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Moral Hazard, Effort Sensitivity and Compensation in Asset-Backed Securitization

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Abstract One interesting explanation for asset securitization is the managerial agency theory—where securitization of cash flows that are relatively insensitive to managerial effort reduces the noise for cash flows that are sensitive to managerial effort (Iacobucci and Winter, 2005). This paper extends this concept in several ways. First, we differentiate the effects of noise and effort sensitivity on managerial effort and compensation, underscoring the importance of a less noisy environment. We also carefully delineate the conditions under which asset securitization would improve the welfare of managers and shareholders of the originating company. Second, we relax the assumptions regarding the expected income-producing function and the income variance, and further take into consideration the change of the marginal production of income with respect to effort before and after securitization. Third, under a multitask principal-agent model framework, we explore how the relationship between managerial activities on different assets affects the incentive compensation for the manager of the originating company and the joint surplus for shareholder and manager. This is particularly relevant when entire buildings are securitized as opposed to pools of income-generating assets. Finally, we examine the role of the third-party servicer.

Keywords Moral hazard · Effort sensitivity · Managerial compensation · Principal-agent model · Asset-backed securitization

Introduction

Asset-backed securitization (ABS) is a financial innovation whereby debt instruments backed by cash flows generated from revenue-producing assets are converted into marketable securities and offered for investment purposes in the capital markets. Over the past two decades, ABS has developed remarkably, in particular in the US, and has grown into an alternative, attractive important source of funds in the capital markets. Many income-producing assets such as credit card receivables,

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public securities, automobile loans, commercial mortgages, home quality loans, trade receivables and leases, have been securitized. However, studies that discuss theoretically motivations for asset securitization and its relevant structure features have been limited.

While several explanations have been offered for the wide-spread acceptance of ABS—liquidity enhancement, regulatory requirements, cost efficiency or risk reallocation[1]—the managerial agency theory advocated by Iacobucci and Winter (2005) is appealing as it is an economic internally motivated explanation that is regulation-free and bankruptcy-free. Essentially, Iacobucci and Winter (2005) propose that asset-backed securitization is an alternative useful mechanism to control managerial agency problems where securitization of cash flows that are relatively insensitive to managerial effort reduces the noise for cash flows that are sensitive to managerial effort. They also demonstrate that asset securitization can strengthen incentive compensation schemes, influence manager reputation, monitoring and restrictions on the free cash flow over which managers have discretion.

This paper extends this concept in several ways. First, we differentiate the effects of noise and effort sensitivity on managerial effort and compensation, underscoring the importance of a less noisy environment. We also carefully delineate the conditions under which asset securitization would improve the welfare of managers and shareholders of the originating company. Second, we relax the assumptions regarding the expected income-producing function and the income variance, and further take into consideration the change of the marginal production of income with respect to effort before and after securitization. Third, under a multitask principal-agent model framework, we explore how the relationship between managerial activities on different assets affects the incentive compensation for the manager of the originating company and the joint surplus for shareholder and manager. This is particularly relevant when entire buildings are securitized as opposed to pools of income-generating instruments. Finally, we examine the role of the third-party servicer.

The remainder of this paper is organized as follows. In the next section, we briefly highlight the basic structural and transactional features of ABS transactions. Section 3 reviews the literature associated with this study. In Section 4, standard moral hazard models are used and developed to examine the effect of securitization on the welfare of managers and shareholders of the originating company. Section 5 further takes a generalized case into consideration. Section 6 incorporates a multitask principal-agent model framework to examine the strategic implication of securitization. We then turn to the role of an independent third party servicer in ABS transactions in Section 7. Section 8 gives the concluding remarks.

Basic ABS Structure

In a typical ABS transaction, a company (originator) sells its financial assets that generate a steady stream of cash flows to an especially created corporation or trust, often called a special purpose vehicle (SPV), which finances the purchase via issuing

[1] See, e.g., Obay (2000) and von Thadden (2000).

tradable securities [see, e.g., Roever (1998)]. While there are a large variety of ABS forms, they are usually a variation of this basic structure. Any fixed income asset such as credit card receivables, public securities, automobile loans, commercial mortgages, home quality loans, trade receivables, leases, etc, may be securitized.

The purpose of structuring the SPV is to create a "bankruptcy remote" structure that facilitates an off-balance-sheet transfer of the assets being securitized from the originator. Therefore, it is important for the established SPV to be a separate legal entity from the originator, and such transfer should also be a "true sale at law." The features segregate the assets from the operation of the originator completely such that investors can invest in the ABS securities backed by the assets without being exposed to any operational risk of the originator [see, e.g., Roever (1998) and Iacobucci and Winter (2005)].

In order to purchase the securitized assets, the SPV raises funds commonly through the issue of debt securities backed by the cash flow from the assets. The debt securities are usually partitioned into two or more classes, or tranches (i.e., the credit enhancement of senior/subordinated structures). The distinction between the classes depends to a great extent on the priority of claims on the cash flows flowing into the SPV. When debt securities are redeemed, the senior tranches are required to be paid off first. To secure higher credit ratings, the debt securities usually also require incorporating other credit enhancement tools into their ABS process, such as insurance policy forms, financial guarantees, letters of credit, cash collateral accounts, spread accounts, or over-collateralization structures [see, e.g., Obay (2000)].

The ABS process involves a number of important third parties that provide various commitments and services to an ABS transaction, such as a servicer, credit support provider, underwriter, paying agent, custodian, rating agency, etc. They can affect the structural and procedure features of ABS transactions by means of different ways [see, e.g., Silver (1998)]. While the basic transaction of ABS is the swap of the securitized assets and funding proceeds between the originator and the SPV, the specific structures of ABS transactions are often complicated due to the involvement of the different types of third parties and the incorporation of the credit enhancement tools for protecting the interests of ABS investors in default scenarios.

Relevant Literature

Studies that discuss theoretical motivations for asset securitization and its relevant structure features have been limited. von Thadden (2000) developed the basic model of liquidity provision through banks to evaluate securitization. In his models, the financial marketplace is not complete, which implies that firms and individuals cannot hedge against the time when they need strongly liquidity in unfavorable environments. In such environments, banks can act as providers of liquidity, which protect them from being forced to liquidate assets. As a consequence, securitization can be perceived as an opportunity to banks, and allows them to furnish new services and frees lending capacity on their own balance sheets.

Obay (2000) provides a comprehensive survey on theories attempting to explain the asset securitization phenomenon. His results show that in addition to liquidity enhancement and risk allocation, regulatory requirements, corporate competition, cost and return considerations, portfolio management, and accounting benefits are cited as securitization stimuli.

Riddiough (1997) develops a model of asymmetric asset value information to examine the optimal design and governance of asset-backed securities. In his model, asset markets are characterized by adverse selection problems. Riddiough shows that governance can be optimally designed through the proportional split of senior and subordinated bond structure to ensure efficient liquidation payoffs in ABS, and adverse selection risk can be internalized through retention of the risky or junior security. He also suggests that governance is more efficiently structured by allowing junior security holders to control the debt renegotiation process when default occurs.

More recently, Iacobucci and Winter (2005) propose that asset securitization is an alternative useful mechanism to control managerial agency problems. Iacobucci and Winter's theory is appealing as it is an economic internally motivated explanation to asset securitization. Our study further extends their explanation within the moral hazard model framework.

