$ is strictly convex, even the equilibrium in which all firms restructure is still not "first best," as the allocation of investment will be ex-post suboptimal.
In what follows, we analyze the relative advantages of the optimal type-1 and type-2 unbalanced investment strategies (without differentiating tax rates among firms). First we note that, for both incentive and tax revenue purposes, it is always optimal for the government to set \( t = y \). Given this, a type-2 strategy is feasible under a smaller set of parameter values than a type-1 strategy. To make restructuring a dominant strategy for a subset of firms at some high tax rate \( \tilde{t} > t = y \geq 0 \), condition (5) would have to be satisfied with \( \rho(y)\tilde{y} > C(I^+) \) replaced by \( \rho(y)[\tilde{y} - \tilde{I}] > C(I^+) \). The latter is generally a strictly stronger condition, except for the case of \( y = 0 \).

For the next result, we will assume for simplicity that \( y = 0 \) and \( C = 1/(1+I) \). This makes both type-1 and type-2 strategies feasible and allows us to concentrate on optimality. In addition, we will represent \( \rho(t) = a + bt \) (where \( a,b > 0 \) and \( a + b \leq 1 \)). This allows the interpretation of \( a \) as a measure of "absolute commitment power" by the government that does not depend on social pressure, and thus revenue. "b," on the other hand, measures how responsive commitment power is to revenue. We will refer to this as "variable commitment power." Since \( y = 0 \) in this case, \( t = 0 \). A type-1 strategy combines unbalanced investment with \( \tilde{I} = \tilde{I} = 0 \), while a type-2 strategy employs unbalanced investment with \( \tilde{t} > 0 = \tilde{t} \).

**Proposition 7:** In the case of \( \tilde{y} = 1, y = 0 \), and \( \rho(t) = a + bt \) (where \( a > 0, b > 0 \) and \( a + b \leq 1 \), and \( C(I) = 1/(1+I) \), under pessimistic selection:

(a) If \( a > C(I) \), there exists a unique equilibrium under which investment is balanced and all firms restructure (\( \alpha = 1 \)).

(b) If \( b \leq a \leq C(I) \), a type-1 unbalanced investment strategy is optimal, featuring \( t = 0 \) and unbalanced investment concentrated in an interval \( [0, \alpha] \) where \( \alpha < 1 \).

(c) For any \( b > 0 \), there exists an \( a^* \) such that if \( a < a^* \), there exists a range of investment resources, \( (I(a), I(a)) \), such that a type-2 unbalanced investment strategy is optimal for a and \( I \in (I(a), I(a)) \) (\( t > 0 \) and unbalanced investment). Furthermore there exist values of I in this interval that support complete restructuring (\( \alpha = 1 \)) in equilibrium.
In Proposition 7, (a) corresponds to the case of Proposition 2, case 1, and Proposition 5. Absolute commitment power is high enough and costs at balanced investment are low enough to support a unique efficient equilibrium with global restructuring. In the case of (b), absolute commitment power at low (0) revenue is not great enough to support such a unique equilibrium, but variable commitment power is also weak, implying that the spillover effect of a type-2 strategy will be weak. The interpretation of (c) is as follows: First, variable commitment power is strong relative to absolute commitment power. This implies that the a; associated with a type-1 strategy is likely to be very low due to a low probability of commitment at low revenue, and that the spillover effect from a type-2 strategy is relatively large. But this spillover effect cannot be exploited unless investment resources are large enough to create a "revenue zone," where incentives for restructuring are strong despite both high taxes and low commitment probability. This consideration leads to the lower bound on investment resources, f(a). The upper bound, F(a) comes from the simple fact that, since costs asymptotically approach 0, very high I will create case (a) for any fixed a.

To summarize, when both are feasible, a type-1 strategy tends to dominate a type-2 strategy if commitment power at low revenue is very weak and not increasing significantly in revenue or initial investment resources are very modest. On the other hand, a type-2 strategy can work better than a type-1 strategy in situations where (i) government resources for investment (or ability to attract foreign investment) are relatively significant and (ii) social pressure decreases relatively quickly in tax revenue, making ρ a rapidly increasing function.

