THE SOUTHERN BUSINESS AND ECONOMIC JOURNAL

Indexed in PAIS Bulletin and EBSCO Publishers Online ISSN: 0743779X

Volume 43, Number 1 2020

Articles

Published by the Auburn University at Montgomery College of Business

The Short-run and Long-run Effects of Fiscal Policy on Inflation in China

Yuexing Lan
Auburn University Montgomery

Abstract

This paper examines the main determinants of the inflation in China at the provincial level with focus on the effect of fiscal policy on the inflation in both short and long run. Our empirical results show that money is the main determinant of the inflation and fiscal deficit does not affect the inflation in the short run. In contrast, our results suggest a statically significant positive correlation between fiscal deficit and the inflation in the long run in China. These findings are consistent with those with those from the literature.

Introduction

China began its transition to a market economy about 40 years ago through the implementation of its open-door policy and the decentralization of its fiscal system, among other reforms, producing a high growth rate. The literature contains a large body of work on China's reform, but few papers examine the impact of fiscal reform on the country's economy (for details see Lin & Liu, 2000; Ma, 1997; Zhang & Zou, 1998). However, while these authors have studied the effect of this policy on economic growth in China, to the best of our knowledge, the study discussed in this paper is the first to investigate the short-run and long-run effect of fiscal policy on inflation in China.

The literature on fiscal policy indicates that the fiscal deficit could affect inflation. The seigniorage theory developed by Sargent and Wallace (1981) shows that the fiscal deficit is inflationary. Government debt is specified in nominal terms, and inflation reduces the real value of the debt. Hence, a high level of debt might encourage a government to print money ("seigniorage ") in order to reduce the real value of its debt (for details see Click, 1998; Dornbusch, Sturzenegger, Wolf, Fischer, & Barro, 1990; Fischer, Sahay, & Végh, 2002).

The Chinese fiscal system underwent some important changes during the reform period. Thus, it is necessary to present a brief overview of the fiscal reform in China.

Greater decentralization first occurred under the fiscal contracting system or *caizheng chengbao zhi* (1980–93). Each level of government became responsible for balancing its own budget (see Lin & Liu, 2000; Wong, 1997). Central government revenue came from customs duties, direct taxes, and profit remittances from the central government's SOEs. Local revenues included salt taxes, agricultural taxes, and local levies. The central and provincial governments shared revenues from the profits of dually controlled large-scale enterprises as well as industrial and commercial taxes (see Argarwala, 1992). However, even after these defined divisions of revenue, transfers still occurred between the central and provincial governments. In some cases, the central government would "borrow" from a provincial government, while other times the central government would transfer additional revenues to a provincial government. These ex-post transfers lessened the provincial governments' independence from the central government.

The second major reform was the tax assignment system (1994–present). The central government reassigned taxes between the central and local governments (see Jin & Zou, 2003). Tax revenues to the central government came from tariff duties, income taxes paid by SOEs under the jurisdiction of the central government, consumption taxes, import-related consumption taxes, and taxes imposed on financial institutions and railroads. Local taxes now included sales taxes, income taxes from locally-controlled SOEs, and personal income taxes. Both sides split other tax revenue, the most important of which is the value-added tax (VAT) revenue with 75 percent going to the central government. The second aspect of this reform continued to decrease the authority the central government had over the provincial governments' budgets. The degree of ex-post transfers lessened, and the provincial governments were allowed to keep their "extra-budgetary revenue" obtained from user fees and tax surcharges (see Jin, Qian, & Weingast, 2005).

One of consequences of these fiscal reforms is that they caused large distinctions across provinces in terms of their budgetary positions. Thus, it is possible to examine whether these distinctions could influence inflation in China. What might be the effect of the fiscal deficit on inflation in that country?

The study discussed in this paper aimed to investigate this issue. We examined the short-run and long-run effects of fiscal policy on the inflation.

Why is it important to investigate the long-run effect of fiscal policy on the inflation? The literature could not establish a strong and significant relationship between fiscal deficits and inflation (see Blanchard & Fischer, 1989). Seigniorage theory implies that fiscal deficits and inflation need not be contemporaneously correlated (see Catão & Terrones, 2005; Sargent & Wallace, 1981). However, the theory does posit that there is a significant connection between fiscal deficits and inflation in the long-run.

The remainder of the paper is organized as follows. Section 2 presents the empirical models. Section 3 provides details about the data sources. Section 4 presents the empirical results and main findings. The conclusion is presented in Section 5.

Empirical Models

Short-run Empirical Model

To explain the inflation process and the effect of the fiscal deficit on inflation in the short-run, we use the vector auto regression (VAR) methodology proposed in the literature (see Brada & Kutan, 1999; Komulainen & Pirttilä, 2000; Ross, 2000).

We first estimate a 4-variable VAR model with CPI, money supply data (M1), oil price, and fiscal deficit to examine inflation across provinces in China. We estimate this VAR model for each province. Granger causality tests are also performed for all variables for all provinces. In general, each VAR can be expressed as:

$$Y_t = c + \sum \Phi Y_{t-1} + \varepsilon_t \tag{1}$$

Y_t is a vector of endogenous variables, c is a vector of constants, ε_t is a vector of white noise residuals that are uncorrected with their own lagged, and Φ is a time invariant matrix of autoregressive coefficients to be estimated.

Long-run Empirical Model

To investigate the long-run effect of fiscal deficit on inflation, our empirical methodology follows that of Darvas, Rose, and Szapáry (2007), which examines the long-run effects of fiscal policies on business cycle volatility and growth. In the literature, this empirical methodology is widely used to investigate the long-run effect of fiscal policy on economic variables (see Furceri, 2007, 2009; Lan & Sylwester, 2010).

The empirical analysis relies on a key variable: fiscal deficit. We measure fiscal deficit in province i during sub-period τ as:

$$Fiscal_{i\tau} \equiv 1/\tau * \sum \left(\left| Budg_{it} \right| \right) \qquad (2)$$

$Budg_{it}$ is the provincial nominal government budget deficit of province i at time t, measured as a percentage of nominal GSP. $Fiscal_{i\tau}$ denotes the average (over sub-period τ) absolute value of the budget deficit of province i.

The benchmark regression takes this simple form:

$$Inflation_{i\tau} = \alpha_{\tau} + \beta\, Fiscal_{i\tau} + M1_{i\tau} + Oilprice_{i\tau} + \varepsilon_{ij\tau} \qquad (3)$$

$Inflation_{i\tau}$ is the average (over sub-period τ) inflation rate in province i, $M1_{i\tau}$ is the average (over sub-period τ) annual percent change of M1, and $Oilprice_{i\tau}$ is the average (over sub-period τ) annual percent change in the oil price.

To allow inflation-budget deficit elasticity to change across inflation levels, we also use a different measurement of inflation: log (1+ $P_{i\tau}$) where $P_{i\tau}$ is the average (over sub-period τ) annual percent change of CPI in province i.

The second robustness check is a different speciation of deficit. We also use deficit scaled by M1 to allow for the nonlinearity in the model.

Data

China has 31 provincial level localities. Due to the lack of data, we excluded the provinces of Xizang (Tibet), Hainan, Chongqing, and Sichuan. Thus, we worked with 27 provincial level localities.

Annual data from 1980 to 2009 on the index of real Gross State Product (RGSP), the CPI, and government spending and revenue (FISCAL) for 27 provinces in China were obtained from www.chinadataonline.com. These data were provided by the National Bureau of Statistics of China. Money supply data (M1) were collected from the People's Bank of China, which is the Central Bank of China. Oil prices were obtained from www.eia.gov.

Growth for each province in China is computed as the first difference in the log of RGSP. Inflation for each province in China is computed as the first difference of the log of CPI. Fiscal deficit is the absolute value of the difference between government revenue and government spending, measured as a percentage of Gross State Product (GSP). Finally, the increase in the oil price is measured as the first difference in the log of the annual average crude oil price.

Empirical Results and Main Findings

Empirical Results in the Short-run

Before estimating the models, we conducted routine diagnostic unit root tests. We tested the stationarity of our variables using the Augmented Dickey-Fuller (ADF) and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) methods.

Table 1 reports the ADF test statistics for all provinces for four economic variables: the first difference of the log of CPI, M1, and oil price and the fiscal deficit measured as a percentage of GSP. We reject the null of a unit root for the first difference of the log in M1, oil price, and the fiscal deficit measured as a percentage of GSP across the provinces at conventional test sizes. As seen in the second column in Table 1, the test statistics for the first difference of the log in CPI indicate they are stationary, expect for Guizhou province. We did not report the KPSS test statistics. The results also generally indicate the first differences for all the variables to be stationary.

Table 1: Unit Root Test (ADF)

Province	CPI	M1	OIL PRICE	FISCAL
Anhui	-4.38	-4.71	-4.77	-5.40
Beijing	-5.22	-5.61	-4.77	-3.63
Fujian	-4.34	-3.82	-4.77	-6.69
Gansu	-2.88	-6.81	-4.77	-3.83
Guangdong	-3.17	-4.73	-4.77	-3.18
Guangxi	-3.16	-8.10	-4.77	-5.64
Guizhou	-2.57**	-3.43	-4.77	-5.43
Hebei	-4.02	-5.40	-4.77	-7.26
Henan	-4.32	-4.44	-4.77	-7.54
Heilongjiang	-3.55	-2.93	-4.77	-4.65
Hubei	-2.81	-2.98	-4.77	-6.25
Hunan	-4.32	-4.44	-4.77	-7.54

Inner Mongolia	-4.13	-5.29	-4.77	-5.73
Jiangshu	-4.60	-4.57	-4.77	-3.20
Jiangxi	-3.05	-2.71	-4.77	-4.75
Jilin	-4.20	-5.22	-4.77	-4.19
Liaoning	-2.65	-5.15	-4.77	-4.75
Ningxia	-4.48	-3.64	-4.77	-4.76
Qinghai	-3.87	-4.02	-4.77	-4.28
Shangdong	-2.70	-3.45	-4.77	-2.88
Shanghai	-4.79	-3.97	-4.77	-3.82
Shannxi	-4.05	-7.05	-4.77	-4.96
Shanxi	-4.58	-3.76	-4.77	-4.78
Tianjing	-3.32	-2.78	-4.77	-3.93
Xinjiang	-3.87	-2.82	-4.77	-3.51
Yunnan	-2.64	-5.09	-4.77	-5.99
Zhejiang	-2.70	-4.70	-4.77	-6.58

Note. The critical values for the ADF statistics are: -2.62 (10%), -2.97 (5%), and -3.68 (1%).

** Fails to reject the null hypothesis of the unit-root process at the 10% level for the ADF test.

Now, we turn to our findings. The number of lags is determined by the Akaike Information Criterion (AIC) and Schwarz, or the so-called Bayesian Information Criterion (BIC). For all provinces, two lags are sufficient to generate white-noise residuals.

The results of the Granger Causality tests and variance decompositions for all variables and for all provinces are shown in Table 2. We found that the money supply has a strong causal effect on CPI for most of the provinces in China (18/27). However, we do not find that fiscal deficit has significant causal effects on the price level for the provinces.

Table 2: Is the Price Level Caused by …?

Province	M1	OIL PRICE	FISCAL
Anhui	N	N	N
Beijing	N	N	N
Fujian	N	N	N

Gansu	N	N	N
Guangdong	Y	N	N
Guangxi	Y	N	N
Guizhou	Y	N	Y
Hebei	Y	N	N
Henan	N	N	N
Heilongjiang	Y	N	N
Hubei	Y	N	N
Hunan	N	N	N
Inner Mongolia	Y	N	N
Jiangshu	Y	N	N
Jiangxi	N	N	N
Jilin	Y	N	N
Liaoning	Y	N	N
Ningxia	Y	N	N
Qinghai	Y	N	Y
Shangdong	Y	N	N
Shanghai	Y	N	N
Shannxi	Y	N	N
Shanxi	N	N	N
Tianjing	Y	N	N
Xinjiang	Y	N	N
Yunnan	N	N	N
Zhejiang	Y	N	N

Examining the variance decompositions shows the relative importance of each variable in explaining the change in the price level. Table 3 presents the decompositions of forecast error variance of inflation. As seen in Table 3, money supply seems to generally play a more dominant role in explaining price variation for all the provinces.

Table 3: Variance Decompositions and Relative Importance in Explaining the Price Level

Province	M1	OIL PRICE	FISCAL

Anhui	26.00	10.00	18.00
Beijing	8.00	5.00	7.00
Fujian	15.00	8.00	8.00
Gansu	9.00	1.00	1.00
Guangdong	43.00	2.00	1.00
Guangxi	19.00	2.00	2.00
Guizhou	14.00	1.00	9.00
Hebei	17.00	1.00	2.00
Henan	9.00	1.00	5.00
HLJ	12.00	1.00	1.00
Hubei	14.00	1.00	3.00
Hunan	9.00	1.00	5.00
IM	32.00	5.00	2.00
Jiangshu	31.00	1.00	1.00
Jiangxi	5.00	1.00	8.00
Jilin	45.00	2.00	3.00
Liaoning	38.00	5.00	8.00
Ningxia	16.00	1.00	3.00
Qinghai	31.00	3.00	10.00
Shangdong	21.00	1.00	1.00
Shanghai	15.00	1.00	1.00
Shannxi	23.00	2.00	11.00
Shanxi	9.00	1.00	3.00
Tianjing	21.00	3.00	1.00

Empirical Results in the Long-run

The 30-year sample period is divided into two uneven sub-periods: 1980–1993 and 1994–2009, corresponding to different phases of fiscal reforms in China.

Table 4 and Table 5 report the coefficient estimates of β from Equation (3).

Table 4 presents the estimates for the entire sample. All the coefficients are positive and significantly different from zero at the 5 percent or 10 percent levels. The results from different measurements of fiscal deficit and the inflation are similar. Table 5 presents the estimates for the sample after the second fiscal reform in 1993. Our findings suggest that there is a more significant and strong positive correlation between fiscal deficit and inflation (Table 5).

Table 4: Estimates of β, for the Entire Sample

Row		Fiscal/GDP	Fiscal/M1
1	Benchmark	0.0012*	0.0047**
		(0.0009)	(0.0019)
2	Inflation	0.0012**	0.0037*
		(0.0008)	(0.002)

Note. Standard errors are given in parentheses. Coefficients that are significantly different from 0 at the 0.10, 0.05, and 0.01 levels are marked with one, two, and three asterisk(s).

Table 5: Estimates of β, After the 1994 Sample

Row		Fiscal/GDP	Fiscal/M1
1	Benchmark	0.0047***	0.0049**
		(0.0013)	(0.001)
2	inflation	0.005***	0.028***
		(0.0014)	(0.007)

Note. Standard errors are given in parentheses. Coefficients that are significantly different from 0 at the 0.10, 0.05, and 0.01 levels are marked with one, two, and three asterisk(s).

In summary, there is no significant relationship between fiscal deficit and inflation in the short-run, and inflation is driven by money growth in the short-run. In contrast, our results suggest a statically significant positive correlation between fiscal deficit and inflation in the long-run in China. These findings are consistent with the results reported in the literature.

Conclusions

We examined the main determinants of the inflation in China at the provincial level with a focus on the short-run and long-run effect of fiscal policy on inflation. Our empirical results show that money supply is the main determinant of inflation, and fiscal deficit does not affect inflation in the short-run. In contrast, our results suggest a statically significant positive correlation between fiscal deficit and inflation in the long-run in China. These findings are consistent with some of the results reported in the literature.

References

Argarwala, R. (1992). *China: Reforming intergovernmental fiscal relations*. World Bank Discussion Paper 178.

Blanchard, O., & Fischer, S. (1989). *Lectures on macroeconomics*. Cambridge, MA: MIT Press.

Brada, J. C., & Kutan, A. M. (1999). *The end of moderate inflation in three transition economies?* William Davidson Institute Working Papers Series 230. William Davidson Institute at the University of Michigan.

Catão, L. A. V., & Terrones, M. E. (2005). Fiscal deficits and inflation. *Journal of Monetary Economics*, *52*(3) 529–554. doi:10.1016/j.jmoneco.2004.06.003

Click, R. W. (1998). Seigniorage in a cross-section of countries. *Journal of Money, Credit and Banking*, *30*(2) 154–163. doi:10.2307/2601207

Darvas, Z., Rose, A., & Szapáry, G. (2007). Fiscal divergence and business cycle synchronization: Irresponsibility is idiosyncratic. In J. Frankel & C. Pissarides (Eds.). *NBER International Seminar on Macroeconomics*. Cambridge, MA, and London: MIT Press.