Moral hazard is one major concern in contract and organization theories, and to date there has been an extensive literature toward understanding and solving moral hazard problems [see Hart and Holmström (1987), for a comprehensive survey on the literature]. The moral hazard literature typically assumes that in a single principal-agent relationship, the agent's action is unobservable, the principal cannot costlessly monitor the agent's work, and therefore the action is the agent's private information. The inability of the principal to observe the action results in complexity in the design of incentive scheme so that he can only affect the action by conditioning the agent's utility to the observable outcomes.

Moral hazard problems are usually analyzed by maximizing the principal's expected utility subject to the agent receiving a minimum expected utility level and incentive-compatibility constraints. In order to resolve the maximizing problem, we often need to incorporate several extensively accepted assumptions, for example, risk-neutral principal, risk-averse agent and separable preferences for the agent [see, e.g., Harris and Raviv, (1979), Holmstrom, (1979), Mirrlees, (1976, 1999), Shavell, (1979a, 1979b), and Grossman and Hart, (1983)].

Holmström and Milgrom (1987) develop a simple agency model in which linear contracts are optimal in the performance signals. More specifically, they show that with an exponential utility function, normal errors and quadratic costs, the optimal scheme is linear because the agent has a rather rich action space. The model has been widely adopted in the literature [see, e.g., Holmström and Milgrom (1990, 1991), and Heinrich (2002)]. Holmström and Milgrom (1991) proposed a multitask principal-agent model where the principal is assumed to have several different tasks for the agent to perform, or the agent's single task includes several dimensions that he needs to perform simultaneously. Incentive pay serves not only to allocate risks and motivate hard work, but also to direct the allocation of the agent's attention among their various duties. This model provides an alternative approach to investigating wider organizational issues such as asset ownership, job design and allocation of authority [see also Macho-Stadler and Pérez-Castrillo, (1997)]. Our study is closely related to Holmström and Milgrom (1987, 1991).

In addition, several other papers are also related to this study. Itoh (1993) studies the effects of coalitional behavior on moral hazard problems in the principal-multiagent context. It is shown that when agents can share some private information with one another, the principal can benefit from coalitional behaviors among agents. Mutual monitoring among agents also improves the principal's welfare [see also Varian (1990), Holmström and Milgrom (1990), and Itoh (1991)].

A Moral Hazard Model

In this section we examine incentive compensation arrangement for the manager of the originator company by appealing to a standard moral hazard model within the single principal-agent framework. We will first analyze the situation before securitization and, subsequently, after securitization. We assume that any ABS will be a 'true sale' [see Schwarcz (1993), and Iacobucci and Winter (2005)] and that the originator/manager will no longer be responsible for the operation of the securitized asset. Instead, the SPV and/or servicer[2] will be responsible for the operation of the asset. We also assume that the originator has no residual claim on the securitized asset, but this assumption will be relaxed subsequently.

The standard moral hazard model usually focuses on the tradeoff between risk sharing and efficient production to derive optimal contracts under special assumptions on probability distributions and utility functions. In our case, we assume that the shareholder[3] (principal) is risk-neutral and her objective is to maximize wealth. The risk-averse manager (agent)[4] undertakes the operation of the assets held by the originator company but his managerial action is unobservable. The shareholder designs a contract or mechanism to balance managerial incentives against efficiency in assigning risk.

The manager chooses a costly action (say effort) $a \in [\underline{a}, \overline{a}] \subset \Re$, $[\underline{a}, \overline{a}]$ representing the range of all probable actions, and correspondingly, incurs a cost or disutility $c = c(a)$. The expected utility function of the manager's preference from a compensation scheme s is assumed to have the following form,

$$u(CE_m) = E\{u[s - c(a)]\} \tag{1}$$

where $u[s - c(a)] = 1 - \exp[-\gamma(s - c(a))]$ with constant absolute risk aversion γ, CE_m represents the manager's certainty equivalent payoff, and $c(a) = a^2/2$. Since the manager's action is unobservable, the shareholder cannot directly incorporate the action into the terms of the contract and has to design the compensation scheme contingent on the observable variables such as incomes, denoted by $s(r)$.

The income, $r = r(a)$, generated from the assets held by the originator is assumed to be a costlessly observable random variable and also $r \in [\underline{r}, \overline{r}]$, $0 < \underline{r} < \overline{r}$,[5] whose realization is determined by the unobservable action of the manager and a noise term. As motivated by Iacobucci and Winter (2005), we further assume that the

[2] We note that in practice, the established SPV is usually not an operating entity and has a minimum of executive staff, and a servicer is appointed to administer the SPV's day-to-day operations.

[3] We opt for the singular for readability.

[4] Standard principal-agent models of firms usually assume that shareholders (principal) are risk-neutral, while managers (agent) are risk-averse [see, e.g., Heinrich (2002)]. This is because shareholders can achieve risk-neutrality by diversifying their investments in a wide range of assets.

[5] In much of the moral hazard literature, a monetary outcome such as revenue or profit, is assumed to be the only commonly observable variable [see, e.g., Holmstrom (1979)].

originator has two assets, A and B, before securitization and asset B will be disposed under the securitization exercise. We denote the incomes from assets A and B as r_A and r_B respectively. Although the total income is composed of the incomes from both assets, the shareholder is unable to observe the decomposition of the income.[6]

We assume that the production function of incomes can be simply written as

$$r_i = f_i(a_i) + \varepsilon_i, \tag{2}$$

where r_i represents the produced income for $i = 1$ (before securitization) and 2 (after securitization), $f_i(\cdot)$ an expected income function, a_i a costly action and ε_i, a normal random term with mean zero and variance σ_i^2. The expected income function $f_i(a_i)$ is assumed to be increasing and linear or strictly concave in effort. In the simplest case, $r_1 = r_A + r_B$ and $r_2 = r_A$. However if the originator over-collateralizes the asset-backed securitization by holding the most junior tranche, then r_2 is the sum of r_A and interest payments on the junior tranche. If the originator retains a residual claim in the securitized asset in addition to the junior tranche, where any surplus in cash flows net of debt payment goes to the originator, then we can define $r_2 = r_A + d_j + \max(r_B - d_s, 0)$, where d_s and d_j are the debt obligations associated with the senior and junior tranches, respectively.

Following the standard moral hazard literature, the shareholder and manager agree on a contract (β,w,a) where β and w are the share of income and fixed wages respectively to the manager. Given this situation, Holmström and Milgrom (1987) demonstrate that the optimal sharing rule between the shareholder and manager can be represented by a linear contract [see also Holmström and Milgrom (1990, 1991)]. Therefore, we can write the incentive compensation of the manager as

$$s_i = \beta_i r_i(a_i) + w_i = \beta_i(f_i(a_i) + \varepsilon_i) + w_i, \tag{3}$$

where $0 < \beta_i < 1$ denotes a commission rate and w_i represents a fixed wage. Expressing the above in terms of the manager's certainty equivalent income,[7] we have

$$CE_m = \beta_i f_i(a_i) + w_i - c(a_i) - \frac{1}{2}\gamma\beta_i^2\sigma_i^2, \tag{4}$$

where the last term, $-\frac{1}{2}\gamma\beta_i^2\sigma_i^2$, is the manager's risk premium (for a derivation of this equation, see Appendix). Equation (4) indicates that the manager's certainty equivalent income is equal to the expected wage minus the private cost of effort and minus a risk premium.