5. The Chinese Experience of Special Economic Zones

The Chinese successful experience with special economic zones and areas can be interpreted along the lines of our analysis above. In July 1979, the Chinese government decided the two southern provinces, Guangdong and Fujian, should pursue reform "one step ahead" of other regions. In 1980, China formally established four "special economic zones," Shenzhen, Zhuhai and Shantou in Guangdong, and Xiamen in Fujian. These zones and the areas of Guangdong and Fujian gained considerable autonomy (for example, in approving foreign investment projects) from the central
government and enjoyed many preferential treatments (Zhou, 1984).

During the entire decade of the 1980s, both domestic and foreign investments in these areas were very high. In the early 1980s, when foreign investments first came to China, they were concentrated in these areas, and this trend continued to the late 1980s. For example, between 1985 and 1991, foreign investment in Guangdong province accounted for more than 20% of the national total (Statistical Yearbook of Guangdong, 1992, p. 355, and previous issues). In contrast, between 1979 and 1991, the total foreign investment in Shanghai, the old industrial center of China, accounted for only 7% (Statistical Yearbook of China, 1992, p. 643, and previous issues).

Furthermore, starting in 1980 and for most of the 1980s, both Guangdong and Fujian in effect kept all revenues they produced: Guangdong delivered a fixed but very low quota of revenue to the central government, and Fujian received a fixed subsidy from the central government. As a result, for most of the 1980s, each year Guangdong province remitted only about 1 billion in tax revenues to the central government while Shanghai remitted more than 12 billion. The central government relied heavily on Shanghai for tax revenues to maintain the state budget for social expenditures.

During this period of combining high investment with low taxes, many firms in Guangdong were restructured, and many other new firms emerged. Meanwhile, firms in Shanghai and other areas generally stagnated. By 1990, Guangdong ranked number one among provincial-level regions in terms of GDP, moving up from the number four position in 1985, while Shanghai dropped from the number six position in 1985 to number ten in 1990 (Statistical Yearbook of China, 1992, p. 36).

In China, at the early stage of the reform, government commitment power was very weak, domestic and foreign investment abilities were limited, and the population was pessimistic. Our theory shows that it may be optimal to concentrate investment power and fiscal incentives into the special economic zones, which would receive both priority investments and lower taxes. China apparently followed this type 1 strategy. The result is that Guangdong restructured due to concentrated investment and low taxes on the one hand, and the government relied on the less-reformed region of Shanghai for revenue to meet political obligations and maintain social expenditures on the other. From this perspective, we can understand why regions like Shanghai
should not be given low taxes at the early stage of reform, because revenues from Shanghai are needed to resist political pressure from other parts of the country.

The situation changed somewhat in the late 1980s and early 1990s. The government continues to concentrate investment in special economic zones but relies on larger flows of revenues from those regions into the other regions of the economy. The central government started to raise less revenues from Shanghai and more tax revenues from regions like Guangdong. Tax revenue remitted from Shanghai to the central government declined from 12 billion in 1986 to about 9.5 billion each year between 1988 and 1991 (Statistical Yearbook of Shanghai, 1992, p. 53). At the same time, tax revenue remitted by Guangdong province to the central government reportedly increased more than two times between 1988 and 1991 (Qian and Stiglitz, 1996).10 Thus, in the early 1990s, China appears to move from a type-1 toward a type-2 oriented strategy. Higher tax revenue from heavily invested regions generates a positive spill-over effect and pulls up the rest of the economy, first from Guangdong to other coastal areas, then to the whole country.

In the mid-1990s, the situation changed further. Since 1993, the expectations of the population became more optimistic about the future of reform and development, and the government apparently shifted to a more balanced investment strategy. For example, the 1994 tax reform basically unified tax rates across regions and the new policies phased out preferential treatments enjoyed by the special economic zones. Also, inland areas started to receive more attention and more domestic and foreign investment. Overall, the strategy concerning coastal and inland regions becomes more balanced. Our theory predicts precisely why it should be the case.