Dornbusch, R., Sturzenegger, F., Wolf, H., Fischer, S., & Barro, R. J. (1990). Extreme inflation: Dynamics and stabilization. *Brookings Papers on Economic Activity, 1990*(2)1–84. doi:10.2307/2534504

Fischer, S., Sahay, R., & Végh, C. A. (2002). Modern hyper- and high inflations. *Journal of Economic Literature*, *40*(3) 837–880. doi:10.1257/jel.40.3.837

Furceri, D. (2007). Is government expenditure volatility harmful for growth? A cross-country analysis. *Fiscal Studies*, *28*(1) 103–120. doi:10.1111/j.1475-5890.2007.00049.x

Furceri, D. (2009). Fiscal convergence, business cycle volatility, and growth. *Review of International Economics*, *17*(3) 615–630. doi:10.1111/j.1467-9396.2009.00837.x

Jin, H., Qian, Y., & Weingast, B. R. (2005). Regional decentralization and fiscal incentives: Federalism, Chinese style. *Journal of Public Economics*, *89*(9–10) 1719–1742. doi:10.1016/j.jpubeco.2004.11.008

Jin, H., & Zou, H.-F. (2003). J. Rodden, G. S. Eskeland & J. Litvack (Eds.). *Soft-budget constraints and Local Government in China in* *fiscal decentralization and the challenge of hard budget constraints*. Cambridge, MA, and London: MIT Press.

Komulainen, T., & Pirttilä, J. (2000). Fiscal explanations for inflation: Any evidence from transition economies? *SSRN Electronic Journal*, *35* 293–316. doi:10.2139/ssrn.250531

Lan, Y., & Sylwester, K. (2010). Provincial fiscal positions and business cycle synchronization across China. *Journal of Asian Economics*, *21*355–364. doi:10.1016/j.asieco.2010.02.004

Lin, J. Y., & Liu, Z. (2000). Fiscal decentralization and economic growth in China. *Economic Development and Cultural Change*, *49*(1) 1–21. doi:10.1086/452488

Ma, J. (1997). *Intergovernmental relations and economic management in China*. New York: St. Martin's Press.

Ross, K. (2000). Post-stabilization inflation dynamics in Slovenia. *Applied Economics*, *32*(2) 135–149. doi:10.1080/000368400322831

Sargent, T. J., & Wallace, N. (1981). Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*, *5*(3) 1–17. doi:10.21034/qr.531

Wong, C. (1997). *Financing Local Government in the People's Republic of China Hong Kong*. Oxford: Oxford University Press.

Zhang, T., & Zou, H.-F. (1998). Fiscal decentralization, public spending, and economic growth in China. *Journal of Public Economics*, *67*(2) 221–240. doi:10.1016/S0047-2727(97)00057-1

Is a Nonprofit Organization's Self-preparing its Tax Return Associated with Lower Donations?

Nicholas P. Marudas
Mercer University
Julie Petherbridge
Mercer University
Maria A. Leach-López
The University of South Dakota

Abstract

Neuman, Omer, and Thompson (2015) find an association between nonprofit organizations' (NPOs') self-preparing their tax returns and lower donations relative to using a paid preparer, suggesting that NPOs that self-prepare could increase donations by using a paid preparer. Using similar data, we test a similar model as well as a second model of donations and find that NPOs' self-preparing their tax returns is not associated with lower donations.

Introduction

This study examines whether a nonprofit organization's (NPO's) choice to self-prepare its tax return is associated with lower donations. The results of this study should be useful to NPOs in deciding whether to self-prepare their tax return or use a paid preparer.

In a comprehensive paper on determinants and consequences of choice of tax service provider by NPOs, Neuman, Omer, and Thompson (2015) (hereafter "NOT"), find, among other things, that an NPOs' self-preparing its tax return is negatively related to donations it receives in the following year. NOT is the only study of which we are aware that examines the association between self-preparing tax forms and donations. They state that they expect NPOs that self-prepare their tax forms to receive lower donations because self-prepared returns may provide donors with lower-quality information than professionally prepared returns or because donors believe that NPOs that self-prepare their tax forms provide lower quality information.

NPOs that self-prepare their tax forms may interpret NOT's results as support for hiring a paid tax preparer to increase donations, and firms providing tax services may use NOT's results as a marketing tool for providing tax services to NPOs that currently self-prepare their tax forms.

For self-prepared returns, ceteris paribus, to provide donors with lower-quality information, donors must be aware of whether an NPO self-prepares its tax return. We are skeptical that donors are aware of which NPOs self-prepare their tax returns. Who prepares an NPO's tax return is not reported on the financial statements, nor is it reported by any watchdog agency or the popular press. Therefore, to become aware of whether an NPO self-prepares its tax return, a donor would have to examine the tax return itself. We believe it highly unlikely that donors examine NPO tax returns. Balsam and Harris (2014) examine the response of donations to executive compensation as reported on the tax form and do not find a significant relation between executive compensation and overall donations. Interestingly, Balsam and Harris do find a significant negative relation between donations and high executive pay for NPOs for which such pay is reported in the popular press. This supports the notion that donors generally do not access the tax form to learn the amount of NPO executive compensation but can learn of high executive compensation from the popular press. We are not aware of any articles in the popular press on NPOs self-preparing their tax returns. Kitching (2009) finds that NPOs with a Big-N auditor receive higher donations, ceteris paribus, than NPOs with a non-Big-N auditor. Kitching posits that this may be because donors perceive that NPOs with a Big-N auditor have higher-quality financial reporting. However, the name of the auditor is available from NPOs' annual reports but is not available from the tax return.

Alternatively, to the extent that donors are aware of which NPOs self-prepare their tax returns, they might perceive that the ability of an NPO to self-prepare its tax return is an indicator of in-house expertise and the NPO's emphasis on cost savings. Donors might view this positively and reward such NPOs with more donations, instead of viewing it negatively as an indicator of lower-quality reporting as reported by NOT.

We attempt to confirm NOT's results by testing a model and data very similar to theirs. Our results indicate that an NPO's self-preparing its tax forms is not significantly associated with donations. Additionally, our results for some of the control variables differ significantly from NOT's results and are generally more consistent with results of other studies. We also include additional control variables in NOT's model and find qualitatively similar results. As an additional robustness test, we test a simpler model of donations established in the literature (Tinkelman, 1998) to which we add the self-preparer variable. Results from testing this model also indicate that an NPO's self-preparing its tax forms is not significantly associated with donations. These results suggest that NPOs should not be concerned that self-preparing their tax forms negatively impacts donations, nor that using an outside tax preparer will increase donations.

Sample Selection

In selecting our sample, we attempted to follow NOT's methodology. They selected an initial sample of NPOs that were both in the Federal Clearinghouse of A-133 audits for 2004-06 and in the Statistics of Income (SOI) database for 2004-06. They selected this sample when the latest SOI data available was for 2006. When SOI data became available for 2007 and 2008, they identified which of their initial sample of 1,172 NPOs also had data for 2007 and 2008 in the SOI and Clearinghouse databases. In this way, they created a sample consisting of five years of data from 2004 to 2008. They then selected every other NPO, reducing their sample by approximately half, leaving them with a final sample of 940 NPOs.

We also developed a data set of NPOs in both the Federal Clearinghouse and the SOI databases. Like NOT's study, our study includes five years of data. We manually collected data on tax preparer for the five years from 2002 to 2006, to test the effect of self-preparing the tax form in 2005 on donations in 2006, whereas NOT's sample consists of five years of data from 2004 to 2008 to test the effect of self-preparing the tax form in 2007 on donations in 2008. We elected to test the donations received in 2006 as a mid-point in NOT's model. Additionally, our sample was developed in the same way NOT developed their sample and the model tested is essentially the same as NOT's as discussed below.

Our initial data set, following NOT, contains all NPOs that were in both the Federal Clearinghouse of A-133 Audits database and the Statistics of Income database and for which there is three consecutive years of data (2004-06). This data set contains 2,317 NPOs. Following NOT, we then selected, from this sample, every other NPO within each industry classification, for which to manually collect data on tax preparer. Our sample was reduced by half, (1,158 NPOs), leaving 1,159 NPOs. Because our study needs five consecutive years of data, we lost 175 NPOs that did not have five consecutive years of data, leaving 984 in our sample.

We did not delete NPOs with zero fundraising, as is done in many prior studies, because NOT did not do so[1]. However, we also tested NOT's model to which certain control variables are added, including an indicator variable for whether an NPO reports zero fundraising.

The correlations are presented in Table 1a and Table 1b, with the variable descriptors located below Table 1a and above Table 1b. Descriptive statistics for our sample and for NOT's sample are shown in Table 2. Applying the method of Hair, Anderson, Tatum, and Black (1995), no significant multicollinearity is indicated in the data for any of the models tested. Cook's test for influential outliers indicated no influential outliers in the data for any of the models tested.

Table 1a: Correlations

	ZEROFR	PREPARE	NOCOMP	INDDON	CHG DON	PRICE	DISTRESS	ADMIN	LOWRISK	TSURP
ZEROFR	1.000	-.030	.011	.009	.020	-.031	-.071	.015	-.014	.100
SELF PREPARE	-.030	1.000	-.021	.021	.030	.002	-.072	-.020	-.021	-.040
NOCOMP	.011	-.021	1.000	-.008	.014	.038	-.012	-.085	.086	-.011
INDDON	.009	.021	-.008	1.000	.013	.007	.007	.008	.093	-.007
CHG DON	.020	.030	.014	.013	1.000	.051	.021	-.024	-.001	.056
PRICE	-.031	.002	.038	.007	.051	1.000	-.034	-.065	.090	.045
DISTRESS	-.071	-.072	-.012	.007	.021	-.034	1.000	.008	.052	-.057
CHG ADMIN	.015	-.020	-.085	.008	-.024	-.065	.008	1.000	.012	-.009
LOWRISK	-.014	-.021	.086	.093	-.001	.090	.052	.012	1.000	-.007
TSURP	.100	-.040	-.011	-.007	.056	.045	-.057	-.009	-.007	1.000
PREV	.025	.005	.089	-.054	.049	.036	-.092	-.047	.015	.090
GOV	-.017	.052	.020	-.090	.041	.151	-.016	.039	.067	.033
NONAUDITOR	-.052	.238	.066	-.115	.051	-.020	-.036	-.008	-.078	.052
LEVERAGE	-.162	.021	-.039	-.035	-.003	-.007	-.027	-.022	-.046	.279
FR	.034	-.070	.096	.008	.113	-.101	.123	.063	-.012	.012
AGE	.002	-.075	-.080	.037	.152	.018	.022	.060	-.018	.022
FEESENS	-.039	.001	-.021	-.030	.086	.664	-.027	-.019	.034	.066
DON	.010	.010	.030	-.113	-.116	-.003	-.053	-.078	-.001	-.011
TASS	-.006	-.133	.023	.014	-.063	-.064	.073	.015	-.040	-.059

ZEROFR is an indicator variable that takes on the value of one if the NPO reports zero fundraising expenses and zero otherwise
SELFPREPARE is an indicator variable taking the value one if the tax return is self-prepared and zero if it is not
NOCOMP is an indicator variable taking the value one if the NPO reports zero executive compensation and zero otherwise
INDDON is the mean across the five years of (DON / median DON of the industry)
CHGDON is $(DON_t - DON_{t-1}) / DON_{t-1}$
PRICE is total expenses / program expenses

[1] We tested the model on the observations with zero fundraising expenses and then the observations with non-zero fundraising expenses. For the zero fundraising expenses sample, the results for all variables were qualitatively identical to the results of the full sample, except that governmental support was no longer significant. For the non-zero fundraising expense sample, results were qualitatively identical to the results of the full sample.

DISTRESS is an indicator variable equal to one if the NPO falls at or below the 5th percentile of NPO organizations in the ratios of: net assets to total assets or net assets to total revenues and zero otherwise
CHGADMIN is (administrative expenses at time t – administrative expenses at time t-1) / administrative expenses at time t-1
LOWRISK is an indicator variable taking the value of one if the NPO is described as "low risk" in the A-133 audit report and zero otherwise
TSURP is (total revenues – total expenses) / total revenues
PREV is program service revenues
GOV is governmental support
NONAUDITOR is an indicator variable taking the value of one if the paid preparer of the tax form and the auditor of the financial statements is not the same and zero otherwise
LEVERAGE is total debt / total assets
FR is fundraising expenses
AGE is years since the NPO first filed its tax return
FEESENSITIVITY is an indicator variable equal to one if the NPO administrative expenses to program expenses is below the industry median (by ntee code) and zero otherwise
DON is direct public support
TASS is total assets

Table 1b: Correlations

	PREV	GOV	AUDITOR	E	FR	AGE	FEESENS	DON	TASS
ZEROFR	.025	-.017	-.052	-.162	.034	.002	-.039	.010	-.006
SELF PREPARE	.005	.052	.238	.021	-.070	-.075	.001	.010	-.133
NOCOMP	.089	.020	.066	-.039	.096	-.080	-.021	.030	.023
INDDON	-.054	-.090	-.115	-.035	.008	.037	-.030	-.113	.014
CHG DON	.049	.041	.051	-.003	.113	.152	.086	-.116	-.063
PRICE	.036	.151	-.020	-.007	-.101	.018	.664	-.003	-.064
DISTRESS	-.092	-.016	-.036	-.027	.123	.022	-.027	-.053	.073
CHG ADMIN	-.047	.039	-.008	-.022	.063	.060	-.019	-.078	.015
LOWRISK	.015	.067	-.078	-.046	-.012	-.018	.034	-.001	-.040
TSURP	.090	.033	.052	.279	.012	.022	.066	-.011	-.059
PREV	1.000	.186	.076	-.018	-.036	-.177	-.022	.258	-.493
GOV	.186	1.000	-.017	.052	.135	.139	.006	-.101	-.362
NONAUDITOR	.076	-.017	1.000	.029	-.008	.043	.025	-.054	.009
LEVERAGE	-.018	.052	.029	1.000	-.005	.057	.035	-.031	-.045
FR	-.036	.135	-.008	-.005	1.000	-.152	-.109	-.490	.053
AGE	-.177	.139	.043	.057	-.152	1.000	.037	-.083	-.220
FEESENS	-.022	.006	.025	.035	-.109	.037	1.000	-.058	-.001
DON	.258	-.101	-.054	-.031	-.490	-.083	-.058	1.000	-.521
TASS	-.493	-.362	.009	-.045	.053	-.220	-.001	-.521	1.000

Variable descriptors found above Table 1b

Table 2: Descriptive Statistics

	Our data	Neuman, Omer, and Thompson (NOT) data

	Mean	Std. Dev.	Mean	Std. Dev.
$lnDON_{t+1}$	15.087	2.213	14.939	2.098
$lnDON_t$	14.929	2.214	14.940	2.098
SELFPREPARE	0.304	0.460	0.244	0.429
lnFR	11.345	5.484	10.907	5.660
lnPRICE	0.180	0.109	0.182	0.115
lnPREV	15.817	4.531	17.721	1.526
lnGOV	12.828	5.424	12.726	5.560
lnAGE	4.101	0.809	3.635	0.643
CHGDON	0.650	4.825	0.352	0.479
CHGADMIN	0.110	0.604	0.010	0.035
DISTRESS	0.011	0.105	0.029	.0167
FEESENSITIVITY	0.485	0.500	0.452	0.497
NOCOMP	0.095	0.293	0.216*	0.411*
NONAUDITOR	0.134	0.341	0.121	0.327
LOWRISK	0.777	0.416	0.802	0.398
INDDON	5.712	40.310	1.459**	1.314**
TASSET	18.314	1.846		
LEVERAGE	-1.338	0.815		
TSURP	0.076	0.122		
ZEROFR	0.178	0.383		
N	984		940	

DON is direct public support
SELFPREPARE is an indicator variable taking the value one if the tax return is self-prepared and zero if it is not
FR is fundraising expenses
PRICE is total expenses / program expenses
PREV is program service revenues
GOV is governmental support
AGE is years since the NPO first filed its tax return
CHGDON is $(DON_t - DON_{t-1}) / DON_{t-1}$
CHGADMIN is (administrative expenses at time t – administrative expenses at time t-1) / administrative expenses at time t-1
DISTRESS is an indicator variable equal to one if the NPO falls at or below the 5th percentile of NPO organizations in the ratios of: net assets to total assets or net assets to total revenues and zero otherwise
FEESENSITIVITY is an indicator variable equal to one if the NPO administrative expenses to program expenses is below the industry median (by ntee code) and zero otherwise
NOCOMP is an indicator variable taking the value one if the NPO reports zero executive compensation and zero otherwise
NONAUDITOR is an indicator variable taking the value of one if the paid preparer of the tax form and the auditor of the financial statements is not the same and zero otherwise
LOWRISK is an indicator variable taking the value of one if the NPO is described as “low risk” in the A-133 audit report and zero otherwise

INDDON is the mean across the five years of (DON / median DON of the industry)
TASSET is total assets
LEVERAGE is total debt / total assets
TSURP is (total revenues – total expenses) / total revenues
ZEROFR is an indicator variable that takes on the value of one if the NPO reports zero fundraising expenses and zero otherwise

* This is for NOT's variable MISREPORT. Although NOT discuss the variable NOCOMP, they do not report descriptive statistics for it, since they do not use it in their model.
** NOT defined this variable as "the natural logarithm of the mean of public support less industry median support over the prior years". We find that, as thereby defined, this variable assumes an undefined value for some of the observations in our sample because the mean of (public support less industry median support) is negative and the log of a negative number is undefined. However, in their descriptive statistics, NOT report a positive mean value. They find this variable to be not significant in their model. We defined this variable in the only plausible way we could think of to produce defined values for all observations, as the mean of (public support / median industry public support) over the five years and found it be significant though very small. We tested the sensitivity of results to excluding this variable in the model and found no qualitative differences for any variables in the model.