Under the linear sharing scheme, the shareholder's payoff is

$$(1 - \beta_i)(f_i(a_i) + \varepsilon_i) - w_i. \tag{5}$$

[6] If income can be attributable, then the shareholder can structure a multi-tasking compensation scheme for managing each asset. Such an arrangement is better suited for companies managing a portfolio of property buildings. We address this scenario in a subsequent section.

[7] The certainty equivalent income of the manager is a certain income that will produce the utility equivalent to the expected utility of his actual uncertain income.

The shareholder is assumed risk-neutral. Her certainty equivalent payoff may therefore be written as[8]

$$CE_s = (1 - \beta_i) f_i(a_i) - w_i. \quad (6)$$

As a consequence, the joint certainty equivalent payoff to the shareholder and the manager under the linear sharing scheme is equal to

$$f_i(a_i) - c(a_i) - \frac{1}{2}\gamma\beta_i^2\sigma_i^2. \quad (7)$$

This expression is independent of the fixed component (w_i), which serves to allocate the joint certainty equivalent payoff between the shareholder and the manager.

The shareholder's optimal problem is to maximize her certainty equivalent payoff subject to incentive and participation constraints by designing contracts for the manager. That is, the shareholder's problem is to

$$\text{Maximize } CE_s(a_i), \quad (8a)$$

$$\text{subject to} \quad CE_m(a_i) \geq CE_m(a_i') \quad \text{for every } a_i', \quad (8b)$$

$$CE_m(a_i) \geq \underline{CE}, \quad (8c)$$

where, for simplicity, $\underline{CE}$ represents the manager's reservation utility [see, e.g., Holmström and Milgrom (1990)]. Incentive constraint (8b) is normally used to determine the incentive compensation β_i in equation (4), while participation constraint (8c) is commonly utilized to determine the fixed compensation w_i.

When there exists transferable utility between a principal and an agent, the established incentive-efficient linear contract should maximize the sum of the individual utilities, i.e., their joint surplus [see Holmström and Milgrom (1990)]. Equation (6) implies that the utilities of the shareholder and the manager are transferable. Thus, we can rewrite the shareholder's problem (8a) as:

$$\text{Maximize } CE_s(a_i) + CE_m(a_i). \quad (8d)$$

In summary, the incentive-efficient linear contract designed by the shareholder is the one that maximizes the total certainty equivalent payoff of both the shareholder and the manager subject to the constraints.

A Simple Model

We first consider a simple version of the moral hazard model, where the generated income in the originating company is assumed to be the sum of the manager's effort and the normal random term[9]:

$$r_i = a_i + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma_i^2). \quad (9)$$

[8] Since the shareholder is risk-neutral, her certainty equivalent income is only equal to the expected value of her uncertain income.

[9] Equation (9) has been widely adopted in the relevant literature [see, e.g., Holmström and Milgrom (1987, 1990, 1991), Lafontaine and Slade (2001), and Heinrich (2002)]. We adopt a simple effort/output production function for mathematical tractability.

We further assume that $\sigma_1^2 > \sigma_2^2$ and that the variances are known to both the shareholder and the manager,[10] while we keep other assumptions unchanged. As a result, we can rewrite the shareholder's problem (8) in the form:

$$\max\left[a_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2\right], \tag{10a}$$

subject to

$$a_i \in \arg\max\left[\beta_i a_i + w_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2\right] \tag{10b}$$

The first-order condition of constraint (10b) leads to: $a_i = \beta_i$. That is, the manager would choose effort equal to the incentive compensation scheme in the first place. Substituting the manager's effort choice into the shareholder's problem generates:

$$\max\left[\beta_i - \frac{\beta_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2\right]. \tag{10c}$$

From the first-order condition of (10c), we obtain an optimal sharing rule before and after securitization:

$$\beta_i^* = \frac{1}{1+\gamma\sigma_i^2}. \tag{11}$$

The key to this solution to induce a higher-powered compensation scheme ex-securitization lies in a reduction in the variance. Consider the situation where the originator company securitizes asset B as a 'true sale' where the originator has no residual claim to asset B. After securitization, the originator company holds only asset A, which has a lower variance in income, that is, $\sigma_1^2 > \sigma_2^2$. When $\sigma_1^2 > \sigma_2^2$, it is straightforward to verify that $\beta_1^* < \beta_2^*$ from equation (11). This suggests that asset securitization can lead to a decrease in the noisy relationship between effort and profit, and therefore help design a higher-powered incentive contract. In fact, this point is also one of the main insights in Iacobucci and Winter (2005). We further separate out the effects of noise and effort sensitivity by focusing on the noise reduction. We have the following proposition.

Proposition 1 *Given the foregoing assumptions, asset securitization results in higher powered compensation contract, which motivates the manager to exert more effort on the management of the remaining asset, and therefore increases the joint surplus of the shareholder and the manager when* $\sigma_1^2 > \sigma_2^2$.

Proof: The first-order condition of constraint (10b) results in the relationship: $a_i = \beta_i$. Substituting the optimal sharing rule (11) into this relationship, we have

$$a_i^* = \frac{1}{1+\gamma\sigma_i^2}.$$

When, $\sigma_1^2 > \sigma_2^2$, $a_1^* < a_2^*$ holds.

[10] $\sigma_1^2 > \sigma_2^2$ is one of basic assumptions in Iacobucci and Winter (2005).

On the other hand, substituting the optimal sharing rule (11) into the joint surplus (10c) yields:

$$CE_j^* = \frac{1}{1+\gamma\sigma_i^2} - \frac{1}{2\left(1+\gamma\sigma_i^2\right)^2} - \frac{\gamma\sigma_i^2}{2\left(1+\gamma\sigma_i^2\right)^2}.$$

Rearranging the right-side terms of this equation, then we have

$$CE_j^* = \frac{1}{2\left(1+\gamma\sigma_i^2\right)}.$$

When $\sigma_1^2 > \sigma_2^2$, it can also be readily found that $CE_{j1}^* < CE_{j2}^*$ always holds, where CE_{j1}^* represents the joint surplus before securitization while CE_{j2}^* represents that after securitization. ■

This proposition suggests that asset securitization would result in a higher powered compensation contract and therefore motivate the manager to make more effort on the management of the remaining asset so that the joint surplus is increased, when it provides an environment that is less noisy in order to better evaluate managerial effort. Another interesting question in ABS transactions is to evaluate whether both the shareholder and manager would be better off with securitization. In this regard, we have the following propositions.

Proposition 2 *When $\sigma_1^2 > \sigma_2^2$, the shareholder would be better off, while the manager's well-being is unchanged with securitization in the second-best solution of problem* (10).

