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***Investment Portfolio under Soft Budget: Implications for
Growth, Volatility and Savings***

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Investment Portfolio under Soft Budget:
Implications for Growth, Volatility and Savings

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Abstract: Consider an economy with a high risk and high return and a low risk and low return asset and risk-averse agents making intertemporal consumption and investment decisions. The agent will choose a savings rate to balance current and future consumptions, and an investment portfolio to balance between return and risk. A government program to insure the high risk and high return asset will lead to increased investment in the asset, which in turn leads to higher total return, total risk and total savings in the economy, even if *ex ante* the program constitutes zero expected subsidy. The agent is worse off under such a program. These results reflect on the experiences of a number of Asian economies featured by interventionist government, high savings, high growth and recent financial crisis.

- Implementing an industrial policy. Some countries have growth and development strategies resting upon the growth of certain industries or businesses. South Korea and Japan, for example, promoted big businesses to implement an export-led growth strategy. In the process of implementing their export strategies, strong ties between the government and big businesses were forged and, until very recently, the tacit understanding has been that the government will help big businesses through difficult times.¹
- Encouraging risk taking. It is said that, to encourage growth, risk-taking behavior should be encouraged. In fact, encouraging risk taking is often equated to encouraging entrepreneurship.
- Promoting a social policy. Large state-owned enterprises may be established to promote employment or national pride.² Given the importance of these large SOEs in achieving employment or other social objectives, resources from the government are often used to prevent them from going bankrupt.

Government infusion of resources into a troubled business to help it through difficult times is a form of soft-budget constraint (SBC). Kornai (1980, 199?) pioneered the study of SBC problem, drawing heavily from the experiences of centrally planned socialist economies. The reasons for and examples of SBC given above should have made

¹ As an example, consider the case of a government coordinated effort to rescue Mazda in Japan in the mid-1970s. At roughly the same time, U.S. government also helped Chrysler to avoid bankruptcy by providing a loan guarantee.

² Of course, SOEs also have been used to promote industrial policies. See Justin Lin, et al, 1996, for a discussion of SOEs and industrial policies in China. See Perkins, 1986, for a discussion and examples of using SOEs to enhance national pride.

1. Introduction.

Suppose that, in an economy, there are a few projects of high (expected) returns with a high aggregate risk and many projects of low (expected) returns with a low aggregate risk. Let us call the aggregate of these high risk projects *the* high risk and high return (HR&HR) project and the aggregate of the other projects *the* low risk and low return (LR&LR) project. It is easy to imagine that, within a broad range of the parameters, a rational, risk-averse investor would diversify her investment portfolio between the assets of these two projects, reflecting the desire for a higher return and, at the same time, to avoid excessive risks. Meanwhile, the total investment (savings) of the investor should reflect the individual's balance between current and future consumptions.

Suppose that the government introduces a program to insure against the risks of the HR&HR project, i.e., providing compensation to it in case of a bad outcome. What does such an insurance program do to the economy in terms of savings, growth and volatility? How does it affect the welfare of the investor? This paper addresses these questions.

Governments around the world provide resources to help cover business losses for various reasons. Below are a few familiar ones.

- Favoritism. In some countries, e.g., Indonesia, family members, relatives and close friends of government leaders own big businesses. Businesses with strong personal connections with powerful government leaders can typically expect resources from the government to help cover losses in cases of bad outcomes.

of the overall investment portfolio is higher and the economy becomes more volatile.

Savings is also higher, but investors are worse off.

The reason for higher volatility of the economy is that, although it reduces the risk born by an individual investor in the HR&HR project, the insurance does not alter the real distribution of the outcomes of the project. As more investment is put in the HR&HR project, there is more risk in the economy and its performance is more volatile.

The higher savings and lower welfare are due to the higher overall risk in an individual investor's portfolio, despite reduced risks in the HR&HR project under the insurance. To understand the higher overall risk in an investor's portfolio, note that the risks associated with the HR&HR project is not diversifiable, or can be "pooled". Resources used to cover their losses must come from the rest of the economy, i.e., the LR&LR project. Zero ex ante expected subsidy in the insurance program means that when an HR&HR project does poorly, LR&LR projects will be taxed to subsidize it. When an HR&HR project makes a profit, it will be taxed to subsidize LR&LR projects. This establishes a perfect correlation between the HR&HR and the LR&LR asset. The HR&HR and LR&LR assets will do poorly or well together. The reduction in the risk of HR&HR asset is completely offset by a corresponding increased risk in the LR&LR asset. Put it simply, the insurance program did not change the fact that the investor bears the full risk of the economy. And we know that total risk in the economy is higher when more investment goes into the HR&HR project. The new balance between the current and future consumption reflects increased risk in future consumption, leading to higher

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clear that SBC is not a problem confined to centrally planned economies. While reasons as why SBC exists have been fairly extensively studied,³ the implications of it for savings, growth and stability in a decentralized economy have not.⁴

The possibility of government infusion of resources to rescue a project in case of a loss should be distinguished from the more extensively studied issue of government subsidies. While, by definition, subsidy means a net transfer of resources, possible government rescue effort does not have to mean a positive net transfer of resources on average. At the same time the government promises to help in case of a loss, it can also schedule to tax the business more heavily in case it makes a profit so that the ex ante, expected net transfer of resources is zero. In such a case, SBC becomes equivalent to what is more commonly known as insurance. Our analysis will focus on such a zero-subsidy insurance scenario because it is important to understand that even a zero-subsidy program to reduce business risks have unambiguous implications for savings, growth, volatility and, eventually, welfare in an economy. As will be shown, when SBC does constitute a positive subsidy in the ex ante expected sense, as is true in many real world examples, the results obtained in the zero-subsidy case are only strengthened.