Models Tested

The Neuman, Omer, and Thompson (2015) Model

Neuman, Omer, and Thompson (2015) ("NOT") developed and tested the following model of donations.

$$\begin{aligned} lnDON_{t+1} = {} & a + b_1NONAUDITORt + b_2SELFPREPAREt + \\ & b_3MISREPORTt + b_4lnDON_t + b_5lnFR_t + b_6lnPRICE_t + \\ & b_7lnPREV_t + b_8lnGOV_t + b_9lnAGE_t + b_{10}CHGDONt + \\ & b_{11}CHGADMINt + b_{12}DISTRESS_t + b_{13}FEESENSITIVITY_t \\ & + b_{14}LOWRISK_t + b_{15}lnINDDON_t + u_{t+1} \qquad (1) \end{aligned}$$

NONAUDITOR is an indicator variable taking on the value one if the paid preparer is not the NPO's auditor and the value zero if the paid preparer is the NPO's auditor, SELFPREPARE is an indicator variable taking the value one if the tax return is self-prepared and zero if it is not, MISREPORT is an indicator variable that takes on the value one if a company reports no or zero executive compensation on the tax return but does disclose the amount of executive compensation in a supplemental disclosure (indicating that the NPO does, in fact, pay executive compensation). The remaining control variables are described below.

DON is donations, FR is fundraising expenses, PRICE is total expenses / program expenses, PREV is program service revenues, GOV is governmental support, AGE is years since the NPO first filed its tax return, CHGDON is (DON_t - DON_{t-1}) / DON_{t-1}, CHGADMIN is (administrative expenses at time t – administrative expenses at time t-1) / administrative expenses at time t-1, INDDON is mean of (DON / median DON of the NPO's industry) over the last five years.

NOT define INDDON as "the natural logarithm of the mean of public support less industry median support over the prior years." In the presentation of their model, they do not indicate the log of the value. However, in their Descriptive statistics section, they report a mean value of 1.459, suggesting that this is the log of some number; had the unlogged version of the variable been used, the mean would have been orders of magnitude higher. The logged values of the variable as NOT define it is undefined for some of the observations in our sample because the unlogged variable is negative, the log of which is undefined. NOT do not state whether they encountered such undefined values and, if they did, how they dealt with these observations. Because of this, we defined the variable as the natural log of the mean of (DON / median industry DON), which is consistent with NOT's stated purpose for including INDDON: to "… include industry-adjusted contributions over the prior five years." NOT found INDDON not to be significant. Using our definition of INDDON, we find it to be significant. We tested the sensitivity of results to excluding this variable in the model and found no qualitative differences for any variables in the model.

DISTRESS is an indicator variable equal to one if the NPO falls at or below the 5th percentile of NPO organizations in the ratios of: net assets to total assets or net assets to total revenues and zero otherwise, FEESENSITIVITY is an indicator variable equal to one if the NPO administrative expenses to program expenses is below the industry median (by NTEE code) and zero otherwise, LOWRISK is an indicator variable equal to one if the NPO qualifies as a low-risk auditee as indicated in the A-133 audit report and zero otherwise, and u is the usual error term.

We test the NOT model with one slight modification - we replace MISREPORT with a similar variable, NOCOMP. Following Gordon, Knock, and Neely (2009) and NOT, who discuss this variable, we define this variable as taking a value of one if the NPO reports zero executive compensation and zero otherwise. Doing this assumes that all instances of reporting zero executive compensation are errors.

Following Gordon, Knock, and Neely (2009), we believe that this is a reasonable assumption. NOT, however, consider that 423 of the 586 observations with zero executive compensation on line 25 of the Form 990, actually correctly reported zero compensation because either the executive compensation in the detailed listing of executive compensation by individual also showed zero executive compensation for each individual or because the organization disclosed that a related party paid the executive compensation. This is how MISREPORT differs from NOCOMP. NOT state that the latter explanation applied to "the majority of cases." We take the view that donors and watchdog agencies would not consider the first explanation – reporting zero executive compensation for all individuals in the detailed listing of executive compensation on the Form 990 – to be convincing evidence that the NPO is not misreporting its executive compensation. Furthermore, because disclosure that a related party paid the executive compensation is not obvious in the 990, we doubt that an individual donor or a watchdog agency would be aware of this. In fact, according to NOT, Charity Navigator, a major watchdog agency, "advises prospective donors to be skeptical of zero executive compensation expense, noting '…If a charity you are considering reports no salary for its CEO, then we recommend you contact it directly … to learn how it has been able to attract and retain a competent leader without paying the individual'" (p. 714). This strongly implies that even Charity Navigator is unaware of related parties paying all of an NPO's executive compensation. We believe it is unlikely that a donor would contact an NPO that reports zero executive compensation, instead assuming that the NPO has misreported executive compensation. NOT found their variable, MISREPORT, to be not significant. Therefore, replacing NOCOMP for MISREPORT, the modified model we test is:

$$\begin{aligned} lnDON_{t+1} = {} & a + b_1NONAUDITORt + b_2SELFPREPAREt + \\ & b_3NOCOMPt + b_4lnDON_t + b_5lnFR_t + b_6lnPRICE_t + \\ & b_7lnPREV_t + b_8lnGOV_t + b_9lnAGE_t + b_{10}CHGDONt + \\ & b_{11}CHGADMINt + b_{12}DISTRESS_t + b_{13}FEESENSITIVITY_t \\ & + b_{14}LOWRISK_t + b_{15}lnINDDON_t + u_{t+1} \qquad (2) \end{aligned}$$

NOT's model does not include controls for certain factors that plausibly affect donations such as size (Tinkelman, 1998), leverage, extent of surplus, and whether an NPO reports zero fundraising expenses, a potential alternative signal of low-quality financial reporting (Yetman and Yetman, 2013). Therefore, we add total assets

(TASSET), as a proxy for size, lagged total debt to total assets (LEVERAGE) as a proxy for leverage, lagged (total revenues – total expenses) / total revenues (TSURP) as a proxy for extent of surplus, and an indicator variable ZEROFR, that takes on the value of one if the NPO reports zero fundraising and zero otherwise. The model that includes theses control variables, therefore, is:

$$lnDON_{t+1} = a + b_1NONAUDITORt + b_2SELFPREPAREt + b_3NOCOMPt + b_4lnDON_t + b_5lnFR_t + b_6lnPRICE_t + b_7lnPREV_t + b_8lnGOV_t + b_9lnAGE_t + b_{10}CHGDONt + b_{11}CHGADMINt + b_{12}DISTRESS_t + b_{13}FEESENSITIVITY_t + b_{14}LOWRISK_t + b_{15}lnINDDON_t + b_{16}lnTASSET_t + b_{17}lnLEVERAGE_t + b_{18}TSURP_t + b_{19}ZEROFR_t + u_{t+1} \quad (3)$$

Finally, as an additional robustness test, we test a simpler model already established in the literature, the Tinkelman (1998) model, which is:

$$lnDON_{t+1} = a + b_1lnFR_t + b_2lnPRICE_t + b_3lnPREV_t + b_4lnGOV_t + b_5lnOTHREV_t + b_6lnTASSET_t + b_7lnAGE_t + b_8SELFPREPARE_t + u_{t+1} \quad (4)$$

where DON is donations, FR is fundraising expenses, PRICE is total expenses / program expenses, PREV is program service revenues, GOV is governmental support, OTHREV is total revenues – (DON + GOV + PREV), TASSET is total assets, AGE is years since first filing a tax form, and SELFPREPARE is an indicator variable taking on the value one if the organization self-prepared its tax form and zero otherwise.

Results

We find that SELFPREPARE is not significant in any of the three models we test: the NOT model without additional control variables, as shown in column 2 of Table 3; the NOT model with additional control variables, as shown in column 3 of Table 3, and the Tinkelman (1998) model, as shown in Table 4. This is inconsistent with NOT's result that SELFPREPARE is significantly negative (-.262).

Table 3: Parameter Estimates from the Modified Neuman et. al (2015) Models

Without additional control variables

$lnDON_{t+1} = a + b_1NONAUDITORt + b_2SELFPREPAREt + b_3NOCOMPt + b_4lnDON_t + b_5lnFR_t + b_6lnPRICE_t + b_7lnPREV_t + b_8lnGOV_t + b_9lnAGE_t + b_{10}CHGDONt + b_{11}CHGADMINt + b_{12}DISTRESS_t + b_{13}FEESENSITIVITY_t + b_{14}LOWRISK_t + b_{15}lnINDDON_t + u_{t+1}$

With additional control variables

$lnDON_{t+1} = a + b_1NONAUDITORt + b_2SELFPREPAREt + b_3NOCOMPt + b_4lnDON_t + b_5lnFR_t + b_6lnPRICE_t + b_7lnPREV_t + b_8lnGOV_t + b_9lnAGE_t + b_{10}CHGDONt + b_{11}CHGADMINt + b_{12}DISTRESS_t + b_{13}FEESENSITIVITY_t + b_{14}LOWRISK_t + b_{15}lnINDDON_t + b_{16}lnTASSET_t + b_{17}lnLEVERAGE_t + b_{18}TSURP_t + b_{19}ZEROFR_t + u_{t+1}$

	No additional control variables	Additional control variables	
	Estimate (t-stat)	Estimate (t-stat)	Variance Inflation Factors
CONSTANT	.502 (1.49)	-.310 (-0.79)	
NONAUDITOR	.034 (0.46)	.025 (0.34)	1.1
SELFPREPARE	-.001 (-0.23)	-.040 (-0.70)	1.2
NOCOMP	-.029 (-0.34)	-.009 (-0.10)	1.1
DON_t	.862*** (54.50)	.815*** (42.80)	2.9
FR	.030*** (4.97)	.096*** (3.97)	1.9
PRICE	.089 (0.29)	-.012 (-0.04)	1.9
PREV	.002 (0.36)	-.005 (-0.75)	1.7
GOV	.069*** (3.65)	.051** (2.56)	1.4
AGE	.045 (1.22)	.022 (0.61)	1.6
CHGDON	-.050*** (-9.67)	-.046*** (-8.81)	1.1
CHGADMIN	.025	.032	1.0

	(-0.62)	(0.80)	
DISTRESS	-.248 (-1.07)	-.102 (-0.41)	1.1
FEESENSITIVITY	-.058 (-0.87)	-.072 (-1.09)	1.9
LOWRISK	.049 (.083)	.040 (0.68)	1.1
INDDON	.001** (2.31)	.001** (2.11)	1.1
TASSET		.057** (2.27)	3.6
LEVERAGE		-.108*** (-3.24)	1.3
TSURP		-.793*** (-3.54)	1.3
ZEROFR		.868*** (2.83)	3.9
R-squared	.884	.887	

*, **, and *** denote statistically significant at <.10, <.05 and <.01 levels, respectively
NONAUDITOR is an indicator variable taking the value of one if the paid preparer of the tax form and the auditor of the financial statements is not the same and zero otherwise
SELFPREPARE is an indicator variable taking the value one if the tax return is self-prepared and zero if it is not NOCOMP is an indicator variable taking the value one if the NPO reports zero executive compensation and zero otherwise
DON is direct public support
FR is fundraising expenses
PRICE is total expenses / program expenses
PREV is program service revenues
GOV is governmental support
AGE is years since the NPO first filed its tax return
CHGDON is $(DON_t - DON_{t-1}) / DON_{t-1}$
CHGADMIN is (administrative expenses at time t – administrative expenses at time t-1)/ administrative expenses at time t-1
DISTRESS is an indicator variable equal to one if the NPO falls at or below the 5^{th} percentile of NPO organizations in the ratios of: net assets to total assets or net assets total revenues and zero otherwise
FEESENSITIVITY is an indicator variable equal to one if the NPO administrative expenses to program expenses is below the industry median (by ntee code) and zero otherwise
LOWRISK is an indicator variable taking the value of one if the NPO is described as “low risk” in the A-133 audit report and zero otherwise
INDDON is the mean across the five years of (DON / median DON of the industry)
TASSET is total assets
LEVERAGE is total debt / total assets
TSURP is (total revenues – total expenses) / total revenues

ZEROFR is an indicator variable that takes on the value of one if the NPO reports zero fundraising expenses and zero otherwise

As shown in column 2 of Table 3, we find certain control variables to be significant. We compare our results with those of NOT and with those of Petrovits, Shakespeare, and Shih (2011), the model on which NOT's model is based. Generally, as discussed below, our results are more consistent with those in the literature and with the specific results of Petrovits et al., than NOT's results are.

We find a significant positive coefficient of .862 for prior year donations (DONt), similar to .922 reported by Petrovits and others (2011). NOT also find prior year donations to be significantly positive but with a much smaller coefficient of .096.

We find a significant positive coefficient of .030 for fundraising expense (FR), similar to .022 reported by Petrovits and others (2011). All other papers in the literature on the determinants of donations that we are aware of find FR to be significantly positive. NOT find fundraising expense to be not significant.

NOT report a very large significant positive coefficient of .973 for GOV. Many prior papers find a negative association between GOV and donations, with the highest parameter estimate (-.27) reported by Tinkelman (1999). Of the papers reporting a positive relation between GOV and donations, the highest significant parameter estimate reported is 0.12 (Marudas, 2004). Petrovits and others (2011) report a very small significant positive coefficient of .002, consistent with prior studies. We find a significant positive coefficient of .069.

NOT report a large significant negative coefficient of -1.055 for lagged change in donations (CHGDON). We also find a significant negative coefficient of -.050, but it is much smaller.

We find lagged change in administrative expenses (CHGADMIN) to be not significant. However, NOT report a very large significant positive coefficient of 2.986. This is somewhat surprising; Jacobs and Marudas (2009), Tinkelman and Mankaney (2007), and Marudas, Hahn, and Jacobs (2013) find a significant negative relation between donations and the ratio of administrative expenses to total expenses, consistent with their conjectures that donors prefer NPOs with lower administrative expenses.

Finally, we find a significant, but very small, positive coefficient of .001 for industry normalized donations (INDDON), whereas NOT find it to be not significant.

Results for testing the model with additional controls, shown in column 3 of Table 3, are qualitatively similar for all variables. SELFPREPARE is not significant. All four of the additional control variables are significant, although the coefficient of determination for the model is nearly unchanged.