Proof: As to problem (10), we further take the participation constraint of the manager into consideration, i.e., $\beta_i a_i + w_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2 \geq \underline{CE}$, as well as incentive constraint (10b). Then the following second-best solution can be generated:[11]

$$\beta_i^* = \frac{1}{1+\gamma\sigma_i^2}$$

and

$$w_i^* = \underline{CE} - \frac{1-\gamma\sigma_i^2}{2\left(1+\gamma\sigma_i^2\right)^2},$$

and therefore

$$a_i^* = \frac{1}{1+\gamma\sigma_i^2}.$$

Substituting these results into equation (6) generates:

$$CE_s^* = \left(1 - \frac{1}{1+\gamma\sigma_i^2}\right)\left(\frac{1}{1+\gamma\sigma_i^2}\right) + \frac{1-\gamma\sigma_i^2}{2\left(1+\gamma\sigma_i^2\right)^2} - \underline{CE} = \frac{1}{2\left(1+\gamma\sigma_i^2\right)} - \underline{CE}.$$

When $\sigma_1^2 > \sigma_2^2$, it can be readily found that $CE_{s1}^* < CE_{s2}^*$ always holds, where CE_{s1}^* represents the shareholder's certainty equivalent payoff before securitization

[11] See e.g., Heinrich (2002).

while CE^*_{s2} represents that after securitization. However, we also find that the manager's certainty equivalent payoffs before and after securitization are always equal to $\underline{CE}$, when these results are substituted into equation (4). ■

It is noteworthy that from the second-best solution, we have $\partial\beta^*_i/\partial\sigma^2_i < 0$ and $\partial w^*_i/\partial\sigma^2_i > 0$. This implies that as income variance declines, it is optimal to diminish the fixed compensation component and to increase the performance incentive compensation component. However, in business management practice, the fixed compensation components of managers are commonly kept unchanged and will not be decreased due to carrying out the securitization strategies. Also, in this solution, since all the bargaining power resides in the shareholder, she would choose a compensation contract, subject to the two constraints, that keeps the manager's certainty equivalent payoffs before and after securitization unchanged by balancing the increase of the performance incentive compensation component and the reduction of the fixed compensation component, in order to maximize her income surplus. But this suggests that the manager is not motivated to carry out a securitization strategy. As a result, we have the following proposition regarding the third-best case.

Proposition 3 *When $\sigma^2_1 > \sigma^2_2$, both the shareholder and the manager would be better off with securitization in the third-best case, assuming that fixed wages are unchanged after securitization and that the performance incentive compensation scheme does not exceed some critical value: $\beta_i < \overline{\beta}$.*

Proof: The shareholder's certainty equivalent payoff may be written as

$$CE_s = (1 - \beta_i)a_i - w_i.$$

In the optimum, the first-order condition of constraint (10b) requires that the manager will pick effort: $a_i = \beta_i$. Therefore, we have

$$CE^*_s = \beta_i - \beta^2_i - w_i.$$

For the shareholder to be better off, it is obvious that the following relation must be true:

$$\beta_1(1 - \beta_1) < \beta_2(1 - \beta_2).$$

However, we can rewrite

$$CE^*_s = \beta_i - \beta^2_i - w_i = -\left(\frac{1}{2} - \beta_i\right)^2 - w_i + \frac{1}{4}.$$

As a result, when both β_1 and β_2 are smaller than $1/2(\overline{\beta})$ and there is no change in fixed wages after securitization ($w_1 = w_2$), it can be readily found from this equation that $CE^*_{s1} < CE^*_{s2}$ would hold due to $\beta^*_1 < \beta^*_2$.

On the other hand, the manager's certainty equivalent payoff can be written as

$$CE_m = \beta_i a_i + w_i - \frac{a^2_i}{2} - \frac{1}{2}\gamma\beta^2_i\sigma^2_i$$

In the optimum, the manager will pick effort: $a_i = \beta_i$. Substituting the result into the above equation generates

$$CE_m^* = w_i + \frac{\beta_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2 = w_i + \frac{\beta_i^2}{2}\left(1 - \gamma\sigma_i^2\right).$$

As a result, when $\sigma_1^2 > \sigma_2^2$ and $w_1 = w_2$, it can be readily found that $CE_{m1}^* < CE_{m2}^*$ holds due to $\beta_1^* < \beta_2^*$. ■

The intuition behind this result is simple. The shareholder is giving up a higher share of income to the manager after securitization (a higher powered incentive) to ensure that the manager exert more effort (hence producing more income) on the remaining asset.[12] So the shareholder is trading off between a higher compensation scheme (receiving a lower share of income) while attempting to boost income (increasinghe bottom line). If the profit sharing rule (compensation scheme) is disproportionately high in favor of the manager, then it becomes more difficult for the shareholder to be better off after securitization. Even when $\sigma_1^2 > \sigma_2^2$, it is straightforward to see that the shareholder is better off only when the securitization results in a sufficiently large reduction in noise.

A Generalized Case

In the previous model, we considered a simple moral hazard model, where the generated income in the originating company is equal to the sum of the manager's effort and the normal random term. This indicates that the expected generated income is only simply equal to effort exerted by the manager. In this section, we will relax this assumption and consider a more rational one. Specifically, we assume that the expected income function $f_i(a_i)$ in equation (2) is concave in effort, which implies that $f_i'(a_i) > 0$ and $f_i''(a_i) < 0$.

On the other hand, the previous model also assumed that $\sigma_1^2 > \sigma_2^2$ and that the variances are known to both the shareholder and the manager. However, this is an assumption that may not hold true in practice. We therefore relax this assumption and explore the explanation of ABS from the viewpoint of accelerating income production.

We retain the idea in Iacobucci and Winter (2005) where the cash flows generated by the mixed assets prior to securitization are less sensitive to managerial effort than those generated by the remaining assets after securitization. As a consequence, we may assert that in the optimum, the first-order derivative of income function with respect to effort satisfies: $f_1'(a_1) < f_2'(a_2)$. This assumption suggests that in the optimum, the expected marginal production of income with respect to effort prior to securitization be smaller than that after securitization.[13]

[12] This point is not discussed in Iacobucci and Winter (2005) where they implicitly assume that income (benefit) after securitization is unchanged. For shareholder income to remain unchanged, shareholders must continue to derive benefits from the securitized asset, which would violate the 'true sale' assumption.

[13] However, the asset securitized out (asset B) cannot be completely insensitive to effort. If this were the case, then the manager would not exert any effort whatsoever in managing asset B. In equilibrium, the shareholder will only compensate the manager for effort accruing to asset A, and there will be no differentiation in compensation schemes before and after securitization.

Proposition 4 *Given the foregoing relaxed assumptions, the increased performance incentive compensation after securitization improves the effectiveness of the compensation system for the manager when $f_1'(a_i) < f_2'(a_2)$, and raises the joint surplus of the shareholder and manager when the expected income increase outweighs the higher compensation cost, including an adjustment for risk.*

Proof: The manager's certainty equivalent payoff can be written as

$$CE_m = \beta_i f_i(a_i) + w_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2.$$

The first-order condition of this equation with respect to effort yields: $f_i'(a_i) = a_i/\beta_i$). When $a_i > 0$ and $f_1'(a_1) < f_2'(a_2)$, we have

$$0 < \frac{a_1}{\beta_1} < \frac{a_2}{\beta_2}.$$

This result indicates that as the incentive compensation is increased, effort is also raised and, in particular after securitization, effort is increased more rapidly so that every unit of performance incentive compensation will yield more effort than prior to securitization.

On the other hand, according to equation (7) the total certainty equivalent payoff of the shareholder and the manager may be written as

$$CE_j = f_i(a_i) - \frac{a_i^2}{2} - \frac{1}{2}\gamma\beta_i^2\sigma_i^2 = f_i(a_i) - \left(\frac{a_i^2}{2} + \frac{1}{2}\gamma\beta_i^2\sigma_i^2\right).$$

When $f_2(a_2) - f_1(a_1) > \left(\frac{a_2^2}{2} + \frac{1}{2}\gamma\beta_2^2\sigma_2^2\right) - \left(\frac{a_1^2}{2} + \frac{1}{2}\gamma\beta_1^2\sigma_1^2\right)$, it is easy to show that $CE_{j1} < CE_{j2}$ always holds, where CE_{j1} represents the total certainty equivalent payoff prior to securitization while CE_{j2} represents that after securitization. ■

Proposition 4 reveals an important feature not fully considered by Iacobucci and Winter (2005). This proposition indicates that the internally economic explanation of asset securitization is also likely to be relevant to the higher income productivity with respect to effort rather than only reducing the noise for cash flows that are sensitive to managerial effort.