The study finds that, straightforwardly, when there is more than one investor making investment decisions, insurance against possible bad outcomes of the HR&HR project induces investors to invest more in the project. It follows that the expected return

³ Reviews of works to explain SBC can be found in Kornai (1997), DM&R. Kornai sees paternalism or favoritism as exogenous reasons to explain SBC. Industrial and social policies also fall into this categories. He calls the information-based explanations of SBC by Dewatripont and Maskin (1995) and Bai and Wang (1997) as endogenous explanations.

⁴ Kornai (1980) studies shortage as a macro phenomenon in socialist economies with SBC. See also Qian, 199?, on shortage. Dewatripont and Maskin's (1995) and Qian and Xu's (1997) work suggest the prevalence of adverse selection problems in an economy where firms are under SBC.

$$(1) \quad V_1''(\alpha) = \int u''[\alpha r_0 + (1-\alpha)R](r_0-R)^2 dF < 0,$$

i.e., V_1 is concave in α . $V_1'(1) = \int u'(r_0)(r_0-R)dF = u'(r_0)(r_0-r) < 0$. For r sufficiently close to r_0 , $V_1'(0) = \int u'(R)(r_0-R)dF > 0$. Denote the optimal α by α_1 . Then, α_1 is in $(0, 1)$ and satisfies

$$(2) \quad V_1'(\alpha_1) = \int u'[\alpha_1 r_0 + (1-\alpha_1)R](r_0-R)dF = 0.$$

Case 2: The government provides free insurance for the risky project.

Suppose the government provides insurance to the risky asset by subsidizing it when its returns are low and taxing it when its returns are high. As a result, the effective return of the risky asset to the investors is

$$\underline{R} = \begin{cases} R_1 & \text{if } R < R_1, \\ R & \text{if } R_1 \leq R \leq R_2, \\ R_2 & \text{if } R > R_2. \end{cases}$$

We assume that the government does not subsidize the risky asset on average; i.e., the mean of \underline{R} is the same as the mean of R . Furthermore, when the government needs to subsidize the risky asset, it taxes the return to the riskfree asset, and when the government taxes the risky asset, it distributes the tax revenue among investors of the riskfree asset.

In this case, an agent bases her choice of α on her expectation of other agents' choice. Since all agents are identical, the agent's expectation is rational if and only if her optimal choice coincides with her expectation of other agents' choice. Then, her choice is the equilibrium, which we denote by α_2 .

savings. Because the original risk-return combination is optimal, a higher total risk means the investor is worse off.

2. The basic model

Consider an economy with many identical agents, each having \$1 to invest.

Suppose there are two types of assets, an LR&LR asset with a certain rate of return r_0 and an HR&HR asset with a random rate of return R . Suppose that R has mean value $r > r_0$ and the probability distribution function $F(R)$.

Assume that agents are risk averse and have the same utility function $u(w)$, with $u' > 0$ and $u'' < 0$. Each agent chooses the allocation of her investment between the two assets to

Maximize $u(w)$, subject to: total investment is \$1.
 α

where α is the share of the LR&LR asset.

Without government intervention, the agent's wealth at the end of the investment period is

$$w_1 = \alpha r_0 + (1-\alpha)R,$$

and her expected utility is

$$V_1(\alpha) = \int u[\alpha r_0 + (1-\alpha)R]dF.$$

Differentiate V_1 with respect to α . We have

$$V_1'(\alpha) = \int u'[\alpha r_0 + (1-\alpha)R](r_0-R)dF$$

and

for all α in $(0, 1)$. Given the second order condition (1) and comparing equilibrium conditions (2) and (3), we have $\alpha_2 < \alpha_1$, that is, although the government intervention does not give net subsidy to the risky asset, it still increases the equilibrium allocation of investment to the risky asset.

The intuition for this result is as follows. As an investor increases her investment in the risky project, she increases the volatility of the tax. Since she does not internalize the effect of her decision on the risk borne by other agents, she invests more in the risky project than what is socially optimal.

Before we conclude this section, we compare ex ante subsidy and ex post subsidy. With ex ante subsidy, the government gives the investor s for every dollar invested in the risky asset. With ex post subsidy, the government subsidizes the risky asset when its returns are low, so that the investor's effective return becomes R_1 when $R < R_1$ and remains R otherwise. We assume that in both cases, the subsidy is financed by a tax on the riskfree asset and that the expected value of the ex post subsidy is the same as the ex ante subsidy, i.e., $s = E\{R_1 - R \mid R < R_1\} \text{Prob}\{R < R_1\}$. In this case, we can show that the equilibrium level of α is lower with ex post subsidy than with ex ante subsidy, and in both cases of subsidy, the equilibrium level of α is lower than that without any subsidy.

3. The effect of government intervention on savings.

[To be supplied.]