TABLE 4: Parameter Estimates from the Tinkelman (1998) Model

$$lnDON_{t+1} = a + b_1 lnFR_t + b_2 lnPRICE_t + b_3 lnPREV_t + b_4 lnGOV_t + b_5 lnOTHREV_t + b_6 lnTASSET_t + b_7 lnAGE_t + b_8 SELFPREPARE_t + u_{t+1}$$

	Estimate (t-stat)
CONSTANT	1.158* (1.79)
FR	.166*** (18.15)
PRICE	-.264 -(0.67)
PREV	-.083*** (-7.24)
GOV	.155*** (4.43)
OTHREV	.116** (3.03)
TASSET	.479*** (8.52)
AGE	.129** (1.97)
SELFPREPARE	-.053 (-0.54)
R-squared	.631

*, **, and *** denote statistically significant at <.10, <.05 and <.01 levels, respectively
DON is donations
FR is fundraising expenses
PRICE is total expenses / program expenses
PREV is program service revenues
GOV is governmental support
OTHREV is total revenues – (DON + GOV + PREV)
TASSET is total assets
AGE is years since first filing a tax form,
SELFPREPARE is an indicator variable taking on the value one if the organization self-prepared its tax form and zero otherwise.

Discussion and Limitations

Neuman, Omer, and Thompson (2015) ("NOT") find that NPOs that self-prepare their tax forms receive significantly lower donations in the subsequent year than NPOs that use a paid preparer. Using similar data and a similar model, we find that NPOs that self-prepare their tax forms do not receive significantly lower donations than NPOs using a paid preparer. We find the same result from testing the model with additional variables to control for size, leverage, "profitability" and whether an NPO reports zero fundraising expenses, and from testing a simpler model of donations established in the literature. Our results suggest that donors may not be aware of whether NPOs self-prepare or, if they are aware of this, do not view this negatively. This is important because, based on NOT's results, some NPOs currently self-preparing their tax forms may believe that using a paid preparer would increase donations and would be more likely to hire a paid preparer. Furthermore, tax preparers could use NOT's results to market tax preparation services to NPOs that currently self-prepare. Our results raise some doubt regarding whether NPOs that currently self-prepare their tax form could increase donations by hiring a paid preparer.

One limitation of this study and NOT's is that the samples tested include only NPOs subjected to an A-133 audit. We find that self-preparing the tax return has no significant effect on NPOs that already are subjected to a rigorous A-133 audit. However, it may be that NPOs that have only a financial statement audit or whose financial statements are not audited at all may suffer lower donations from self-preparing their tax returns, since they do not provide the donor market with a signal (the A-133 audit) of higher-quality financial reporting. Future research could test samples of NPOs not subjected to an A-133 audit, instead of limiting the sample to NPOs with an A-133 audit. Additional research could also identify organizational characteristics that impact the sensitivity of donations to whether an NPO self-prepares its tax form or hires a paid preparer.

References

Balsam, S., & Harris, E. E. (2014). The impact of CEO compensation on nonprofit donations. *The Accounting Review,* 89(2) 425-450.

Gordon, T. P., Knock, C. L., & Neely, D. G. (2009). The role of rating agencies in the market for charitable contributions: An empirical test. *Journal of Accounting and Public Policy,* 28(6) 469-484.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W. C. (1995), *Multivariate Data Analysis.* Prentice-Hall Inc., Upper Saddle River, NJ., USA, 4th Ed.

Jacobs, F. A., & Marudas, N. P. (2009). The combined effect of donation price and administrative inefficiency on donations to US nonprofit organizations. *Financial Accountability & Management,* 25(1) 33-53.

Kitching, K. (2009). Audit value and charitable organizations. *Journal of Accounting and Public Policy,* 28(6) 510-524.

Marudas, N. P. (2004). Effects of nonprofit organization wealth and efficiency on private donations to large nonprofit organizations. *Research in Governmental and Nonprofit Accounting,* 11 71-92.

Marudas, N. P., Hahn, T., & Jacobs, F. A. (2014). An improved model of effects of accounting measures of inefficiency on donations. *Journal of Finance and Accountancy,* 15 1-14.

Neuman, S. S., Omer, T. C., & Thompson, A. M. (2015). Determinants and consequences of tax service provider choice in the not-for-profit sector. *Contemporary Accounting Research,* 32(2) 703-735.

Petrovits, C., Shakespeare, C., & Shih, A. (2011). The causes and consequences of internal control problems in nonprofit organizations. *The Accounting Review,* 86(1) 325-357.

Tinkelman, D. (1998). Differences in sensitivity of financial statement users to joint cost allocations: The case of nonprofit organizations. *Journal of Accounting, Auditing, and Finance,* 13(4) 377-393.

Tinkelman, D. (1999). Factors affecting the relation between donations to not-for-profit organizations and an efficiency ratio. *Research in Governmental and Nonprofit Accounting,* 10(1) 135-161.

Tinkelman, D., and Mankaney, K. (2007). When is administrative efficiency associated with charitable donations? *Nonprofit and Voluntary Sector Quarterly,* 36(1) 41-64.

Yetman, M.H., and Yetman, R. J. (2013). Do donors discount low-quality accounting information? *The Accounting Review,* 88(3) 1041-1067.

Captive Insurance, Income Stability, and Firm Performance: Evidence from S&P Europe 350 Companies

Mu-Sheng Chang, California State University, Northridge[1]
Jiun-Lin Chen, Valparaiso University
Harold Weston, Georgia State University

Abstract

We examine the use of captive insurance among S&P Europe 350 companies, evaluating the effects of establishing a captive insurance subsidiary on income volatility and profitability. The efficiency of risk management via captives implies improved cash flow and stabilized income for firms with captives. The European Union (EU) differs from the United States (U.S.) because the former tends to regulate captives in a more uniform, enhanced regulatory environment. With captives present in thirty-five percent of all firm-years 2000 through 2017, our analysis shows that captives do not contribute to income stability. We find that some positive relationship exists between captive use and profitability, though this is not consistent, and that better financial outcomes as measured by ROA are only delivered by firms with captives formed during this sample period. This study also verifies that S&P Europe 350 firms with captives are not characterized by lower levels of cash holdings, intangible assets, and capital expenditures—three firm attributes observed in the existent studies on captives in the U.S. Overall, our study does not yield robust evidence to support the conjecture that a captive structure can help firms with reduced income volatility and increased profitability.

Introduction

Risk financing plays an essential part of risk management, and firms ought to make choices in the selection of a strategy weighted more

[1] The authors acknowledge Courtney W. Claflin for his assistance with finding the captive database. The CSUN Center for Risk Management and Insurance provided financial support, and the Department of Finance, Financial Planning, and Insurance at CSUN supported the purchase of the Captive Insurance Database.

heavily on either risk transfer or risk retention—a commitment reflective of their risk attitude and appetite. Since the mid-1990s, the risk landscape has demonstrated a long-term trend that more business firms retain their risk (or parts of it) via a captive insurance structure (Chang and Chen, 2018; Marsh, 2017; Cole and McCullough, 2008).[2] Furthermore, the report by Federation of European Risk Management Association (FERMA, 2017) highlights that a captive can be used to insure the risks of its parent company (or companies) by employing a basic mutual insurance principle that aligns the financial interests of the insurer and the insured.[3] On one hand, business firms face the familiar first- and third-party loss exposures, for which insurance has always been available. Emerging unfamiliar loss exposures, due to technological changes (e.g., cyber – actually more of an expanding than emerging risk), disruptive new business competitors, and social and political realignments (Brexit, tariffs, etc.) would suggest a greater need for risk transfer to insurers, who are presumably more capable of paying for uncertain losses due to the benefit of risk pooling, with coverages evolving for those risks. On the other hand, retention for these loss exposures makes sense here because technology (the increasing use of sensors and controls), science, and experience have improved loss control on some of these exposures; with continuing improvements these processes should lead to lower loss ratios for insureds and insurers alike on traditional loss exposures. Coupled with the mixed circumstances indicated above, the continuous growth in captive usage raises the empirical question why more corporations

---

[2] Captives have been consistently growing in popularity as a means of risk retention since the mid-1990s. A captive insurance company (referred to as a ‘captive’ in this article) is funded and owned by a parent company or group of parent companies to insure the risks of its owner(s). The term *captive* is synonymous with *captive insurance company*, *captive insurance subsidiary*, *captive insurance structure/arrangement/model*, and *captive insurer*. These terms are used interchangeably throughout this study.

[3] A mutual insurance company is owned by policyholders it insures, so it is considered a risk pooling arrangement where risks are shared among its policyholders/owners/members (Chang, 2012). In other words, a captive incorporates the basic insurance principle of mutualization (FERMA, 2017), but it operates at a smaller scale than typical mutual insurance companies that may insure any companies/individuals in the marketplace. Thus, a captive can be viewed as a variation of the mutual insurance concept.

finance through a captive insurance subsidiary for retained risks in the face of even more uncertain loss exposures ahead in the era of digital, technology-driven economy, particularly in the 2000s.[4]

Why do business firms retain more risk through the growing use of captive insurance companies, while business uncertainty and even conventional loss exposures seem undiminished and possibly increasing? Cost-saving is one clear reason, lack of alternative uses of excess capital may be another, and we propose and test here a third reason – income smoothing. In general, investors prefer a steady trend of income, and stock prices reflect this (Graham et al., 2005).[5] The ability to store capital away and then pull it back when losses arise should reduce variability in loss expenses on the income statement, particularly for high-deductible or retention programs. In this study, we test two hypotheses using evidence from S&P Europe 350 constituent companies[6] to ascertain whether some firm characteristics appear in the presence of a captive and whether using a captive structure contributes to income stability and profitability. The answer provides critical relevance to a better understanding of why more and more modern large-cap, publicly-traded corporations have transitioned their use of traditional risk transfer techniques to alternative solutions via captives in the global changing risk landscape.

As risk management evolves alongside technology transformation, so do the key incentives for the use of captives. Theoretically speaking, managers undertake risk management activities to maximize firm

[4] According to Simpson et al. (2019), the top challenge facing risk managers is how to manage risk associated with technology-driven change. It might be noted that during the period studied, the prices for commercial insurance have not varied too much, and often declined. A hardening market – rising premiums – is another driver for using a captive insurer. Our study does not measure that driver.

[5] According to the survey of more than 400 executives by Graham et al. (2005), the respondents believe that smoother earnings help investors' prediction of future earnings, which in turn raises stock price.

[6] Similar to the S&P 500 index in the United States, the S&P Europe 350 index is usually used as a benchmark to measure the performance of large-cap stocks in Europe. It is composed of 350 individual European company stocks selected from 17 major European markets, making up about 70 percent of the total market capitalization in the region.

value.[7] Practically speaking, companies adopt a captive insurance program because it grants easy access to reinsurance markets,[8] where unusual coverage needs can be easily crafted and still transferred to the insurance market, and the program operates at lower cost and creates a profit center (Rejda and McNamara, 2017 and Culp, 2006), assuming of course either below-projected or even no losses. Recent professional reports give some additional reasons. First, captives serve as a single, holistic platform and a focal point for risk management, enhancing cash flow management and investment returns (Zurich, 2019). Second, companies mainly use captives as a formal, regulated vehicle to fund/insure corporate retained risk and deliver financial solutions that maximize value, according to the captive reports by Marsh (2017, 2019). Third, captives provide efficiency of risk management (FERMA, 2017).[9] Also, captives can create value because they can help firms plug holes in insurance programs and recapture insurance premiums (CICA, 2016). Fourth, a captive structure functions as an efficient risk-financing tool to internalize their first layers of risks (Colaizzo, 2009 and Holzheu et al., 2003).[10]

---

[7] We say "firm value" rather than "shareholder value," relying on Segal (2011), who we think rightly explains that firm value can be based on various measures, such as net assets or equity, cash flow, dividend discount values, etc.; in contrast, shareholder value is (to us) an ambiguous term that seems focused on stock price, for which many factors may influence it well beyond the control of management, and which is largely irrelevant in a private corporation. In theory, firms form captives to maximize either shareholder value or personal utility: Chang and Chen (2019) provide detailed risk management theories behind captive formations.

[8] Reinsurance is a means by which an insurer transfer some of its risks to another insurer. This is a practice applicable to both commercial insurers and captives. Because reinsurance forms and rates are not regulated – reinsurers have more flexibility in arranging insurance for unusual exposures. This is also true, of course, for surplus lines insurers.

[9] Special thanks to Paul A. Owens, Managing Director of Global Captive Practice at Willis Towers Watson, who directed the authors to this report on March 27, 2019.

[10] First layers of risk include deductible and retention levels below the attachment point of primary insurance policies, and retained exposures that are not insured at all. Even though captives can write third-party risks as profit centers, most captives are still formed primarily to fund their parent organizations' retained risks. Marsh (2019) shows that over three quarters of

The motivators for firms to use captives have varied over time. In the 1980s and 1990s, the tax deductibility of premiums paid to captive insurance subsidiaries was a strong incentive for U.S. companies to use captives for income tax savings (Scordis and Porat, 1998; Lai and Witt, 1995; Han and Lai, 1991; Cross et al., 1988; Smith, 1986; Hofflander and Nye, 1984). The Internal Revenue Service considered such deductibility improper and began to attack the tax advantages, to the point that the tax benefit is no longer a key driver for setting up a captive, even if premiums remain deductible in some instances (Queen and Townsend, 2019). In the 2000s, the reasons for starting a captive shifted to cost-saving as a risk financing tool, where improved risk management leads to reduced losses and thus more reasons to retain the risk and finance it through a capital-efficient captive insurance company (FERMA, 2017; Marsh, 2017; Willis Towers Watson. 2017; CICA, 2016; Colaizzo, 2009; Holzheu et al., 2003). Captives help companies efficiently manage their capital and retained risks by internalizing premiums that would be otherwise paid to third-parties, creating risk financing strategies at their own discretion, getting access to reinsurance markets, exercising control over claims, and actively engaging in risk control efforts to prevent losses from occurring in the first place. Put simply, there is reduced reason to pay an insurance premium that has all the loads for an insurer's profit and overhead for very unlikely losses, assuming the firm has excess capital to set aside and has the financial sophistication and dedication to run a captive insurer (Queen and Townsend, 2019).[11]

Marsh (2017) and Chang and Chen (2018 and 2019) proposed that firms fund captives for operation and coverage and strategically store some of their cash holdings in captives for risk management needs. That is, a captive structure serves as a bellwether for how a firm deploys its capital. Without a captive, a firm that is wisely planning for paying for potential future losses must fill and withdraw from loss reserve accounts, which reflect current and near-term losses and thus

---

its managed captives do not write any third-party coverage, and common third-party coverages, if written by its managed captives, include extended warranties, auto liability, theft, and travel accidents.

[11] Operating a captive has its own expense loads – this is, after all, a licensed insurer – and thus the need for a firm to do a feasibility study before switching from an insurance purchaser to a captive insurance operator (Queen and Townsend, 2019).

vary with those losses. Without a reserve fund, the cash comes from the ordinary cash holdings, unless borrowing is intended and used. Either way, cash on hand declines to pay for the losses. With escalating levels of uncertainties from emerging risks (e.g., cyber-attacks, climate changes, [12] now pandemics, etc.), firms seek innovative practices to finance their risks. Thus, many companies have migrated to captive programs tailored to their unique risk profiles, to gain latitude to budget for irregular and far-term losses, thus attaining what they anticipate is an optimal mix of risk-transfer and risk-retention choices varying to economic conditions. This flexible feature can also provide a firm with an effective vehicle to improve its financial performance.

Captive legislation differs substantially in the U.S., the EU, and offshore places such as Bermuda and the Cayman Island.[13] In the U.S., captive legislation is embedded in state insurance laws, while the EU sets the general rules for regulatory requirements for both commercial insurers and captives. As Holzheu et al. (2003) observe, the tax advantage of using captives has diminished in the early 2000s.[14] An increasing number of U.S. companies have kept their captives onshore as state laws and regulations have become more amenable to captive insurance; over half of all states and the District of Columbia have enacted their individual captive insurance laws (Cole and McCullough, 2008).[15]

In contrast, captive insurance companies in Europe are subject to one regulatory standard, making for an easier test without having to adjust for U.S. jurisdictional variables. All European insurance companies, including traditional commercial insurers and captive

---

[12] Reports published by World Economic Forum (2019) and Swiss Re (2019) provide well-documented evidence that environment-related issues pose a dominant risk in the global risks landscape. Cyber risks are well reported by OECD (2017).