The above proposition is based on the crucial assumption in which the expected marginal production of income with respect to effort prior to securitization is smaller than that after securitization. We can further relax this assumption and take into consideration a more general case. Let $G(r_i|a_i)$ represent the normal distribution $N\left(f_i(a_i), \sigma_i^2\right)$of the realized income conditional on action a_i, and $g(r_i|a_i)$ the density function.[14] We show that in this case, if the realized income is sensitive enough to the change of effort, securitizing part of corporate assets and increasing the incentive compensation for the manager contribute to improving the effectiveness of the compensation system, and raising the joint surplus of the shareholder and the manager.

[14] The technology $g(r^i|a_i)$ satisfies the monotone likelihood ratio property (MLRP). The MLRP condition means that $g_{a_i}(r_i|a_i)/g(r_i|a_i)$ increases in r_i, which guarantees that higher income is more likely due to higher effort than lower effort. For a detailed survey on the condition, see Grossman and Hart (1983), Rogerson (1985), Jewitt (1988), and Sinclair-Desgagne (1994).

Proposition 5 *Given the above assumption about the distribution of the realized income, if the realized income is sensitive enough to the change in effort, then the marginal change in the expected joint surplus of the shareholder and the manager with respect to a change in the performance incentive compensation for the manager is strictly positive. In other words, the joint surplus is increasing in the incentive compensation when the sensitivity of the realized income to the change of effort is sufficiently high.*

Proof: In order to prove this proposition, we rewrite the shareholder's problem (8d) as

$$V = \max_{a_i, \beta_i} \left[\int_{\underline{r}}^{\overline{r}} r_i g(r_i|a_i) dr_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma \beta_i^2 \sigma_i^2 \right]. \tag{12a}$$

Problem (12a) is subject to the following two constraints:

$$a_i \in \arg\max \left[\int_{\underline{r}}^{\overline{r}} \beta_i r_i g(r_i|a_i) dr_i + w_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma \beta_i^2 \sigma_i^2 \right], \tag{12b}$$

$$\int_{\underline{r}}^{\overline{r}} \beta_i r_i g(r_i|a_i) dr_i + w_i - \frac{a_i^2}{2} - \frac{1}{2}\gamma \beta_i^2 \sigma_i^2 \geq \underline{CE} \tag{12c}$$

where constraint (12b) is the manager's incentive compatibility constraint,[15] while constraint (12c) represents the participation constraint. We ignore the participation constraint, which is usually used to determine w_i.

The Lagrangian for this problem is

$$L = V + \lambda \left[\int_{\underline{r}}^{\overline{r}} \beta_i r_i g_{a_i}(r_i|a_i) dr_i - a_i \right], \tag{13}$$

where λ is the Lagrangian multiplier corresponding to constraint (12b) and (12c) respectively.

Differentiating this Lagrangian with respect to β_i, then we have

$$\frac{\partial V}{\partial \beta_i} = -\lambda \int_{\underline{r}}^{\overline{r}} r_i g_{a_i}(r_i|a_i) dr_i.$$

Therefore, when $\lambda \int_{\underline{r}}^{\overline{r}} r_i g_{a_i}(r_i|a_i) dr_i < 0,$ we have $\partial V / \partial \beta_i > 0.$ ■

This result shows that the joint surplus of the shareholder and the manager increases as the incentive compensation for the manager is increased when the condition $\lambda \int_{\underline{r}}^{\overline{r}} r_i g_{a_i}(r_i|a_i) dr_i < 0$ is satisfied. As we have established earlier, to maintain managerial incentives after securitization, the compensation scheme should provide higher profit sharing for the manager. We know that λ and r_i are strictly positive, and when $g_{a_i}(r_i|a_i)$ is negative, this condition holds true. That is, a positive

[15] In the first-order approach, constraint (12b) is usually replaced by $\int_{\underline{r}}^{\overline{r}} \beta_i r_i g_{a_i}(r_i|a_i) dr_i - a_i = 0$ in order to simplify the infinite number of global incentive constraints.

change in an effort level will lead to a negative marginal change in the density function of the realized income. As a consequence, the key to improving the expected joint surplus by increasing the incentive compensation depends on whether a change in a_i has a nontrivial effect on the probability density of r_i. This implies that whether the joint surplus would be increased after securitization by increasing the incentive compensation depends on whether the realized income is sensitive to the change of effort and the extent of income sensitivity.

Moral Hazard with Multitask Compensation

In the earlier sections, we have assumed that the shareholder cannot differentiate between the sources of incomes from corporate assets. Although this assumption helps facilitate the analysis, it may often be the case that shareholders are, in fact, able to observe the individual incomes from the assets. This would be true when the assets are individual income-generating properties and where accounting and market practice dictate that incomes are clearly attributed. If so, then the shareholder could implement a more optimal compensation fashion—the multitask compensation scheme—where the manager is compensated for his management of the individual assets.

As we have mentioned earlier, the multitask principal-agent model provides an alternative approach to investigating wider organizational issues such as asset ownership, job design and allocation of authority. Consider a multitask principal-agent relationship where the manager exerts a two-dimensional effort, i.e., the management of both assets A and B, before securitization while he only focuses on the management of asset A after securitization. As assumed previously, the manager is not responsible for managing asset B after securitization. As a consequence, the production function of incomes prior to securitization is rewritten as

$$r_1 = F_1 + \varepsilon_1, \tag{14}$$

where $r_1^T = [r_{1A} \quad r_{1B}]$, $F_1^T = [f_{1A}(a_{1A})\, f_{1B}(a_{1B})]$, and ε_1 is normally distributed with mean vector zero and covariance matrix Σ. The expected income functions, $f_{1A}(a_{1A})$ and $f_{1B}(a_{1B})$, are assumed concave in the efforts. However, asset securitization through a divestiture of asset B (true sale) would simply mean reverting to a one-asset managerial activity of the manager. As such, after securitization the production function of incomes would simply be represented by

$$r_{2A} = f_{2A}(a_{2A}) + \varepsilon_{2A}. \tag{15}$$

Prior to securitization, the manager's certainty equivalent payoff is

$$CE_{m1} = \beta_1^T F_1 + w_1 - \mathbf{1}C - \frac{1}{2}\gamma\beta_1^T\Sigma\beta_1, \tag{16}$$

where $\beta_1^T = [\beta_{1A}\ \beta_{1B}]$, $\mathbf{1} = [1 \quad 1]$, $C^T = [c(a_{1A})\ \ c(a_{1B})]$ and $a_1 = a_{1A} + a_{1B}$, while after securitization, his certainty equivalent payoff is simply rewritten as

$$CE_{m2} = \beta_2 f_{2A}(a_{2A}) + w_2 - c(a_{2A}) - \frac{1}{2}\gamma\beta_2^2\sigma_{2A}^2. \tag{17}$$

Correspondingly, under the linear compensation scheme, the total certainty equivalent payoff of the shareholder and the manager before and after securitization are respectively

$$\mathbf{1}F_1 - \mathbf{1}C - \frac{1}{2}\gamma\beta_1^T\Sigma\beta_1, \tag{18}$$

$$f_{2A}(a_{2A}) - c(a_{2A}) - \frac{1}{2}\gamma\beta_2^2\sigma_{2A}^2. \tag{19}$$

The shareholder's problem is to maximize the two expressions subject to the manager's incentive and participation constraints as in problem (8).