6. Concluding Remarks: Conditions of Eastern Europe and Russia

The commitment problems and political constraints explored in this paper are also prominent in some of the former countries of the Soviet Union and Eastern Europe. After five years of economic transition in Russia, while some progress has been made in macroeconomic stabilization,

10 Although there may be exaggeration of the figures by Guangdong government officials, the trend is clear.
the economic environment still suffers greatly from high and unstable taxation, corresponding to continual adjustments of tax rules and enforcement, associated with chronic tax revenue "crises."

Firms operating in Russia face an average of about 50 different important taxes, and their combined burden is such that tax evasion is still generally considered a necessity for operating a profitable business (Makarevich, 1996). Virtually every year has witnessed a new series of decrees aimed at tapping new sources of tax revenue, including the application of new taxes retroactively. At the same time, social pressures, including a growing number of strikes in 1996, have put pressure on the expenditure side of the budget. The need for deficit-finance has driven interest rates on state securities to such high levels that commercial banks have little interest in making investment loans to the nonfinancial sector (Litwack (1996)). Despite high domestic savings rates of over 15 per cent of income, little of this savings materializes as investment as falls in investment activity in Russia continue to outpace falls in output, and the investment environment in Russia remains characterized by generally weak incentives (Litwack, 1996). In addition to high and unstable taxation, and high interest rates, which reflect budgetary problems, investment in Russia is also limited by a weak infrastructure. The slow speed of agricultural reform, for example, is linked to the poor state of roads and cold storage facilities, which decrease the expected returns on individual investments.

Thus, the problems examined in this paper, limited resources of the state, political pressures on the budget that build with decreases in state expenditures, the absence of fiscal commitment, and important complementarities between infrastructural and local investments, all exist in Russia.

The question of special economic zones has received much attention and debate in Russia in recent years, leading to a draft Law on Free Economic Zones in 1995. But this law has still yet to be passed. At the same time, the region in the East around the city of Nakhodka, and in the West around Kaliningrad have received at least temporary status as special zones, with preferential tax rates and advantages for foreign investments. Although the expediency of the creation of types of special economic zones in Russia or other European transition economies involves important issues other than those considered in this paper, we believe that a consideration of the specific factors listed in the previous paragraph should be central to any policy evaluation in this area.
Figure 1 Balanced Investment \((I_i = I): a > C(I)\)

![Diagram](image)

Figure 2 Balanced Investment \((I_i = I): a < C(I)\)

![Diagram](image)

Figure 3 Balanced Investment \((I_i = I): a < C(I)\)

![Diagram](image)
Figure 4  Unbalanced Investment ($I_i \neq I$): $\bar{t} = 0$, type 1

Figure 5  Unbalanced Investment ($I_i \neq I$): $\bar{t} > 0$, type 2

Figure 6  Unbalanced Investment ($I_i \neq I$): $\bar{t} > 0$, type 2
References


Appendix

Proof of Proposition 1: Define \( h(\alpha) = \rho(\alpha \bar{t} + (1-\alpha)t)[\bar{y} - y - (\bar{t} - t)] \) for \( \alpha \in [0,1] \). Then

(i) If \( h(1) \geq C(I_0) \), then \( h(1) \geq C(I_0) \) for all \( i \in [0,1] \), thus \( y_i = \bar{y} \) for all \( i \) is a continuation equilibrium.

(ii) If \( h(0) \leq C(I_0) \), then \( h(0) \leq C(I_0) \) for all \( i \in [0,1] \), thus \( y_i = y \) for all \( i \) is a continuation equilibrium.