[13] In the wake of adoption of the OECD Base Erosion and Profiting Shifting (BEPS) regulations, European multinationals with captives must meet regulatory and corporate governance standards (FERMA, 2017). According to Marsh (2017), the U.S. has not adopted certain OECD recommendations.

[14] Marsh (2017) also indicates that regulatory and tax advantages in offshore captive formations have either greatly reduced or eliminated.

[15] In addition, the provisions of captive regulation vary across the states in the U.S. in terms of types of captives allowed, capitalization, and taxation.

insurers, must comply with Solvency II—an EU-wide insurance legislative program.[16] According to CICA (2019) and FERMA (2017), captive insurance companies do not substantially differ from traditional commercial insurers, except for their lower level of diversification (i.e., captive risk pools are smaller and normally restricted to their owners).[17] As the second largest economy next to the U.S.,[18] the EU market presents a window into the characteristics of firms with captives under more uniform, enhanced regulatory settings. That is, this study can provide insight into the factors that drive large-cap firms in the EU to develop captive strategies,

[16] The program Solvency II should be implemented in all 28 Member States by January 1, 2016. That is, the EU sets the general rules, and then each of the 28 Member States enacts its own country legislation. The details about Solvency II are well explained by Lloyd's at its webpage: https://www.lloyds.com/market-resources/regulatory/solvency-ii/about/what-is-solvency-ii. The authors appreciate Paul A. Owens, Managing Director of Global Captive Practice at Willis Towers Watson, for his kindness of sharing this source and his expertise in this regard on May 7, 2019. Daniel Bauer compared insurance capital regulation between the U.S. and EU in his presentation at the annual meeting of the Asian-Pacific Risk and Insurance Association on July 30, 2019. In the US, risk-based capital (RBC) requirements are implemented and overseen by each State. In contrast, capital regulation imposed by Solvency II in the EU involves much more sophisticated mathematic models and more complex regulatory standards in capital requirements than requirements in the U.S. (Hartwig, Weisbart, and Lynch, 2015; Thimann, 2014).

[17] CICA (2019) explains that a quota share risk pool is common for commercial insurers and captives. This type of risk pooling arrangement is commonly used with captives because the parent companies typically cannot spread risk on their own to obtain a desired level of risk diversification. Pure captives are the dominant type of ownership (Chang and Chen, 2018; March, 2017, 2019). A pure captive, also known as a single-parent captive, is a captive simply owned by one parent company and formed to insure the risks of its parent. It often has a limited scope of diversification in that typically it covers the risks of the parent company and its subsidiaries (Zurich, 2019).

[18] As of Oct. 2019, the GDP in the U.S. is 22.32 thousand, compared with 18.75 thousand in the EU and 21.96 thousand in Europe. To put it in perspective, the GDP in China is 15.27 thousand. All values are in the unit of billions of U.S. dollars. Source: International Monetary Fund, https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD/EU.

generating a comparison between the world's largest two economies, the U.S. and EU, when it comes to captive use.

As stated earlier, firms form captives for several reasons: cost-saving, possible lack of alternative uses of excess capital, and we propose and test here a third reason – income smoothing. We employ the maximum likelihood treatment effects model to examine the consequential impact of captive use on income stability and profitability. After controlling for the potential self-selection issues as well as the corporate determinants of using captives, we find that using a captive structure does not fulfill the benefit of stabilized income. In addition, there exists no consistent evidence to support a positive relationship between captive use and profitability, even though we did find a marginally significant relationship among firms with captives formed in the 2000s. Finally, our regression results confirm that larger Europe 350 companies with captives do not manifest firm characteristics of smaller proportions of cash holdings, intangible assets, and capital expenditures. All in all, we find that the benefits of income smoothing and better profitability via captives are not evident in our results.

This study adds to the body of knowledge about why large-cap, publicly-traded firms form captives for retained risks. First, the results of this work based on S&P Europe 350 companies complement the existing research largely based on captives formed by U.S. companies. The findings suggest that firm size is a common influential factor behind captive formations for both Europe 350 and S&P 500 companies. In addition, European companies with captives diverge from their peers with captives in the U.S., when it comes to the firm characteristics of cash holdings, intangible assets, and capital expenditures. Regulatory differences in the EU and U.S. seem to explain varying characteristics of firms with captives. Second, the use of captives in European companies is not associated with income stability and higher profitability – contrary to our hypotheses. There is no doubt that all firms set up captives for reducing cost of risk and improving loss control, at least as the dominant and acceptable reasons to do so. Nevertheless, a positive relationship between captive use and ROA only exists among firms with captives formed in the 21st century at the marginal level of statistical significance. It appears that whether a captive can enhance a firm's bottom line lies not just in managerial risk preferences for risk retention but also in financial sophistication and skills of captive operations.

The remainder of this paper proceeds as follows. The next section presents testable hypotheses. Then, the following section describes the data and sample used for analysis. It is followed by statistical results based on the full sample and a survival data set for robustness testing purposes. The last section concludes, proposes avenues for future studies, and addresses the limitations on this research.

Hypotheses Development

We formulate two hypotheses on whether the presence of a captive insurance subsidiary is linked to income stability and profitability. Our rationale is elaborated below each hypothesis.

Hypothesis 1: Firms with captive insurance subsidiaries have lower income volatility.

Captive structures equip companies with substantial flexibility in risk retention and risk transfer strategies tailored to risk management needs. A firm that has an insured loss will receive cash back for that loss from its insurer (whether captive or commercial insurer). What differs is that a firm with a captive may choose to forego making the claim when its own cash reserves are higher due to favorable business periods. In contrast, a firm whose loss is covered by a commercial insurance policy would be unlikely to forego making a claim to a commercial insurer because it paid a premium for exactly that type of indemnity and the premium would be wasted expenditure in that case. Thus, firms with captives should, we expect, be more likely to experience lower levels of income volatility than firms without captives.

Income variability can be explained from several aspects. One aspect is due to losses incurred and resulting expenses. With a captive, the firm will likely be more risk averse (here meaning improved risk reduction and improved worker safety), thereby reducing the loss expenses directly. A second aspect is cash flow back from the captive to the firm for the loss, but this has no noticeable effect because of accounting rules that the captive's cash is consolidated with the firm's, thus no net change, at least under U.S. accounting rules (Bird, 2016; Westover, 2016). That is at the holding company level; at the operating company level things may look different, where a captive payment on a claim would be within the "other income" entry. A third aspect is that firms with a captive probably have much lower deductibles or retentions than with a commercial insurance policy, thus increasing the indemnity payment from the captive. A fourth aspect of income smoothing is loss reserving for long-tailed losses where some probable future loss must be reserved against, such as IBNR, even in the absence of an actual loss that justifies an estimated reserve (Westover, 2016). A fifth aspect is the probable lag time for raising premiums for transferred risks to the captive, against what could be a faster rising premium market for commercial insureds; thus where a hardening insurance market might impose an increase of 15 – 30 percent in annual premium, the captive, with perhaps fewer losses and an expanding use for other exposures, may set a lower premium increase. In sum, there may be income smoothing within the holding company structure even when those holding companies have the same variability of cash levels as companies without captives.

The academic studies support the concept of captives for income smoothing. As Gordon (1964) predicted, managers smooth reported income and the rate of growth in income as long as they have discretion over accounting choices. Merchant (1989) indicates that managers of profit centers within large corporations engage in income smoothing. Recent studies also agree on the fact that managers prefer smooth earnings to volatile earnings, and income smoothing is prevalent (Tucker and Zarowin, 2006; Graham et al., 2005; Fudenberg and Tirole, 1995). A captive structure therefore helps firms improve cash flow (Zurich, 2019; Bird, 2016; Westover, 2016). Culp (2006) stresses that the use of captives can serve as a valuable cash flow smoothing tool. Specifically, the parent company internally retains the cost of coverage via its own insurance subsidiary rather than pays premiums to a third-party insurance company externally. As a result, the use of a captive helps the company accumulate into a captive the insurance premiums that would have been paid to a commercial insurer. Assuming the premium for the risks insured is an actuarial pure premium for expected losses (which means it should be the same no matter who insures it), this removes the additional loadings for the insurer's profit, overhead, state premium taxes, and other charges, though the captive insurer has its own overhead expenses and any reinsurance premium paid. Furthermore, parent companies with captives should be expected to mitigate market pricing imperfections due to moral hazard and adverse selection, and should be able to obtain coverage for risks not readily available or quantitatively developed in the traditional insurance marketplaces.[19] According to Diallo and Kim (1989), a captive insurer can be used as an instrument for reducing the loss-sharing scheme as a result of asymmetric information, contributing to the decrease in the variability of a firm's cash flow. In addition, using captives as an efficient risk financing tool, managers have room to maneuver capital allocation strategies for risk management purposes (Chang and Chen, 2018).[20] This captive structure potentially facilitates the flows of internal capital between the parent company and captive shareholder funds during good and bad times. Put all together, academic research studies provide the base for testing whether the captive in fact smoothes the operating or holding company's income.

While captive insurance has the advantage of efficiency in risk management, there is one particular shortcoming: It has a smaller risk-sharing pool because it primarily insures loss exposures for all businesses affiliated with its owner(s). On the outside, the larger the risk pool, the more likely it is to project the expected losses with accuracy. It appears that firms with captives may be subject to higher variability of income as a result of a smaller risk pool.[21] On the inside, firms with captives retain risks internally. With greater direct

---

[19] According to Zurich (2019), a captive can cover all types of risk but Directors' and Officers' liabilities. As a matter of fact, it can cover risks for which no products are available in the commercial market or on which no insurer is willing to take. That general statement should be qualified to recognize the breadth of surplus lines insurers' flexibility, the alternative risk transfer market, and reinsurer's willingness to take on such risks.

[20] According to Chang and Chen (2018), cash reserves stored in a captive help the parent company shield the cash for various risk management needs and reduce the demand for distributing cash dividends from its shareholders.

[21] There may also be doubts about whether the number of risk exposures is sufficient to constitute risk distribution for purposes of insurance premium deductibility in the U.S., see IRS Revenue Bulletin 2005-40, https://www.irs.gov/irb/2005-27_IRB#RR-2005-40. As noted earlier, tax deductibility is no longer the driver of creating captive insurance companies, so the question of deductibility is often a minor point to the decision to whether to form a captive.

exposure to the cost of risk, firms should have stronger motivations for loss prevention and risk reduction (Zurich, 2019; FERMA, 2017; Bird, 2016; Diallo and Kim, 1989). Stronger loss control practices and expenditures towards that should offset the smaller risk pool factor.[22]

Hypothesis 2: Firms with captive insurance subsidiaries have higher profitability.

If a captive serves as an efficient tool to help firms cope with retained risks, it may also contribute to higher profitability because of lower costs for loss exposures. With the help of captive structures, organizations can move toward a more centralized, customized approach in risk management and turn the efficiency of insurance into cost savings. Nevertheless, researchers are divided on whether captive utilization improves financial performance. Cross et al. (1986) allege that the parent company's stock reacts positively to captive formation—a reflection of investors' belief that the company can benefit from its captive insurance subsidiary. To the contrary, Diallo and Kim (1989), using two samples of firms listed on the New York Stock Exchange, find that the value of stocks of the parent companies remains unchanged after captive formations. In addition, Chang and Chen (2019) lay out no evidence to support a positive effect of captive formation on firm value among S&P 500 companies. Hypothetically, the efficiency of insurance in the form of captives should be able to add value to parent companies, particularly in their operating bottom line.

Data and Sample

To test the relation between captive use and firm performance among S&P Europe 350 companies, we first collected CRSP data on public offering dates and the basic accounting data from the COMPUSTAT Global database. As a result, we can construct the following annual variables for our tests: asset size, cash, capital expenditures (Capex), opacity, sales growth, leverage, return on equity (ROE), return on

[22] It is a topic for another paper to examine whether firms with captives spend more on risk control for traditional insurable risks than firms without captives, or use a lower metric such as net present value or cost of capital.

assets (ROA), market-to-book (MB), price–to-earnings (PE), and firm age.

The details of captive insurance subsidiaries are retrieved from the Captive Insurance Database (CID) managed by Captive Review. We then combine our captive data with accounting data. The accounting data collection started with annual observations for all S&P Europe 350 firms from 2000 to 2017. Then the authors filtered out firms for which data were missing on basic accounting variables, foreign exchange rate, and stock prices that are used to calculate market-based measures. This process left 5,934 firm-year observations. Finally, following Laeven and Levine (2007), the authors excluded extreme outliers by eliminating observations where the basic accounting variables are more than four standard deviations from the sample mean. The final panel data set consisted of 5,789 firm-year observations for large-cap S&P Europe 350 index components over the period 2000–2017.

Table 1a illustrates a summary chart of all active captives licensed by year and by ownership type among S&P Europe 350 companies in our sample.[23] There are 71 out of 158 active captives (i.e., 45 percent) structured as pure ones that primarily insure their parent companies, while half of those active captives have no identified type of ownership. One distinctive note for our sample is that many captives were formed from the 1970s to the 1990s. In fact, 64 percent of all active captives were established before 2000—that is over six of every ten captives. This timeline of captive formations in our sample also poses an interesting comparison with the study of Chang and Chen (2018) that the captives formed by S&P 500 companies before and after 2000 are almost evenly split. Although a lot of reasons may come into play for the slowed growth of captives among S&P Europe 350 in the 2000s, it appears that more stringent captive regulation in the EU has a contributing role to play. For instance, Cole and McCullough (2008) suggest that the "Solvency II" regulatory requirements are expected to increase costs to captives domiciled in the EU; some domiciles have strengthened regulation and capital requirements as a

[23] Six captives formed between 1980 and 2004 became dormant, and they are not treated as active. Also worth noting is that the lack of data on the license year prevents inclusion of eight captives from this summary chart.

result of the EU's "Solvency II" capital requirements that take effect in 2010 (Parekh, 2006).

The United Kingdom is the country of parent origin for 37 percent of those captives, as manifested in Table 1b. This comes as no surprise as this country typically has the largest number of constituents of the S&P Europe 350 index. As far as the industry affiliation of firms with captives is concerned, the Industrials sector makes up 23 percent of those active captives. Table 1c provides a breakdown of captive parent companies based on the two-digit Global Industry Classification (GIC) Standard codes.

Table 1a: Number of Active Captives Formed by Year and by Type

Type / Year	Pure[a]	NA[b]	Cell[c]	Other[d]	Total	Percent	Special Note about Dormant Captives[e]
1970-1974	1	0	0	0	1	1%	
1975-1979	3	3	1	0	7	4%	
1980-1984	7	1	0	0	8	5%	One captive licensed during this period is dormant.
1985-1989	13	16	0	0	29	18%	
1990-1994	8	20	2	0	30	19%	One captive licensed during this period is dormant.
1995-1999	11	14	1	0	26	17%	Two captives licensed during this period are dormant.
2000-2004	13	18	2	0	33	21%	Two captives licensed during this period are dormant.
2005-2009	9	9	0	0	18	11%	
2010-2017	6	0	0	0	6	4%	
Total	71	81	6	0	**158**	**100%**	

Note: This table exhibits the number of active captives formed by S&P Europe 350 companies between 2000 and 2017. Throughout this study, a captive is referred to as any active captive insurance company in the types of pure, group, cell, special purpose vehicle (SPV) and unknown (NA) ownership. [a]A pure captive is an insurance company owned by one parent company and formed to insure the risks of its parent. [b] NA represents captives with missing data on the type of ownership. [c]A cell captive is an insurer in which one or more sponsors segregate each participant's liability through protected cells or separate accounts where those assets are not subject to the liabilities of the other cells. [d]Other captives include one group captive and one SPV. The former is an insurance company owned by a group of parent companies and formed to insure the risks of its parents; the latter is a captive created particularly for reinsurance, securitization or reserve financing purposes. [e]The information about six dormant captives is provided in the note only, and they are not counted toward active captives. Dormant captives are not included in any count. Captives in dormant status can buy insurance from the traditional market but return to the captive when the market fluctuates. In particular, firms with a dormant captive are not treated as firms with captives in our analysis.