To explore the internally economic explanation of ABS under the multitask moral hazard model, we work with the simplest situation in which equation (14) is simplified as

$$r_1 = A_1 + \varepsilon_1, \tag{20}$$

where $A_1^T = [a_{1A} \quad a_{1B}]$.

Correspondingly, we can express the shareholder's problem in the form:

$$\max_{A_1,\beta_1}\left[\mathbf{1}A_1 - \mathbf{1}C - \frac{1}{2}\gamma\beta_1^T\Sigma\beta_1\right], \tag{21a}$$

subject to the incentive constraint

$$a_{1A}, a_{1B} \in \arg\max\left[\beta_1^TA_1 + w_1 - \mathbf{1}C - \frac{1}{2}\gamma\beta_1^T\Sigma\beta_1\right], \tag{21b}$$

where $C^T = [c(a_{1A}) \quad c(a_{1B})]$. Problem (21) can be further rewritten as

$$\max\left[a_{1A} + a_{1B} - c(a_{1A}) - c(a_{1B}) - \frac{1}{2}\gamma\left(\beta_{1A}^2\sigma_{1A}^2 + \beta_{1B}^2\sigma_{1B}^2 + 2\beta_{1A}\beta_{1B}\sigma_{AB}\right)\right]. \tag{22a}$$

subject to

$$a_{1A}, a_{1B} \arg\max\left[\beta_{1A}a_{1A} + \beta_{1B}a_{1B} + w_1 - c(a_{1A}) - c(a_{1B}) - \frac{1}{2}\gamma\left(\beta_{1A}^2\sigma_{1A}^2 + \beta_{1B}^2\sigma_{1B}^2 + 2\beta_{1A}\beta_{1B}\sigma_{AB}\right)\right]. \tag{22b}$$

As in Holmström and Milgrom (1991), we call managerial activities of assets A and B complements, when $\sigma_{AB} < 0$. In contrast, they are substitutes when $\sigma_{AB} > 0$. We have the following proposition.

Proposition 6 *Given that both income streams from assets A and B are observable signals of managerial performance, securitization improves the effectiveness of the incentive compensation system for the manager, and possibly increases the joint surplus of the shareholder and the manager when managerial activities of the two assets are substitutes.*

Proof: Since both income streams are observable, the shareholder can pick multitask incentive schemes to maximize (22b). First-order conditions for the maximization of (22b) with respect to a_{1A} and $a_{1\mathrm{B}}$ show $\beta_{1A} = a_{1A}$ and $\beta_{1B} = a_{1B}$. As a result, maximizing problem (22a) with respect to β_{1A} and β_{1B} yields,

$$\beta_{1A}^{*} = \frac{1 - \gamma\beta_{1B}\sigma_{AB}}{1 + \gamma\sigma_{1A}^{2}} \tag{23}$$

and

$$\beta_{1B}^{*} = \frac{1 - \gamma\beta_{1A}\sigma_{AB}}{1 + \gamma\sigma_{1B}^{2}}. \tag{24}$$

Asset securitization through a divestment of asset B would simply mean reverting to a one-asset managerial activity of the manager. As such, the post-securitization incentive compensation scheme would simply be represented by $\beta_{2}^{*} = \frac{1}{1+\gamma\sigma_{2A}^{2}}$. As a result, when $\sigma_{AB} > 0$ and $\sigma_{1A}^{2} = \sigma_{2A}^{2}$, $\beta_{1A}^{*} < \beta_{2}^{*}$ holds. This suggests that when the managerial activities are substitutes, the shareholder implement higher-powered incentives in order to improve the effectiveness of the incentive compensation system after securitization. Substituting these results into the joint surplus (22a), in the optimum we have

$$CE_{j1}^{*} = \frac{1}{2(1+\gamma\sigma_{1A}^{2})} + \frac{1}{2(1+\gamma\sigma_{1B}^{2})} - \left[\frac{\gamma^{2}\beta_{1B}^{2}\sigma_{AB}^{2}}{2(1+\gamma\sigma_{1A}^{2})} + \frac{\gamma^{2}\beta_{1A}^{2}\sigma_{AB}^{2}}{2(1+\gamma\sigma_{1B}^{2})} + \gamma\beta_{1A}\beta_{1B}\sigma_{AB}\right]. \tag{25}$$

From Section 4, we know

$$CE_{j2}^{*} = \frac{1}{2(1+\gamma\sigma_{2A}^{2})}.$$

If $\sigma_{1A}^{2} \geq \sigma_{2A}^{A}$ and when $\frac{1}{2(1+\gamma\sigma_{1B}^{2})} < \left[\frac{\gamma^{2}\beta_{1B}^{2}\sigma_{AB}^{2}}{2(1+\gamma\sigma_{1A}^{2})} + \frac{\gamma^{2}\beta_{1A}^{2}\sigma_{AB}^{2}}{2(1+\gamma\sigma_{1B}^{2})} + \gamma\beta_{1A}\beta_{1B}\sigma_{AB}\right]$, it is readily found that $CE_{j1}^{*} < CE_{j2}^{*}$ holds. ■

This proposition reveals that the relationship of managerial activities on assets A and B plays an important role in determining whether asset securitization helps enhance the incentive for the manager of the originating company. When managerial tasks on the two assets are complements, equations (23) and (24) show that increasing the incentive for managerial task on one asset would simultaneously enhance that on the other asset. As a consequence, asset securitization cannot be viewed as a better strategic choice compared with retaining asset B as an important revenue-producing resource, as the managerial activities of assets A and B are complementary.

However, when both managerial tasks are substitutes, equations (23) and (24) show that the incentive for one managerial task would increase the incentive cost for the other one so that it is more difficult to enhance the managerial incentive for this task. In other words, the incentive for one managerial task would cause the manager to substitute effort away from the other task. As a result, asset securitization can be regarded as a better strategic choice so that via securitization the manager would concentrate his effort on the managerial task on asset A and strive to create more revenues from this asset. In particular, equation (25) shows that given that the variance of incomes from asset A is unchanged after securitization, when the generated income from asset B, $\frac{1}{2\left(1+\gamma\sigma_{1B}^2\right)}$, is not enough to offset the reduction of revenues caused by substitution of managerial activities, $\left[\frac{\gamma^2\beta_{1B}^2\sigma_{AB}^2}{2\left(1+\gamma\sigma_{1A}^2\right)}+\frac{\gamma^2\beta_{1A}^2\sigma_{AB}^2}{2\left(1+\gamma\sigma_{1B}^2\right)}+\gamma\beta_{1A}\beta_{1B}\sigma_{AB}\right]$, carrying out asset securitization would increase the joint surplus of the shareholder and the manager under the optimal incentive compensation scheme.

In addition, we also notice that even if only one managerial activity is observable via income signal or no managerial activity is observable but the knowledge about the relationship of the managerial activities on assets A and B is available, the results discussed above still can help us identify whether asset securitization is an alternative corporate strategy. However, when the shareholder cannot observe the individual incomes from the assets completely or even obtain the relevant knowledge, she cannot design a multitask compensation contract for the manager but only design a single-dimensional compensation contract based on the total income signal. In this eventuality, the question of whether asset securitization is a better corporate strategy would be addressed in accordance to the previous propositions. Of course, these propositions also directly apply to the multitask case.