(iii) If \( h(1) < C(I_0) \) but \( h(0) > C(I_0) \), by the continuity of \( h \) and \( C \), the intermediate value theorem implies the existence of an \( \alpha \in (0,1) \) such that \( h(\alpha) = C(I_0) \), thus \( \{ y_i = \bar{y} \text{ for } i < \alpha \text{ and } y_i = y \text{ for } i > \alpha \} \) is a continuation equilibrium.

Define \( g(\alpha) = h(\alpha) - C(I_0) \). If \( \bar{t} < t \), \( g(\alpha) \) is monotonically decreasing in \( \alpha \), which means that (i) (ii) and (iii) are mutually exclusive and in (ii) \( \alpha \) is unique. If \( \bar{t} > t \), \( g(\alpha) \) is increasing in \( \alpha \), multiple continuation equilibrium are possible (as in Figure 2). ■

Proof of Proposition 2: Let \( I_0 = I \). Then \( g(\alpha) = h(\alpha) - C(I) = \rho(\alpha \bar{t} + (1-\alpha)t)[\bar{y} - y - (\bar{t} - t)] - C(I) \).

Case 1: The choice of \( \{ \bar{t} = t^*, t = y \} \) gives \( g(1) > 0 \), hence \( \alpha = 1 \) is a unique continuation equilibrium. Because it maximizes the government’s payoff, the tax policy is optimal too.

Case 2: Given a tax policy \( \{ \bar{t} = t^*, t = y \} \), \( g(1) \geq 1 \), thus \( \alpha = 1 \) is a continuation equilibrium. But for this tax policy, \( g(0) \leq \rho(y)[\bar{y} - y] - C(I) < 0 \), therefore \( \alpha = 0 \) is also a continuation equilibrium. By the same argument, \( \alpha = 0 \) is a continuation equilibrium for any tax policy that satisfies \( \bar{t} \geq y \). If \( \bar{t} < y \), \( g(1) = \rho(\bar{t})[\bar{y} - \bar{t}] - C(I) < 0 \), hence \( \alpha = 1 \) is not a continuation equilibrium, and some \( \alpha < 1 \) is. Hence there exist strategies for the firms that select a continuation equilibrium in case 2 such that \( \alpha < 1 \) for all \( (\bar{t}, t) \). Equilibrium in the case of these strategies must feature \( \alpha < 1 \).

By setting tax policy \( \{ \bar{t} = 0, t = y \} \), \( g(0) = \rho(y) \bar{y} - C(I) \). If \( \rho(y) \bar{y} > C(I) \), \( \alpha = 0 \) cannot be a continuation equilibrium, and the government can guarantee a continuation equilibrium with \( \alpha > 0 \). Therefore, \( \alpha = 0 \) cannot be an equilibrium. Conversely, if \( \rho(y) \bar{y} \leq C(I) \), \( \rho \) being an increasing function implies that \( g(0) \leq 0 \) for \( (\bar{t}, t) \), or \( \alpha = 0 \) will always be a continuation equilibrium for any \( (\bar{t}, t) \). Therefore, there will exist an equilibrium with \( \alpha = 0 \).

Case 3: First, suppose \( \bar{t} \geq 1 \). Then \( g(\alpha) \) is non-decreasing. By the condition of case 3, \( g(1) < 0 \).
Therefore, \( g(\alpha) < 0 \) for all \( \alpha \). This implies that \( y_i = \bar{y} \) for all \( i \) is the only continuation equilibrium.

If \( \bar{t} < t_i \), \( g(\alpha) \) is decreasing. There will be a unique continuation equilibrium by Proposition 1. But, by the condition of case 3, \( g(1) < 0 \). Hence, it must be the case that any continuation equilibrium in case 3 features an \( \alpha < 1 \), and that equilibrium is unique. The government will induce the maximum \( \alpha \) across continuation equilibria. The final part follows an identical argument to that in the last paragraph of the proof of Case 2 above.

**Proof of Proposition 3:**

(i) Case 1 obviously remains the same as the nonindexed tax schemes that induce the unique continuation equilibrium with \( \alpha = 1 \) remain feasible in this case.