Table 1b: Breakdown of Active Captives by Country

Country	No. of Captives	Proportion of Active Captives
Belgium	2	1%
Denmark	4	3%
Finland	4	3%
France	19	12%
Germany	19	12%
Ireland	5	3%
Italy	4	3%
Luxembourg	2	1%
Netherlands	4	3%
Norway	4	3%
Portugal	2	1%
Spain	6	4%
Sweden	12	8%
Switzerland	13	8%
United Kingdom	58	37%
Total	**158**	**100%**

Table 1c: Breakdown of Active Captives by Industry

GIC	Industry	No. of Captives	Proportion of Active Captives
10	Energy	8	5%
15	Materials	19	12%
20	Industrials	36	23%
25	Consumer Discretionary	22	14%
30	Consumer Staples	18	11%
35	Health Care	10	6%
40	Financials	15	9%
45	Information Technology	4	3%
50	Communication Services	11	7%
55	Utilities	15	9%
Total		**158**	**100%**

Note: This breakdown is based on the two-digit Global Industry Classification (GIC) Standard codes.

The definitions of all variables are provided in the Table 2. The descriptive statistics of our data are reported in Table 3. We have made available a mean comparison between firms with and without a captive insurance subsidiary in Table 4.

Table 2: Variable Definitions

Variable	Definition	Sign
Captive	= 1 if a firm has a captive insurance subsidiary in a given year and 0 otherwise	+/−
Income volatility	[Standard deviation of quarterly net income estimated over the subsequent three-year period (12 quarters)] divided by a firm's current quarterly income	
ROA	Net income/total assets = NICON/AT	
ROE	Net income/total equity = NICON/(AT-LT)	
Size	Ln (assets) = Ln (AT)	+/−
Cash	Cash/total assets = CH/AT	−
Opacity	Intangible assets/total assets = INTAN/AT	−
Capex	Capital expenditure/total assets = CAPX/AT	+/−
Sales growth	The percentage growth in annual sales (REVT) from the prior year to the current year	+
Leverage	Book value of long-term debt/Market value of equity = DLTT/(PRCCD × CSHOC)	NA
Dividend	= 1 if a firm paid dividends (DVT) in a given year and 0 otherwise	NA
Market-to-book (MB)	Stock price per share /Book value per share = PRCCD/((AT-LT)/ CSHOC)	+
Price-to-earnings (PE)	The year-end stock price/earnings per share for the fiscal year = PRCCD/(NICON/CSHOC)	+/-
Age	The number of months since a firm has stock price information in COMPUSTAT Global database	+

Note: The sources of data include the Captive Insurance Database (CID) for the captive variable and the COMPUSTAT Global database for the rest variables. NA means that no priors on the sign of that variable are expected.

According to Table 3, thirty-five percent of all firm-years are accounted for by firms with captives, a figure that is similar to the finding for S&P 500 companies reported by Chang and Chen (2019). Firms have an average ROA of 4.8 percent and carry almost 8 percent of assets in cash. Approximately 23 percent of assets are intangible.

As displayed in Table 4, the results present a univariate comparison between two sets of firms. First, mostly consistent with the literature, firms with captives are characterized by larger size, lower levels of cash holdings and smaller proportions of intangible assets.[24] Second, the difference is not significant in supporting Hypothesis 1 regarding income volatility. Third, the differences about two profitability measures provide contradictory results. The measure ROA shows the difference is not significant, while the measure ROE suggests that firms with captives are more profitable than their counterparts without captives. It remains to be seen whether these variables are at play in the multivariate settings.

Table 3: Descriptive Statistics

Variable	*N*	Minimum	Maximum	Mean	Median	Std. deviation
Captive	5789	0.000	1.000	0.350	0.000	0.477
Income volatility	4064	0.026	70.762	0.953	0.426	2.953
ROA	5789	-2.033	0.890	0.048	0.044	0.083
ROE	5789	-17.373	11.257	0.136	0.127	0.460
Size	5789	2.893	15.143	9.410	9.257	1.540
Cash	5789	0.000	0.396	0.078	0.058	0.069
Opacity	5789	-0.008	0.893	0.227	0.180	0.197
Capex	5789	0.000	0.218	0.044	0.038	0.033
Sales growth	5789	-6.181	11.353	0.082	0.055	0.403
Leverage	5789	0.000	8.680	0.469	0.242	0.771
Dividend	5789	0.000	1.000	0.711	1.000	0.453
MB	5789	0.071	128.222	3.147	2.136	5.038
PE	5789	-1279.030	1381.450	19.003	15.620	74.295
Age	5789	0	384	220.932	228.000	94.332

[24] Chang and Chen (2018 and 2019) assert that S&P 500 companies with captives have a tendency to maintain lower cash reserves than their counterparts without captives. They also suggest that firms with captives are linked to smaller proportions of capital expenditures and intangible assets.

Table 4: Mean Comparison of S&P Europe 350 Companies with and without Captives

Variable	*N*	Firms with captives	*N*	Firms without captives	Mean difference	*p* value
Income volatility	1443	0.861	2621	1.004	-0.143	0.1125
ROA	2025	0.046	3764	0.049	-0.003	0.1314
ROE	2025	0.149	3764	0.129	0.021	0.0866*
Size	2025	10.087	3764	9.045	1.042	0.0001***
Cash	2025	0.069	3764	0.083	-0.014	0.0001***
Opacity	2025	0.216	3764	0.233	-0.017	0.0008***
Capex	2025	0.044	3764	0.045	-0.001	0.4267
Sales growth	2025	0.061	3764	0.093	-0.032	0.0045***
Leverage	2025	0.495	3764	0.455	0.039	0.067*
Dividend	2025	0.765	3764	0.683	0.082	0.0001***
MB	2025	2.930	3764	3.263	-0.333	0.0127**
PE	2025	16.521	3764	20.338	-3.817	0.047**
Age	2025	245.708	3764	207.602	38.106	0.0001***

Note: The *p* value is based on a *t* test on the difference in means that assumes unequal variances. ***p<0.01, **p<0.05, *p<0.1.

Analytical Methods and Empirical Results

Captives and Income Volatility

We investigate the effect of captive formation on income stability for our first hypothesis. Thanks to the efficiency of insurance via captives, companies can leverage how they manage their internal capital in a more efficient way that caters to various risk management purposes. Hence, we predicted that firms with captives have lower volatility of income.

To account for the self-selection of firms into forming a captive insurance subsidiary, we apply a treatment effect model following Bodnaruk, O'Brien, and Simonov (2016), Hoyt and Liebenberg (2011), and Heckman (1976, 1978). The dependent variable is the standard deviation of quarterly net income estimated over the subsequent three-year period (12 quarters) divided by a firm's current quarterly income.[25] In light of the estimation errors due to overlapping

[25] This measure makes it possible to compare firm with different income levels regarding income stability. Otherwise, firms with higher current income amount may experience higher standard deviation of quarterly income than firms with lower income amount, everything else held equal.

observations, we include only every third year, starting with year 2000. Captive formation is treated as the variable of interest in the model, along with several control variables. The regression results are reported in Table 5 with the model specified as follows.

$$Y_i = \alpha + \beta\, Captive_i + \textstyle\sum_i \lambda_i\, Control\ variable_i + \varepsilon_i \quad (1)$$

$$Captive_i^* = \delta\omega_i + \mu_i \quad (2)$$

where $Captive_i$ in the first equation is an endogenous dummy variable, indicating whether the captive treatment is received, and it is estimated with $Captive_i^*$ from the second equation. That is, $Captive_i^*$ is an unobservable latent variable and a linear function of the coefficient vector ω_i that contains a set of characteristics that affect a firm's choice to form a captive. That is, the second equation reflects the decision to receive the treatment. To explain differences in income volatility, Eq. (1) incorporates a vector of control variables: firm size, capital expenditures, return on assets, sales growth, leverage, and dividend payment. Following Chang and Chen (2018, 2019) and the finding in Table 4, the determinants of captive formation include firm size, cash, opacity, capital expenditures, firm age, leverage, and dividend payment in Eq. (2).

Both equations (1) and (2) are jointly estimated, using maximum-likelihood estimation to control for a selection bias due to the likely endogeneity of captive decision. That is, this two-equation model simultaneously estimates the decision to use captives and the effect of that decision on income volatility. In addition, the equation also controls for time and industry fixed effects; standard errors are adjusted for clustering at the firm level.[26]

With the year 2000 as a reference year, Table 5 reports estimates of treatment regressions based on the entire sample in Specifications (1) and (2) and on the subsamples—industrial and nonfinancial—in Specifications (3) and (4), respectively. According to Specification (1), the coefficient for the *Captive* variable in the regression is significant and positive.[27] This outcome is at odds with the first hypothesis that

[26] All regressions throughout this article are conducted with time and industry fixed effects, along with firm-level clustering for standard errors, unless otherwise specified. Industry dummies are based on the two-digit Global Industry Classification (GIC) Standard codes.

[27] The results remain similar when we instead use 2002 as a reference year. However, the coefficient for *Captive* is not significant when the year 2001 is

firms with captives should experience more income stability. We further include country dummies in Specification (2) to control for potential regulatory differences by country, and the results are mostly unchanged. After all, we find that firms with captives have higher income volatility than do their counterparts, using the treatment regressions adjusted for self-selection of captive use in the full sample. One plausible inference to be drawn is that firms with captives are still vulnerable to higher variability of income because of smaller risk pools. The shortcoming of a limited scope of diversification in a captive structure is likely to be conducive to higher levels of income volatility in firms with captives.[28]

Noteworthy are the results that income stability is further affected by other firm factors. On one hand, income volatility is negatively related to both *Size* and *ROA*, respectively. That is, a firm's income become less volatile as it gets bigger in size and becomes more profitable. On the other hand, a positive relation between income volatility and leverage suggests that a firm's income become more volatile as it becomes more leveraged. The greater use of debt in a firm's financial structure appears to magnify its performance, leading to more volatility of its income. (This leads us to speculate that whatever income smoothing might exist with a captive, the effect is dwarfed against these factors on income stability.)

We further estimate the model to check if the results hold up, using two subsamples of industrial and nonfinancial firms in Specifications (3) and (4), respectively. The results based on nonfinancial firms are aligned with those based on the full sample.[29] However, the model in

---

used as a reference year. The results with 2001 or 2002 as a reference year are not reported in Table 5, but available upon request. In addition, we have applied a rolling 12 quarter window as a robustness check. The results remain similar to those based on every three years, so they are not reported here.

[28] We do not know how much European captive insurers use reinsurance to reduce large loss variances.

[29] In addition, we analyze with a subsample of financial firms. The results show that income volatility of financial firms is not significantly affected by Captive, Size, and ROA at all. Differences exist between financial firms and nonfinancial firms regarding whether income volatility is impacted by the presence of captives, firm size, and profitability. However, it is worth mentioning that a small number of observations are available for the subsample of financial firms. We further estimate the model for the

Specification (3) is not significant for the industrial sector, probably due to a small number of observations. Thus, the results from nonfinancial firms carry more weight in our analysis, consistent with our findings from the full sample.

Table 5: Captive Insurance and Income Volatility (Every 3 Years)

Variable	Full sample		Subsample	
	(1)	(2)	(3) Industrial	(4) Nonfinancial
Panel A: Income volatility (equation 1)				
Captive	3.166***	2.709**	1.666	3.195 ***
	(0.000)	(0.011)	(0.113)	(0.000)
Size	-0.458***	-0.478**	0.0101	-0.445 ***
	(0.001)	(0.013)	(0.954)	(0.002)
Capex	0.101	0.956	-2.245	-0.0173
	(0.977)	(0.785)	(0.530)	(0.996)
ROA	-3.348***	-3.209**	-11.26*	-2.982 **
	(0.005)	(0.011)	(0.037)	(0.015)
Sales growth	-0.177	-0.167	0.600	-0.658 *
	(0.350)	(0.365)	(0.469)	(0.079)
Leverage	0.479***	0.467***	0.126	0.649 ***
	(0.010)	(0.010)	(0.764)	(0.008)
Dividend	-0.346	-0.139	0.595	-0.292
	(0.165)	(0.562)	(0.100)	(0.238)
Constant	5.371***	5.267***	2.509	5.227 ***
	(0.002)	(0.004)	(0.125)	(0.002)
Panel B: Captive (equation 2)				
Size	0.342***	0.482 ***	0.239*	0.340 ***
	(0.000)	(0.000)	(0.069)	(0.000)
Cash	-0.276	-0.794	1.321	-0.433
	(0.663)	(0.314)	(0.397)	(0.516)
Opacity	-0.145	0.132	-0.254	-0.139
	(0.619)	(0.703)	(0.754)	(0.636)
Capex	-0.797	-0.620	-1.982	-0.754
	(0.669)	(0.761)	(0.652)	(0.684)
Age	0.00150**	0.00173 *	0.00419**	0.00151 **
	(0.045)	(0.054)	(0.018)	(0.048)
Leverage	-0.172**	-0.157 **	-0.794*	-0.280 ***
	(0.015)	(0.019)	(0.014)	(0.003)
Dividend	0.345***	0.123	0.200	0.295 ***
	(0.002)	(0.293)	(0.398)	(0.008)
Constant	-4.061***	-4.996 ***	-8.107***	-3.999 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	No	Yes	No	No
No. of observations	1,505	1,505	364	1,440

subsamples with country dummies. The results of nonfinancial firms remain similar, while the model fails to work for financial firms due to a lack of adequate of observations.

No. of clusters	396	396	95	371
Log pseudolikelihood	−4499.9	−4404.3	-1095	-4321.3
Wald test of independent equations	7.7 ***	4.0 **	0.82	7.2 ***

Note: The results of treatment effects are based on S&P Europe 350 Firms, 2000-2017. The dependent variable is income volatility. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Captives and Profitability

Table 6 presents our estimates on our second hypothesis that firms with captives should have higher profitability as a result of the efficiency of insuring risks themselves. The rationale is that a captive can potentially perform as a profit center by means of lower costs of risk management. Higher profitability can be accomplished by easy access to reinsurance markets, more control over claims, increased loss control, etc.

Using a similar method in the former section, we employ a treatment effect model to overcome the self-selection issues regarding the use of captives. The dependent variable is either return on equity (ROE) or return on assets (ROA) measured over the subsequent year. *Captive* is treated as the explanatory variable of interest. That is, we estimate the probability of receiving the captive treatment (Eq. 2) with the general outcome (Eq. 1), using the same set of firm characteristics that explain why firms opt for captives as risk-financing solutions in the previous section. Specifications (1) and (2) of Table 6 report estimates of treatment regressions based on ROA, while Specifications (3) and (4) present estimates based on ROE.

No matter which profitability measure has been used as a dependent variable in Specifications (1) and (3), the coefficients for the *Captive* variable are consistently significant but carry a negative sign. The results are in conflict with our second hypothesis that captive use should have a positive effect of the firm's financial bottom line. Instead, they suggest that firms with captives underperformed compared to firms without captives. It turned out that companies with captives have a 10.9 percent lower ROA and a 54.9 percent smaller ROE. One plausible interpretation is that a captive arrangement is not formed mainly as a driver for a firm's profitability.

Adversely, a firm's profitability is positively related to *Size*, *Sales growth*, and *Dividend*. That is, a firm become more profitable as it becomes larger, grows faster, and pays dividends. The coefficients for

Leverage are significant but negative. The higher degree of leverage does not contribute to higher profitability measured by either ROA or ROE.