The Role of the Servicer

As mentioned earlier, the common market practice is for a SPV to issue debt securities divided into two or more tranches. The senior tranches, and mezzanine tranches if any, are offered to the investors by means of a public offer or a private placement, while the most subordinated tranches are usually retained by the originator.[16] Rating agencies require that the debt securities are redeemed sequentially with the senior tranches being paid off first and then the more subordinated tranches and finally the most subordinated tranches. This implies that the originator, in effect, possesses a stockholder-like residual claim on the cash flows generated from the securitized asset, and that its shareholder is still concerned about managerial activities of the asset.[17]

In ABS transactions, a servicer (servicing agency) is usually appointed to the SPV and performs day-to-day operation functions on behalf of the SPV. Specifically, the main responsibility of the servicer is to engage in the operation of the securitized assets, the collection and distribution of monetary incomes, and the provision of relevant services, while its other functions may also contain monitoring underlying asset condition, making servicing advances, and reporting duties [see, e.g., Silver (1998)]. This suggests that the servicer plays an important role in asset securitization transactions. In this section, we turn to utilize multi-agent moral hazard theory to examine the role of a servicer and the implication of its involvement in ABS transactions.

We treat the servicer, more accurately its manager, as an additional agent who shares operation activities or tasks with the SPV manager. In practice, there probably are different types of servicers involved in ABS transactions, whose roles

[16] In practice, whether the originator retains the most subordinated tranches is basically dependent on the credit enhancement requirement of credit rating agencies, and on the enhancement cost relative to other forms of credit enhancements [see, e.g., Roever, (1998)].

[17] It is clear that the income of the originator and consequently its stock value, are affected by the timely payment of bond interests and principal when the originator retains the most subordinated tranches. A typical case is the bankruptcy of Enron [see, e.g., Schwarcz and Ford (2003)].

can vary from deal to deal. But for simplicity of this analysis, here we only consider the case of an appointed servicer who is risk-averse. We compare the efficiency between the involvement and non-involvement of a servicer in ABS transactions.[18]

In the multi-agent literature, the relationship among agents is often studied from the viewpoints of their collusion or cooperation via side contracts.[19] In this study, we pay particular attention to the cooperation between agents, as it is more likely for the managers of the SPV and the servicer to cooperate other than collude to abscond. This is because the servicer chosen by the originator should have a good reputation in the marketplace so that such selection can prevent the problems of adverse borrower behavior induced by risky debt and strengthen investor confidence in the issued securities. A servicer that has a good reputation and significant value in the marketplace always avoids collusion in practice. Also, the chosen servicer is usually a large reputable institution, which has significant incomes from servicer-unrelated business activities that depend on the market perception of its trustworthiness.

Let both agents have the following utility function,

$$u_n(s_n) = 1 - \exp\left(-\gamma_n s_n\right), \tag{26}$$

where the SPV manager and the servicer's manager are indexed by $n = p, e$ respectively, and γ_n is constant absolute risk aversion. When agents can only observe public information, their side contracting does not have value to a principal.[20] In our case, however, we assume that both the SPV manager and the servicer's manager can observe each other's actions,[21] because their work is largely connected and even overlapping. Consider the case of transferable utility between both the managers. Then we have the following proposition.

Proposition 7 *Given the relevant assumptions, the appointment of a servicer in ABS transactions is in effect equivalent to appointing a more risk-averse SPV manager. Also, when the variance of income streams from asset B is reduced to a certain extent due to professional managerial activities of the servicer, the appointment increases the joint surplus of the originator and the asset-B manager.*

Proof: Assume that there exists a single agent who is assigned the tasks of both the managers. Under the optimal condition he has utility function $1 - \exp\left\lfloor -s_s\left(\gamma_p + \gamma_e\right)\right\rfloor$, where s_s represents the compensation cost (Holmström and

[18] While the originator can usually also affect the managerial behavior of a servicer in some ways, we focus on the efficiency of involvement of a servicer in ABS transactions. For example, to ensure that the ABS investors are paid on a timely basis, the servicer has to engage in active income collection effort. A decline in the collection effort could well result in an increase in delinquencies and losses. A backup servicer is therefore often chosen when the originator starts to originate ABS transactions in order to replace the operating servicer in the events of poor performance or nonperformance of the servicing function, or of its insolvency [see, e.g., Silver (1998)]. An originator that retains the most subordinated tranches can further influence the choice (or replacement) of the operating servicer or determine the appointment of managers of the SPV through the involvement of composition of the SPV board of directors.

[19] See, e.g., Tirole (1992), Holmström and Milgrom (1990), and Itoh (1993).

[20] See Holmström and Milgrom (1990) and Varian (1990).

[21] Holmström and Milgrom (1990), and Itoh (1993) show that when agents can observe each other's actions, agent side contracting can improve the principal's welfare.

Milgrom, 1990). According to equation (11), he can obtain an optimal sharing rule when the securitized asset, asset B, is managed by him:

$$\beta_s^* = \frac{1}{1 + (\gamma_p + \gamma_e)\sigma_{Bs}^2},$$

where σ_{Bs}^2 represents the variance of income streams from asset B when the servicer is involved in the transactions. However, when no servicer is appointed to the SPV, the SPV manager who solely runs asset B can obtain the following sharing rule:

$$\beta_p^* = \frac{1}{1 + \gamma_p \sigma_{Bp}^2}.$$

where σ_{Bp}^2 represents the variance of income streams from asset B without appointing the servicer. Since in the optimum the joint surplus with the seriver $CE_{js}^* = \frac{1}{2(1+(\gamma_p+\gamma_e)\sigma_{Bs}^2)}$ and that without the servicer $CE_{jp}^* = \frac{1}{2(1+\gamma_p\sigma_{Bp}^2)}$, it is readily found that when $\sigma_{Bs}^2 < \gamma_p\sigma_{Bp}^2 / (\gamma_p + \gamma_e)$, $CE_{js}^* > CE_{jp}^*$ always holds. ■

This result shows that when the SPV manager and the servicer's manager can monitor each other's actions so that their "explicit side trade" contract can be written contingent on their effort levels, the appointment of a servicer can be viewed as hiring a more risk-averse SPV manager. Also, when the variance of income streams from asset B is reduced to a certain extent due to professional managerial activities of the servicer, the appointment of the servicer increases the joint surplus of the originator and the asset-B manager, and improves the effectiveness of the compensation system for the asset-B manager. This implies the importance of the servicer providing professional management, high quality services and cash flow risk hedge measures for producing a steady stream of incomes.

However, in securitization practice, the SPV is also often a shell company, where there are no employees or facilities [see, e.g., Silver (1998)]. This implies that we can ignore the SPV's managerial role and focus only on the relationship between the servicer's manager and the originator's manager. We continue to utilize multi-agent models to examine this situation.