(ii) In case 2, there still must exist an equilibrium with \( \alpha = 1 \), since the same strategies and same nonindexed government tax policy will work in this case. Now consider the class of strategies for the firms such that \( y_i = \bar{y} \) for any tax scheme that features \( \bar{t}_i > \bar{y} \). As long as all other firms choose strategies from this class, no one firm would want to deviate and choose a strategy from outside of this class. Such a unilateral deviation to \( \bar{y} \) for a firm that receives \( \bar{t}_i > \bar{y} \) would give:

\[
\rho(\int \bar{t}_j + \int S' \rho(y)[\bar{y} - (\bar{t} - y)] \leq \rho(\bar{y})[\bar{y} - \bar{t}_j] - C(I) \leq 0,
\]

where \( S = \{j: y_j = \bar{y}\} \) and \( S' = \{j: y_j = \bar{y}\} \). The first inequality follows from the facts that \( t_i \leq y \ \forall i \) and by the definition of this class of strategies, \( y_j = \bar{y} \) implies that \( \bar{t}_j \leq \bar{y} \). The second inequality follows directly from the condition of case 2 and the assumption that \( \bar{t}_i > \bar{y} \). Then a straightforward application of the technique used to prove Proposition 1 demonstrates the existence of strategies in this class that choose a continuation equilibrium for any tax scheme.

But continuation equilibrium in the case of these strategies can never feature \( \alpha = 1 \), since this would give the condition that \( y_i = \bar{y} \) and \( \bar{t}_i \leq \bar{y} \ \forall i \). This would imply, for a firm in the group that receives the highest \( \bar{t}_i \):

\[
\rho(\int \bar{t}_j)[\bar{y} - (\bar{t} - \bar{t}_j)] \geq C(I).
\]

Therefore,

\[
\rho(t_i)[\bar{y} - \bar{t}_i] > C(I).
\]

But since \( \bar{t}_i \leq \bar{y} \), the last expression contradicts the condition of case 2. Therefore, this selection of
equilibrium strategies for the firms gives $\alpha < 1$ for any tax scheme. Therefore, there exists an equilibrium with these strategies in case 2 such that $\alpha < 1$. The remainder of the proof of Proposition 3 follows the proof of Proposition 2 quite closely. ■

**Proof of Proposition 5:**

(a) By Case 2 of Proposition 2, under balanced investment, there exists an equilibrium under which all firms restructure ($\alpha = 1$), which would be the equilibrium under optimistic selection. Thus, balanced investment would be optimal under optimistic selection.

(b) Suppose that the condition (5) does not hold. Then $\rho(y)\bar{y} \leq C(I^*) \forall I^*$, which means that $\alpha = 0$ is an equilibrium under any allocation of investment. Thus, given pessimistic selection, an unbalanced investment strategy cannot increase the social surplus in equilibrium.

Suppose that (5) does hold. Consider first the case that $\rho(y)\bar{y} \leq C(I)$, so that $\alpha = 0$ is the equilibrium under pessimistic selection and balanced investment. Choose $\epsilon > 0$ small enough such that $I - \epsilon I^* \geq 0$. Consider the investment policy that gives $I^*$ to a share $\epsilon$ of firms and $I - \epsilon I^* / (1 - \epsilon)$ to the remaining $1 - \epsilon$ share (a continuous investment function can approximate this arbitrarily closely). Choose a tax policy ($\bar{t} = 0$, $t = y$). Then, by (5), $\alpha = 0$ can no longer be a continuation equilibrium, since an individual firm that receives $I^*$ would have an incentive to deviate to $\bar{y}$. By Proposition 1, there will be a unique continuation equilibrium that features an $\alpha > 0$. This gives a strictly greater payoff to the government than under $\alpha = 0$ and balanced investment.