Table 6: Captive Insurance and Profitability

Variable	ROA		ROE	
	(1) Full sample	(2) Full sample	(3) Full sample	(4) Full sample
Panel A: ROA or ROE (equation 1)				
Captive	-0.109***	-0.107***	-0.549***	-0.505***
	(0.000)	(0.000)	(0.000)	(0.003)
Size	0.00673**	0.00983***	0.0509**	0.0628**
	(0.050)	(0.007)	(0.023)	(0.027)
Capex	0.204**	0.206***	0.543	0.517
	(0.011)	(0.009)	(0.201)	(0.208)
Sales growth	0.0124***	0.0128***	0.0291**	0.0316**
	(0.001)	(0.001)	(0.018)	(0.014)
Leverage	-0.0265***	-0.0255***	-0.117***	-0.116***
	(0.000)	(0.000)	(0.003)	(0.003)
Dividend	0.0369***	0.0283***	0.137***	0.0799***
	(0.000)	(0.000)	(0.000)	(0.001)
Constant	-0.00197	-0.0163	-0.308*	-0.329
	(0.951)	(0.631)	(0.087)	(0.107)
Panel B: Captive (equation 2)				
Size	0.307***	0.420***	0.291***	0.416***
	(0.000)	(0.000)	(0.000)	(0.000)
Cash	-1.210*	-1.281*	-0.813	-1.108*
	(0.091)	(0.059)	(0.191)	(0.094)
Opacity	0.0634	0.202	-0.105	0.0753
	(0.772)	(0.402)	(0.643)	(0.778)
Capex	-0.00524	-0.0664	0.386	0.495
	(0.997)	(0.968)	(0.795)	(0.755)
Age	0.00125**	0.00122*	0.00144**	0.00162**
	(0.023)	(0.051)	(0.016)	(0.024)
Leverage	-0.115**	-0.0938*	-0.185***	-0.178***
	(0.033)	(0.066)	(0.004)	(0.005)
Dividend	0.269***	0.0847	0.209**	-0.00280
	(0.004)	(0.356)	(0.027)	(0.975)
Constant	-3.504***	-4.146***	-3.297***	-4.118***
	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	No	Yes	No	Yes
No. of observations	5,789	5,789	5,789	5,789
No. of clusters	470	470	470	470
Log pseudolikelihood	3678.3	4057.3	-6610.0	-6296.4
Wald test of independent equations	42.8***	37.6***	13.6***	8.7***

Note: The results of treatment effects are based on S&P Europe 350 Firms, 2000-2017. The dependent variable is profitability as measured by either ROA or ROE. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Robustness Tests

We also construct a survival data set to test the robustness of the results, following arguments made by Chang and Chen (2019, 2018), Berry-Stölzle and Xu (2018), and Pagach and Warr (2011). The benefit of using this data set is the focus on those companies that formed a captive during the sample period from 2000 to 2017. The final survival data set comes into existence as a consequence of the following two criteria. First, any firm with a captive has only one firm-year observation with the captive variable valued as one. That is, firm-year observations are excluded from the data set once a captive is put in place. Second, firms with captives formed before the year 2000 are not included. Note that the survival data set can capture the factors that affect a firm's decision to form a captive during the sample period at the cost of reduced sample size and lower statistical power. The descriptive statistics on our survival sample are shown in Table 7, while our robustness results are reported in Tables 8—9.

The descriptive statistics of Table 7 are much like those of Table 3 based on the full sample, except for the captive variable. Surprisingly, less than three percent of firm-year observations are represented by firms with captives, in comparison with thirty-five percent observed in Table 3. This outcome is definitely due to the selection criteria that we truncate the full sample for the survival data set. Even though a survival data set has been widely used to examine the effect of a firm's critical decision, it is also obvious the level of statistical power has been seriously compromised.

Table 8 presents the results of the treatment effects model on the relation between captive insurance and income volatility, using the survival data set. The year 2000 is used as a reference year in Specification (1), while Specifications (2) and (3) employ the years 2001 and 2002, respectively. The results are mixed. First, the *Captive* coefficient in Specification (1) turns out to be significant and negative—an outcome consistent with our first hypothesis that captives can help firm with reduced income volatility. This result may suggest that firms with captives formed in the 2000s capitalized on their captive subsidiaries to effectively stabilize their income. Nevertheless, the regression model of Specification (2) is not significant according to the Wald test, and the coefficient for *Captive* in Specification (3) becomes positive again. In a nutshell, our results from the survival data set are partially consistent/inconsistent with the findings from the full sample in the previous section, leading to an inconclusive relationship between captive use and income stability.

We provide the robustness results of captive insurance and profitability in Table 9 on the basis of the survival data set. As profitability is measured by ROA in Specifications (1) and (2), the coefficients for *Captive* are positive with marginal statistical significance at the 10 percent level, a sign opposite to the result found in the full sample of Table 6. This finding is consistent with the hypothesis 2 that firms with captives can be more profitable than their counterparts without captives because of the efficiency of insurance via a captive structure. In other words, firms with captives formed in the 2000s have an almost 2 percent higher ROA than do their counterparts without captives. This finding has borne out the argument that risk management activities implemented are likely to improve value as measured by ROA—a pure measure of profitability. Nevertheless, when ROE is used as the dependent variable in Specifications (3) and (4), neither the *Captive* coefficients nor the regression models are significant. Although the exact reason for this is unknown, it may be related to an issue that ROE is simply the product of ROA and equity multiplier that equals a ratio of assets to equity. Thus, we cannot draw robust conclusions from the results when ROE is used as a dependent variable. In short, out of our analyses comes a notable implication that a positive link between captive use and profitability is not consistently observed across the board. Even though firms with captives formed since 2000 appear to be more capable of leveraging their financial sophistication of captive operations into higher profitability, we fail to find robust evidence in support of the connection between captive use and profitability.[30]

Given that the benefit of the captives may not be observed immediately, we also create an alternative survival sample by including firm-year observations following the captive formation.[31] In

---

[30] Thanks to the constructive comments from the anonymous reviewer, we have further conducted several robustness checks on various sets of non-financial subsamples. However, the results are similar to those based on the full sample in the Empirical Results section, while the captive coefficients are either insignificant or significant and negative. Thus, we do not report them to save space, but they are available upon request.

[31] We benefit from the reviewer's new perspective on an alternative selection of a survival sample to capture the impact of captive formation.

comparison with the initial survival data set that a firm can have only one firm-year observation of the captive presence throughout the sample period, this alternative data set serves as another robustness checks on the impact of captive formation by excluding firms with captives formed prior to 2000 but including subsequent data years for firms that formed captives between 2000 and 2017. The descriptive statistics of this alternative data set show in Appendix 1; the results of treatment effects are provided in Appendix 2-3. In general, these results based on the alternative survival sample concur with the results based on the full sample presented in the previous section. The use of captives does not contribute to income stability. Nor do captive formations help firms improve profitability. When it comes to the determinants of captive formation, S&P Europe 350 firms are not characterized by lower levels of cash holdings, intangible assets, and capital expenditures throughout our study.

Table 7: Descriptive Statistics on the Survival Sample

Variable	*N*	Minimum	Maximum	Mean	Median	Std. deviation
Captive	3857	0.000	1.000	0.024	0.000	0.153
Income volatility	2676	0.026	70.762	1.002	0.436	3.161
ROA	3857	-2.033	0.890	0.048	0.044	0.091
ROE	3857	-17.373	11.257	0.131	0.129	0.510
Size	3857	2.893	14.738	9.074	8.951	1.417
Cash	3857	0.000	0.396	0.082	0.060	0.075
Opacity	3857	-0.008	0.893	0.232	0.175	0.208
Capex	3857	0.000	0.218	0.045	0.037	0.035
Sales growth	3857	-1.000	11.304	0.097	0.062	0.419
Leverage	3857	0.000	8.680	0.461	0.226	0.767
Dividend	3857	0.000	1.000	0.684	1.000	0.465
MB	3857	0.071	128.222	3.253	2.199	5.258
PE	3857	-1279.03	1362.880	19.997	15.950	79.304
Age	3857	0.000	384.000	206.684	210.000	94.430

Note: The definitions of all variables can be found in Table 2.

Table 8: Robustness Tests for Captive Insurance and Income Volatility (Every 3 Years)

Variable	(1) Reference year 2000	(2) Reference year 2001	(3) Reference year 2002
Panel A: Income volatility (equation 1)			
Captive	-1.244**	-0.714**	6.047***
	(0.025)	(0.042)	(0.000)
Size	-0.0973***	-0.215**	-0.183
	(0.182)	(0.025)	(0.127)
Capex	1.794	-4.420	-3.503
	(0.624)	(0.114)	(0.130)
ROA	-2.753**	-7.255***	-2.914*
	(0.038)	(0.000)	(0.065)
Sales growth	-0.186	1.011	-0.0451
	(0.484)	(0.190)	(0.710)
Leverage	0.345*	0.274*	0.605**
	(0.090)	(0.069)	(0.045)
Dividend	-0.135	-0.147	0.298
	(0.500)	(0.580)	(0.164)
Constant	4.010***	3.872***	3.318**
	(0.001)	(0.002)	(0.017)
Panel B: Captive (equation 2)			
Size	0.244***	0.244 **	0.228***
	(0.000)	(0.017)	(0.001)
Cash	-1.888	-2.913	1.623
	(0.332)	(0.324)	(0.267)
Opacity	-0.146	1.127 **	-0.277
	(0.797)	(0.038)	(0.543)
Capex	-1.557	-1.010	-3.938
	(0.570)	(0.817)	(0.359)
Age	0.000219	-0.00196	-0.000931
	(0.887)	(0.213)	(0.222)
Leverage	-0.0423	0.212 **	0.119
	(0.678)	(0.023)	(0.365)
Dividend	0.399	0.0810	-0.0672
	(0.126)	(0.721)	(0.591)
Constant	-8.196	-9.250	-7.318***
	(0.643)	(0.950)	(0.000)
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Country dummies	No	No	No
No. of observations	985	845	846
No. of clusters	294	280	277
Log pseudolikelihood	-2455.0	-2220.2	-2283.0
Wald test of independent equations	3.16 *	1.1	15.0***

Note: The results of treatment effects are based on the survival data set of S&P Europe 350 Firms, 2000-2017. The dependent variable is income volatility. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 9: Robustness Tests for Captive Insurance and Profitability

Variable	ROA		ROE	
	(1) Survival data	(2) Survival data	(3) Survival data	(4) Survival data
Panel A: ROA or ROE (equation 1)				
Captive	0.0185*	0.0199*	0.137	0.140
	(0.080)	(0.058)	(0.237)	(0.218)
Size	-0.00616***	-0.0068***	-0.00997	-0.0102
	(0.005)	(0.003)	(0.261)	(0.265)
Capex	0.155**	0.148**	0.275	0.258
	(0.023)	(0.032)	(0.325)	(0.374)
Sales growth	0.0154***	0.0154***	0.0353**	0.0356 **
	(0.000)	(0.000)	(0.041)	(0.039)
Leverage	-0.0229***	-0.0218***	-0.109**	-0.112 **
	(0.000)	(0.000)	(0.012)	(0.011)
Dividend	0.0306***	0.0327***	0.0887***	0.0843 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.0932***	0.0977***	0.114	0.144 *
	(0.000)	(0.000)	(0.151)	(0.070)
Panel B: Captive (equation 2)				
Size	0.291***	0.343***	0.291***	0.340 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Cash	0.124	-0.0085	0.182	0.0140
	(0.887)	(0.992)	(0.830)	(0.987)
Opacity	0.109	0.287	0.131	0.302
	(0.733)	(0.401)	(0.679)	(0.370)
Capex	-0.599	-0.935	-0.657	-1.049
	(0.722)	(0.607)	(0.691)	(0.552)
Age	-0.00256***	-0.0025***	-0.00259***	-0.00257 ***
	(0.001)	(0.002)	(0.001)	(0.002)
Leverage	0.0226	-0.0049	0.0114	-0.0165
	(0.734)	(0.943)	(0.862)	(0.813)
Dividend	0.149	0.0574	0.156	0.0658
	(0.205)	(0.668)	(0.183)	(0.624)
Constant	-8.494***	-8.736***	-8.527***	-8.730 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	No	Yes	No	Yes
No. of observations	3,857	3,857	3,857	3,857
No. of clusters	405	405	405	405
Log pseudolikelihood	3733.8	3787.8	-3086.0	-3063.0
Wald test of independent equations	7.43***	10.39***	0.98	0.80

Note: The results of treatment effects are based on the survival data set of S&P Europe 350 Firms, 2000-2017. The dependent variable is profitability as measured by either ROA or ROE. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Conclusion

Risk financing is an essential part of a firm's risk management program. The nuance hinges on how a firm decides an optimal combination of risk transfer and risk retention for its loss exposures. A parent company with a captive insurer demonstrates its risk tolerance and embraces a risk-financing strategy that retains risk in a relatively smaller risk pool of all subsidiaries under its roof, instead of transferring most of its loss payments to third-party carriers whose actuarial pricing is typically based on average risk statistics in the commercial market. This research tests whether the expanding use of captives enhances earnings stability and profitability and whether some firm characteristics are associated with captive formations.

A captive insurance structure is an ultimate risk-financing instrument of risk retention that applies the concept of mutual insurance and internalizes the first layers of risks. Recent professional reports further lay emphasis on the benefits of using captives, such as enhanced management of cash flow, improved efficiency of risk management, and maximized value of financial solutions. Our sample is comprised of S&P Europe 350 companies from 2000 to 2017. The treatment effects analyses are conducted to examine the determinants of using captives and the impact of captives on income volatility and profitability. First, there exists no conclusive relation between captive use and income stability. Second, our results suggest that the use of captives is not consistently linked to better profitability, even though firms with captives established in the 2000s did experience higher ROA at a marginal level of statistical significance. It appears that the values created by captives do not manifest themselves in the form of increased profitability across the board. Third, the results confirm a positive relationship between captive use and firm size. In particular, the use of captives among Europe 350 companies is not associated with some firm characteristics such as lower cash holdings and smaller proportions of intangible assets and capital expenditures that feature U.S. S&P 500 companies with captives.

Our study yields two avenues for future research on captives. The first is concerned with captives formed pre- and post-2000. Managers essentially take on risk management activities for the maximization of firm value, so we did expect to see a reliable relationship between profitability and captive use initially. However, our results show that captive formations deliver higher profitability measured by ROA only for those firms with captives created in the 2000s. As a result, more research can be developed to further explain why the efficiency of insurance via captives is better shown by those firms that have formed captives since 2000. The second involves different regulatory environments in the EU and U.S. Even though firm size is a common contributor, the differences of captive regulation in these world's largest two economies may explain to some degree why the use of captives is associated with divergent sets of firm characteristics in the EU and U.S.

Finally, it is necessary to take the following into consideration on the results of this study. Firstly, the S&P Europe 350 companies selected from 17 major European markets account for around 70 percent of the total market capitalization in the region. We realize that the Europe is not fully equivalent to the EU, as the GDP in the former is about 17 percent larger than that in the latter. However, the S&P Europe 350 index is the best alternative proxy for large-cap companies in the Europe that we can study in comparison with existing studies based on S&P 500 companies in the U.S. Secondly, a dummy variable that equals one when a firm forms a captive is not adequate enough to capture a whole picture of a firm's risk financing strategy. It would be ideal to factor in more details about captive operations, such as lines of insurance and volume of premiums. Unfortunately, these detailed data are not public information. At this moment, we hope that our study based on a captive dummy can pave the way for a better understanding of why more firms turn to alternative risk transfer solutions via captives, given the best use of available captive data.

References

Berry-Stölzle, Thomas R., and Jianren Xu, 2018. "Enterprise Risk Management and the Cost of Capital," *Journal of Risk and Insurance* 85(1) 159–201.

Bird, Steven T. 2016. *Risk Financing*. Dallas: International Risk Management Institute, Inc. (IRMI)

Bodnaruk, Andriy, William O'Brien, and Andrei Simonov. 2016. "Captive Finance and Firm's Competitiveness." *Journal of Corporate Finance* 37(C) 201–228.

Captive Insurance Companies Association. 2019. "Commercial Insurance and Captive Insurance Industry: Commonly Accepted Practices." http://www.cicaworld.com/docs/default-source/default-document-library/cica_commonly_accepted_insurance_practices_risk_pools_jan2019.pdf.

Captive Insurance Companies Association. 2016. "15th CICA Captive Market Study." http://www.cicaworld.com/Resources/Publications/CaptiveMarketStudy.aspx.

Chang, Mu-Sheng. 2008. "Alternative Risk Transfer: Evidence of Self-Insurance among Hospitals in Pennsylvania for Workers' Compensation Liability." *Journal of Insurance Regulation* 27 (2): 59–94.

Chang, Mu-Sheng. 2013. "Characteristics of Self-Insurers for Workers' Compensation Losses: Evidence from Manufacturers in Pennsylvania." *Journal of Insurance Issues* 36(2) 175–193.

Chang, Mu-Sheng. 2012. "Systematic Risk in Risk Retention Groups for Liability Insurance," *Review of Management Innovation & Creativity*, 5 (16) 1–15.

Chang, Mu-Sheng and Jiun-Lin Chen. 2019. "Does Captive Insurance Improve Firm Value? Evidence from S&P 500 Companies," *Asia-Pacific Journal of Risk and Insurance*, 14 (1).