Proposition 8 *Given that both income streams from assets A and B are observable signals of managerial performance and that managerial activities of the two assets are substitutes, the servicer's managerial activities increase the joint surplus after securitization when the servicer manager's risk aversion coefficient is no more than the originator manager's.*

Proof: When managerial activities of assets A and B are substitutes, from equation (25) the joint surplus under the multitask compensation, before securitization, can be written as,

$$CE_{j1}^* = \frac{1}{2(1+\gamma_o\sigma_{1A}^2)} + \frac{1}{2(1+\gamma_o\sigma_{1B}^2)} - \left[\frac{\gamma_o^2\beta_{1B}^2\sigma_{AB}^2}{2(1+\gamma_o\sigma_{1A}^2)} + \frac{\gamma_o^2\beta_{1A}^2\sigma_{AB}^2}{2(1+\gamma_o\sigma_{1B}^2)} + \gamma_o\beta_{1A}\beta_{1B}\sigma_{AB}\right],$$

where γ_o is constant absolute risk aversion of the originator's manager. After securitization, the servicer is responsible for day-to-day operation management of the securitized asset. As a result, in the optimum the sum of the two joint surpluses after securitization is equal to

$$CE_{j2}^{*} = \frac{1}{2(1+\gamma_o\sigma_{2A}^2)} + \frac{1}{2(1+\gamma_e\sigma_{2B}^2)}.$$

When $\sigma_{AB} > 0$, $\sigma_{1A}^2 = \sigma_{2A}^2$ and $\sigma_{1B}^2 = \sigma_{2B}^2$, it is readily found that $CE_{j2}^{*} > CE_{j1}^{*}$ holds due to $\gamma_e \leq \gamma_o$. ■

On the other hand, if both the income streams are unobservable and only total income signal is observable before and after securitization, both the variance of the generated income to the originator and its income productivity with respect to effort may be affected by the dynamics of cash-flow surplus of debt payment (the difference between the incomes from the securitized asset and the debt payments associated with more senior tranches) due to the originator retaining a residual claim on the cash flows. But, if the conditions in the propositions in Sections 4 and 5 are satisfied, it is readily found from our proofs that the propositions in these sections still hold true. For example, the smaller the variance of the aggregate income in the originator after securitization, the more the joint surplus of its shareholder and manager is.

Conclusion and Implications

This study extends the moral hazard explanation for asset securitization proposed by Iacobucci and Winter (2005). We first differentiate the effects of noise and effort sensitivity on managerial effort and compensation, underscoring the importance of a less noisy environment. The intuition is that a less noisy environment allows a more precise evaluation of managerial effort and consequently increases the joint surplus of the shareholder and the manager. Also, we show that securitization can benefit the shareholder even when the incentive compensation is increased (to reflect a heightened focus on the management of effort-sensitive assets) and even when the asset base is reduced. This result is consistent with the empirical finding that wealth effects upon securitization are increasing in shareholder capitalization (Thomas, 2001) to the extent that the remaining assets are larger for higher capitalized firms. It is further shown that ABS transactions can also benefit the managers of the originator. Given a less noisy environment to evaluate managerial action after securitization, in the third-best scenario the manager would also be better off with securitization in the optimum.

We further generalize the results by relaxing the assumptions regarding the expected income-producing function and the income variance. As long as the marginal production of income with respect to effort prior to securitization is lower than that after securitization, we show that the increased incentive compensation after securitization improves the effectiveness of the compensation system for the manager and raises the joint surplus of the shareholder and the manager. This would hold true when the expected income increase outweighs the higher compensation cost, including an adjustment for risk.

We further use a multitask principal-agent model to examine the scenario where entire buildings are securitized as opposed to pools of income-generating assets. It is shown that when the managerial activities are substitutes, asset securitization can be regarded as a better corporate strategic choice. Securitization enables the manager to concentrate his effort on managing the remaining asset. As a result, this improves the effectiveness of the incentive compensation system for the manager, and even increasing the joint surplus of the shareholder and the manager.

We also utilize the multi-agent moral hazard theory to examine the role of the third-party servicer. Our results show that it is important, in ABS transactions, that the servicer provides professional management, high quality services and cash flow risk hedge measures in order to produce a steady stream of incomes. The empirical implication is that the market should differentiate between securitization deals that involve independent third-party servicer and those that do not.

In conclusion, this paper extends the idea proposed by Iacobucci and Winter (2005) that asset-backed securitization provides an alternative way to control managerial agency problems and to reduce the informational asymmetry arising from moral hazard problems. This helps shed new light on why ABS transactions became popular over the past two decades and have quickly grown into an attractive, important funding and investing choice in the capital markets. In particular, this paper provides the theoretical framework to formulate several testable hypotheses emulating from the agency motivation for asset securitization.

The extant research on wealth effects associated with securitization (Thomas, 1999, 2001) has not considered agency-related issues. It would be interesting to conduct empirical investigations to evaluate moral hazard explanations for securitization as long as a good proxy for the income sensitivity to effort can be obtained. For instance, our work can be empirically tested where compensation schemes and possible wealth effects can be differentiated between the securitization of income pools and individual buildings. A further differentiation could be made for the types of buildings that were securitized. Our work suggests that a positive wealth effect be observed only for the securitization of properties that are substitutes.

This work is also relevant to studies on asset divestitures. How would asset disposals affect the moral hazard and compensation issues of the divesting firm? Alternatively, how would asset acquisition affect the moral hazard and compensation issues of the acquiring firm? These are some potentially interesting topics for future research.

Given that banks are actively involved in asset securitization, the managerial agency theory for asset securitization is also relevant to one of the key questions in finance—why do we need financial intermediaries? Earlier works such as Greenbaum and Thakor (1987) predict that banks will securitize best assets, retaining their worst. The managerial agency theory offers an alternative explanation, and this paper provides some testable hypotheses to facilitate empirical tests to differentiate between these explanations.

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Appendix

The derivation of equation (4) is based on Milgrom and Roberts (1992: 246–247). In order to obtain equation (4), let $\bar{s} = E[s_i - c(a_i)]$. Using Taylor's expansion, we have the following approximation for the utility function of any realized payoff $y = s_i - c(a_i)$,

$$u(y) \approx u(\bar{s}) + (y - \bar{s})u'(\bar{s}) + \frac{1}{2}(y - \bar{s})^2 u''(\bar{s}). \tag{A1}$$

Taking expectations yields

$$E[u(y)] \approx u(\bar{s}) + E[y - \bar{s}]u'(\bar{s}) + \frac{1}{2}E\left[(y - \bar{s})^2\right]u''(\bar{s}). \tag{A2}$$

Since $E[y - \bar{s}] = 0$, equation (A2) can be rewritten as

$$E[u(y)] \approx u(\bar{s}) + \frac{1}{2}E\left[(y - \bar{s})^2\right]u''(\bar{s}). \tag{A3}$$

Again using Taylor's expansion for $u(CE_m(y))$ yields the following approximation

$$u(CE_m(y)) \approx u(\bar{s}) + [CE_m(y) - \bar{s}]u'(\bar{s}) \tag{A4}$$

where $CE_m(y)$ is the certainty equivalent of y. Substituting equation (1) into equation (A4), we obtain

$$E[u(y)] = u(\bar{s}) + [CE_m(y) - \bar{s}]u'(\bar{s}). \tag{A5}$$

Combining equations (A3) and (A5) and rearranging terms, we find

$$CE_m(y) = \bar{s} - \frac{1}{2}\left[-\frac{u''(\bar{s})}{u'(\bar{s})}\right]E\left[(y - \bar{s})^2\right]. \tag{A6}$$

Since $\bar{s} = E[s_i - c(a_i)] = \beta_i f_i(a_i) + w_i - c(a_i)$, we therefore have

$$CE_m(y) = \beta_i f_i(a_i) + w_i - c(a_i) - \frac{1}{2}\gamma\beta_i^2\sigma_i^2,$$

where $\gamma = -\frac{u''(\bar{s})}{u'(\bar{s})}$ is the coefficient of absolute risk aversion.

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