Consider next the case where $\rho(y)\bar{y} \leq C(I)$ and $\alpha > 0$ in equilibrium under balanced investment and pessimistic selection. Then it must be the case that $\bar{t} \leq t$ in equilibrium under balanced investment and continuation equilibrium is unique. This is because $\bar{t} \geq t$ would imply $g(0) \leq \rho(t)[\bar{y} - t] - C(I) < 0$, hence $\alpha = 0$ a continuation equilibrium and would be chosen under pessimistic selection.

Now choose the following unbalanced investment strategy: Set $I_i = I + \epsilon$ for $i \in [0, \alpha]$ and $I_i = I - \alpha \epsilon / (1 - \alpha)$ for $i \in [\alpha, 1]$. Then if the government chooses the same tax scheme as in the case of balanced investment, by Proposition 1, continuation equilibrium will still be unique. Furthermore, by the choice of $I_n$, the incentive-compatibility constraints for the same $\alpha$ will still be satisfied. Thus, this unique continuation equilibrium must feature the same $\alpha$. Because $C(I)$ is decreasing, this
equilibrium will feature a strictly greater social surplus. ■

Proof of Proposition 6: Repeat the arguments in the proof of Proposition 4, replacing "equilibrium under pessimistic selection" with "unique equilibrium." ■

Proof of Proposition 7: (a) Apply Proposition 4.
(b) By Propositions 5 and 6, an unbalanced investment strategy is optimal in this case. Consider a type-1 strategy $\bar{t}=\bar{t}=0$, $I_i = (1/a)-1$ for $i<\alpha$ and $I_i = 0$ for $i>\alpha$, where $\alpha=(a/(1-a))I<1$. This strategy is optimal among all type-1 strategies and gives the total social surplus $aI$. On the other hand, because $b<\alpha$, for any type-2 strategy featuring $\bar{t}>\bar{t}=0$, $dh(\alpha)/d\bar{t} = -a-b\alpha \bar{t} + b\alpha < 0$, incentives for restructuring are always weakened for all firms as compared with a type-1 strategy featuring $\bar{t}=0$ and same investment strategy. Hence, a type-2 strategy is never optimal and the optimal type-1 strategy is the optimal strategy.
(c) Assume $a<\bar{t}$ and $\bar{t}>0$. Choose $I_\alpha$ such that $C(I_\alpha) = h(\alpha)$, which implies that $I_\alpha = [1/(a+b\alpha \bar{t})(1-\bar{t})] - 1$. Under this investment strategy, firm $\alpha$ has just enough incentives to restructure provided that all firms with $i<\alpha$ restructure. Total investment resources required for supporting the restructuring of $\alpha$ firms in this way is

$$\int_0^\alpha \left( \frac{1}{(a+b\alpha \bar{t})(1-\bar{t})} \right) d\alpha - \alpha = \left( \frac{1}{(1-\bar{t})b\bar{t}} \right) \ln(1+b\alpha \bar{t}/a) - \alpha.$$

Provided that the above quantity is no more than $1$, the total social surplus is given by

$$\int_0^\alpha \left( 1-(a+b\alpha \bar{t})(1-\bar{t}) \right) d\alpha = (1-a(1-\bar{t}))\alpha - (1-\bar{t})b\bar{t}\alpha^2/2.$$

Now for any $a<1/2$, define $I(a)=1/(2a)$. The optimal type-1 strategy gives social surplus $aI(a)=1/2$. Consider the type-2 strategy defined above and under $\bar{t}=1/2$. The total investment resources required for supporting global restructuring ($\alpha=1$) is

$$(4/b) \ln(1+b/2a) - 1 = (4/b) \ln \left( 1+bI(a) \right) - 1 < I(a)$$

as $a$ becomes small. Hence the investment strategy is feasible. The total social surplus under this strategy is given by $1 - (a+b/4)/2 > 1/2$. Thus, type-2 dominates type-1. Here $\alpha=1$ under a type-2 strategy, which proves the final assertion in (c). ■


396. William Poole, "When is Inflation Low?," March 1994. This paper was presented at the CEPR conference, "Monetary Policy in a Low Inflation Regime," March 4-5, 1994.