Chang, Mu-Sheng, and Jiun-Lin Chen. 2018. "The Characteristics of S&P 500 Companies with Captive Insurance Subsidiaries." *Journal of Insurance Regulation*, 37: 35–56.

Chang, Mu-Sheng, and Mary A. Weiss. 2011. "Characteristics of U.S. Self-Insurers for Workers' Compensation Losses." *Journal of Insurance Regulation* 30(1) 139–170.

Colaizzo, Dominic A. 2009. "Introduction to Risk Financing," *Risk Management Handbook for Health Care Organizations*, edited by Roberta Carroll, American Society for Healthcare Risk Management. San Francisco, CA: Jossey-Bass.

Cole, Cassandra, and Kathleen A. McCullough. 2008. "Captive Domiciles: Trends and Recent Changes." *Journal of Insurance Regulation* 26(4) 61–90.

Cross, Mark L., Wallace N. Davidson III, and John H. Thornton. 1986. "The Impact of Captive Insurer Formation on the Parent Firm's Value." *Journal of Risk and Insurance* 53(3) 471–483.

Cross, Mark L., Wallace N. Davidson III, and John H. Thornton. 1988. "Taxes, Stock Returns and Captive Insurance Subsidiaries." *Journal of Risk and Insurance* 55(2) 331–38.

Culp, Christopher L. 2006. *Structured Finance and Insurance: The ART of Managing Capital and Risk*. New Jersey: John Wiley & Sons.

DeMarzo, Peter, and Darrell Duffie. 1995. "Corporate Incentives for Hedging and Hedge Accounting." *Review of Financial Studies* 8(3) 743–771.

Dionne, Georges, and Martin Garand. 2003. "Risk Management Determinants Affecting Firms' Values in the Gold Mining Industry: New Empirical Results." *Economics Letters* 79(1) 43–52.

Diallo, Alahassane and Sangphill Kim. 1989. "Asymmetric Information, Captive Insurers' Formation, and Managers' Welfare Gain." *Journal of Risk and Insurance* 56(2) 233–251.

Feldman, Roger. 2012. "Why Do Employers Self-Insure? New Explanations for the Choice of Self-Insurance vs. Purchased Health Insurance." *Geneva Papers on Risk and Insurance Issues and Practice* 37(4) 696–711.

FERMA, 2017. "Captives in Post BEPS World," accessed at *https://www.ferma.eu/ferma-publishes-guidelines-beps-captive-reinsurance-arrangements*.

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein. 1993. "Risk Management: Coordinating Corporate Investment and Financing Policies." *Journal of Finance* 48(5) 1629–1658.

Fudenberg, Drew and Jean Tirole. 1995. "A Theory of Income and Dividend Smoothing Based on Incumbency Rents." *Journal of Political Economy*, 103 (1) 75–93.

Graham, John R., and Daniel A. Rogers. 2002. “Do Firms Hedge in Response to Tax Incentives?” *Journal of Finance* 57(2) 815–839.

Graham, John R., and Clifford W. Smith Jr. 1999. “Tax Incentives to Hedge.” *Journal of Finance* 54(6) 2241–2262.

Graham, John R., C. R. Harvey, and S. Rajgopal. 2005. “The economic implications of corporate financial reporting.” *Journal of Accounting and Economics* 40: 3–73.

Gordon, M. J., 1964, “Postulates, principles and research in accounting.” *The Accounting Review*, 39 (2): 251–263.

Hall, Shanique. 2012. “Recent Developments in the Captive Insurance Industry.” *CIPR Newsletter* (National Association of Insurance Commissioners and the Center for Insurance Policy and Research), January 2012.

Han, Li-Ming, and Gene C. Lai. 1991. “The Tax Deductibility of Premiums Paid to Captive Insurers: A Risk Reduction Approach.” *Journal of Risk and Insurance* 58(1) 47–62.

Hartwig, Robert, Steven Weisbart, and James Lynch, 2015. “Global Insurance Capital Standards.” Insurance Information Institute. https://www.iii.org/sites/default/files/docs/pdf/paper_capitalstandards_final.pdf.

Heckman, J.J. 1976. “The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables.” *Annals of Economic and Social Measurement* 5: 476–492.

Heckman, J.J. 1978. “Dummy endogenous variables in a simultaneous equation system.” *Econometrica* 46: 931–959.

Hofflander, Alfred E., and Blaine F. Nye. 1984. “Self-Insurance, Captives, and Income Taxation.” *Journal of Risk and Insurance* 51(4) 702–709.

Holzheu, Thomas, Kurt Karl, and Mayank Raturi. 2003. “The Picture of Alternative Risk Transfer (ART).” Swiss Re, Sigma No. 1/2003.

Hoyt, Robert E., and Andre P. Liebenberg. 2011. “The Value of Enterprise Risk Management.” *Journal of Risk and Insurance* 78(4) 795–822.

Laeven, Luc, and Ross Levine. 2007. “Is There a Diversification Discount in Financial Conglomerates?” *Journal of Financial Economics* 85(2) 331–367.

Lai, Gene C., and Robert C. Witt. 1995. "The Tax Deductibility of Captive Insurance Premiums: An Assessment and Alternative Perspective." *Journal of Risk and Insurance* 62(2) 230–252.

Leland, Hayne E. 1998. "Agency Costs, Risk Management, and Capital Structure." *Journal of Finance* 53(4) 1213–1243.

Marsh. 2017. "Captives at the Core: The Foundation of a Risk Financing Strategy." *Captive Landscape*, May 2017. https://www.marsh.com/us/campaigns/captive-report-2017.html

Marsh. 2019. "Securing Your Future with a Captive." *Captive Landscape*, June 2019. https://www.marsh.com/us/insights/research/captive-report-2019.html.

Mayers, David, and Clifford Smith. 1982. "On the Corporate Demand for Insurance." *Journal of Business* 55(2) 281–296.

Merchant, Kenneth A. 1989. *Rewarding Results: Motivating Profit Center Managers*. Boston: Harvard Bus. School Press.

Nocco, Brian, and René M. Stulz. 2006. "Enterprise Risk Management: Theory and Practice." *Journal of Applied Corporate Finance* 18(4) 8–20.

Organisation for Economic Co-operation and Development (OECD). 2017. "Supporting an Effective Cyber Insurance Market." OECD Report for the G7 Presidency.

Pagach, Donald, and Richard Warr. 2011. "The Characteristics of Firms That Hire Chief Risk Officers." *Journal of Risk and Insurance* 78(1) 185–211.

Parekh, Rupal, 2006. "Bermuda to Tighten Rules on Commercial Reinsurers; International Changes in Solvency Oversight Spur Regulatory Move," *Business Insurance*, Oct. 9, p. 4.

Queen, Matthew and Light Townsend. 2019. *Modern Captive Insurance: A Legal Guide to Formation, Operation, and Exit Strategies*. Chicago (IL): American Bar Association.

Rejda, George E., and Michael J. McNamara. 2017. *Principles of Risk Management and Insurance*. 11th ed. Boston: Pearson Education.

Scordis, Nicos A., and M. Moshe Porat. 1998. "Captive Insurance Companies and Manager-Owner Conflicts." *Journal of Risk and Insurance* 65(2) 289–302.

Segal, Sim. 2011. *Corporate Value of Enterprise Risk Management: The Next Step of Business Management*. Hoboken (NJ): Wiley.

Simpson, Craig, Dawn Holberton, and Dougie McAndrew. Apr 2019. "What Makes a Successful Risk Leader?" *Risk Management* 66(3) 44–46 and 48–50.

Smith, Barry D. 1986. "Analyzing the Tax Deductibility of Premiums Paid to Captive Insurers." *Journal of Risk and Insurance* 53(1) 85–103

Smith, Clifford W., and René Stulz. 1985. "The Determinants of Firms' Hedging Policies." *Journal of Financial and Quantitative Analysis* 20(4) 391–405.

Stulz, René. 1984. "Optimal Hedging Policies." *Journal of Financial and Quantitative Analysis* 19(2) 127–140.

Swiss Re. 2019. "Natural Catastrophes and Man-Made Disasters in 2018: "Secondary" Perils on the Frontline," *Sigma* No. 2/2019. https://www.swissre.com/institute/research/sigma-research/sigma-2019-02.html.

Thimann, Christian. 2014. "Regulating the global insurance industry: Motivations and challenges, VOX CEPR Policy Portal."https://voxeu.org/article/regulating-global-insurance-industry-motivations-and-challenges.

Trueman, Brett and Sheridan Titman. 1988. "An Explanation for Accounting Income Smoothing." *Journal of Accounting Research* 26: 127-139.

Tucker, Jennifer W. and Paul A. Zarowin. 2006. "Does Income Smoothing Improve Earnings Informativeness?" *The Accounting Review* 81(1) 251-270.

Westover, Kathryn A. 2016. *Captives and the Management of Risk*. 3rd ed. Dallas: International Risk Management Institute, Inc. (IRMI)

Willis Towers Watson. 2017. *Unlocking Potential: Global Approaches to Insurable Benefit Financing, Multinational Pooling and Benefit Captives Research Report 2016/2017*. London: Willis Towers Watson.

Willis Towers Watson. 2020. "Caught between a rock and a hardening insurance market?" https://www.willistowerswatson.com/en-US/Insights/2020/01/caught-between-a-rock-and-a-hardening-insurance-market.

World Economic Forum. 2019. "The Global Risks Report 2019," 14th Edition. https://www.weforum.org/reports/the-global-risks-report-2019.

Zurich. 2019. "Our Guide to Captives." 03/19. https://www.linkedin.com/feed/update/urn:li:activity:6531479609693868032/.

Appendix

Appendix 1: Descriptive Statistics on the Alternative Survival Sample

Variable	*N*	Minimum	Maximum	Mean	Median	Std. deviation
Captive	4803	0	1	0.216	0	0.412
Income volatility	3422	0.026	70.762	0.963	0.427	3.016
ROA	4803	-2.033	0.890	0.047	0.043	0.085
ROE	4803	-17.373	11.257	0.132	0.124	0.472
Size	4803	2.893	15.143	9.356	9.166	1.591
Cash	4803	0	0.396	0.080	0.059	0.071
Opacity	4803	-0.008	0.893	0.232	0.183	0.203
Capex	4803	0	0.218	0.044	0.037	0.034
Sales growth	4803	-1	11.304	0.086	0.056	0.388
Leverage	4803	0	8.680	0.497	0.251	0.816
Dividend	4803	0	1	0.692	1.000	0.462
MB	4803	0.071	128.222	3.119	2.104	4.959
PE	4803	-1279.030	1362.880	19.135	15.833	74.286
Age	4803	0	384.000	214.772	218.000	96.001

Note: *Captive* is a dummy variable that equals 1 for a firm-year in which a captive is used and 0 otherwise. *Income volatility* is calculated as [the standard deviation of quarterly net income estimated over the subsequent three-year period (12 quarters)] divided by a firm's current quarterly income. *ROA* (or *ROE*) measures accounting performance and is equal to net income divided by total assets (or equity). *Size* is measured as the natural log of the book value of total assets. *Cash* is computed as cash divided by total assets. *Opacity* is measured as the ratio of intangible assets to total assets. *Capex* is computed as capital expenditure divided by total assets. *Sales growth* is the percentage growth in annual sales from the prior year to the current year. *Leverage* is equal to the book value of long-term debt divided by the market value of equity. *Dividend* dummy equals 1 if the company paid out dividends for a given year and 0 otherwise. *MB* is the market-to-book ratio. *PE* is the ratio of the fiscal-year-end stock price to earnings per share for the fiscal year. *Age* is the number of months since a firm has stock price information in COMPUSTAT Global database, a proxy for the length of time for a firm as publicly-traded entity.

Appendix 2: Captive and Income Volatility (Every 3 Years) - Alternative Survival Sample

Variable	(1) Reference year 2000	(2) Reference year 2001	(3) Reference year 2002
Panel A: Income volatility (equation 1)			
Captive	3.595***	3.875**	3.978***
	(0.000)	(0.001)	(0.000)
Size	-0.487***	-0.569***	-0.493**
	(0.000)	(0.001)	(0.003)
Capex	3.008	-3.589	-3.553
	(0.426)	(0.279)	(0.249)
ROA	-2.289*	-8.061***	-1.852**
	(0.013)	(0.000)	(0.046)
Sales growth	-0.101	0.844	-0.0788
	(0.681)	(0.200)	(0.414)
Leverage	0.492***	0.369**	0.529**
	(0.008)	(0.013)	(0.025)
Dividend	-0.465*	-0.146	-0.0853
	(0.034)	(0.625)	(0.688)
Constant	7.315***	6.769***	6.135***
	(0.000)	(0.000)	(0.000)
Panel B: Captive (equation 2)			
Size	0.274***	0.302 ***	0.212***
	(0.000)	(0.000)	(0.000)
Cash	0.0967	0.483	-0.0224
	(0.855)	(0.504)	(0.967)
Opacity	0.135	0.348	-0.0708
	(0.572)	(0.347)	(0.637)
Capex	-0.977	1.141	1.402
	(0.564)	(0.568)	(0.311)
Age	0.000309	0.000525	0.000386
	(0.451)	(0.431)	(0.199)
Leverage	-0.0931	-0.0822	-0.0492
	(0.142)	(0.260)	(0.461)
Dividend	0.200**	0.210 *	-0.000568
	(0.048)	(0.080)	(0.995)
Constant	-7.750***	-9.085 ***	-7.307***
	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Country dummies	No	No	No
No. of observations	1264	1078	1080
No. of clusters	339	330	331
Log pseudolikelihood	-3439.9	-3264.9	-3038.9
Wald test of independent equations	33.59 ***	3.07 *	41.0***

Note: The results of treatment effects are based on the alternative survival data set of S&P Europe 350 Firms, 2000-2017. The dependent variable is income volatility. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Appendix 3: Captive and Profitability - Alternative Survival Sample

Variable	ROA		ROE	
	(1) Survival data	(2) Survival data	(3) Survival data	(4) Survival data
Panel A: ROA or ROE (equation 1)				
Captive	-0.116***	-0.1155 ***	-0.514**	-0.475**
	(0.000)	(0.000)	(0.006)	(0.019)
Size	0.00382	0.0054 *	0.0340	0.0403
	(0.241)	(0.091)	(0.131)	(0.115)
Capex	0.174**	0.159 **	0.408	0.356
	(0.029)	(0.049)	(0.283)	(0.345)
Sales growth	0.0140***	0.0143 ***	0.0315**	0.0305**
	(0.000)	(0.000)	(0.040)	(0.041)
Leverage	-0.0225***	-0.0216 ***	-0.104**	-0.107***
	(0.000)	(0.000)	(0.008)	(0.006)
Dividend	0.0304***	0.0268 ***	0.0989***	0.0677***
	(0.000)	(0.000)	(0.000)	(0.003)
Constant	0.0136	0.0092 7	-0.238	-0.216
	(0.692)	(0.792)	(0.229)	(0.297)
Panel B: Captive (equation 2)				
Size	0.315***	0.346***	0.319***	0.378***
	(0.000)	(0.000)	(0.000)	(0.000)
Cash	-1.770**	-1.932**	-0.997	-1.535
	(0.019)	(0.021)	(0.258)	(0.102)
Opacity	0.162	0.259	0.151	0.365
	(0.497)	(0.298)	(0.620)	(0.288)
Capex	-1.654	-2.250	-0.389	-0.937
	(0.334)	(0.180)	(0.830)	(0.610)
Age	0.000149	0.0001	0.000337	0.000444
	(0.786)	(0.771)	(0.590)	(0.538)
Leverage	-0.107**	-0.0929*	-0.168**	-0.165**
	(0.040)	(0.055)	(0.018)	(0.017)
Dividend	0.240**	0.155	0.157	0.0173
	(0.012)	(0.103)	(0.129)	(0.859)
Constant	-42.89***	-50.77***	-8.839***	-9.229***
	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	No	Yes	No	Yes
No. of observations	4,803	4,803	4,803	4,803
No. of clusters	405	405	405	405
Log pseudolikelihood	3634.3	3796.9	-5034.6	-4891.0
Wald test of independent equations	49.11 ***	39.56***	7.44 ***	5.51***

Note: The results of treatment effects are based on the alternative survival data set of S&P Europe 350 Firms, 2000-2017. The dependent variable is profitability as measured by either ROA or ROE. The definitions of all variables can be found in Table 2. The *p*-values are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.