THE REAL EFFECTS OF BANKING CRISES: FINANCE OR ASSET ALLOCATION EFFECTS? SOME INTERNATIONAL EVIDENCE

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The Real Effects of Banking Crises: Finance or Asset Allocation Effects? Some International Evidence

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Abstract

This paper analyzes whether the declining rate of economic growth that follows an episode of banking crisis is motivated by a reduction in the amount of credit available (finance effect) or by a worsening in the allocation of investable resources (asset allocation effect). We use a sample of more than 2,500 industrial firms from 18 developed and developing countries that were involved in 19 systemic banking crises over the 1989-2007 period. The results show that banking crises negatively affect firms' intangible investments, and this intensifies the economic downturn. The negative growth effect is stronger in countries with highly developed financial systems and institutions. Quantitatively, the negative impact of the asset allocation effect during banking crises is larger than the finance effect.

Keywords: Asset Allocation; Banking Crises; Economic Growth; Intangible Assets; Institutions

JEL Codes: G11, K11, O43

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1. INTRODUCTION

Literature has widely documented that banking crises reduce economic growth.[1] This is because crises tend to take place during economic downturns, but also because the problems of the banking sector have independent negative effects on the real economy. Dell'Ariccia *et al.* (2008) confirm that the negative real effects remain after carefully controlling for reverse causality between economic downturns and banking crises. They find that more financially dependent industries perform significantly worse during banking crises than industries that are not so dependent on external funds. This indicates causality running from banking crises to recessions and not simply from recessions to banking crises.

Krozsner *et al.* (2007), moreover, show that the negative effect of banking crises on growth is greater in countries with more developed financial systems. This result extends for crisis periods the huge empirical literature showing that financial development promotes economic growth (Levine, 1997, 2005, La Porta *et al*., 1997, 1998; Rajan and Zingales, 1998; Beck *et al.*, 2000; Beck and Levine, 2002, Beck *et al*., 2003). The interpretation is that operating in an environment where financial markets are well developed is an advantage for more financially dependent industries in good times, but a disadvantage in periods of banking crises.

The negative real effect of banking crises is associated in the above papers with a reduction in the funds mobilized by banks (finance effect). The finance effect determines the available resources for investment and thus affects firm growth. Banking crises might, however, impact negatively on growth not only by reducing the amount of funds available to investment but also by modifying the allocation of investments (asset allocation effect). The relevance of the asset allocation effect in normal periods has been highlighted in several studies (Wurgler, 2000; Claessens and Laeven, 2003; Pang and Wu, 2009). There is no empirical evidence on the variation of firms' asset structure during periods of banking crisis or on its contribution to the negative real effects associated with banking crises. Changes in asset allocation efficiency during banking crises might, however, explain some of the negative real effects traditionally associated with the finance effect.

This paper attempts to fill this gap by empirically analyzing the relative importance of the finance and allocation effects on the reduction of economic growth around 19 systemic banking crises using firm and industry-level data from 18 developed and developing countries over the 1989-2007 period. Specifically, we study the change in firms' intangible intensity during banking crises and the influence of this change on the real effects of the crisis. We control for the reduction of the credit supply during the banking crisis (finance effect) and for reverse causality problems between economic downturns, banking crisis, and changes in intangible intensity.

[1] Bordo *et al.* (2000), Boyd *et al.* (2005), and Hutchison and Noy (2005) show that the magnitude of output losses associated with banking crises varies substantially across crisis episodes. Hoggarth *et al.* (2002) find that output losses in developed countries are higher on average than those in emerging economies.

Our paper makes several contributions to the literature. First, we provide empirical evidence on the importance of the asset allocation effect to explain the reduction of economic growth during banking crises. To analyze the asset allocation effect, we focus on the effect of the asset mix of firms. Similar to Claessens and Laeven (2003), we analyze firms' intangible intensity and use the ratio of intangible and tangible assets as a measure of asset mix. We also analyze the variation of the overall capital efficiency during banking crises, i.e., if there is a change in the efficiency of channeling resources to investments (either tangible or intangible) with the highest returns. Krozsner *et al.* (2007) and Dell' Ariccia *et al.* (2008) do not control for the relevance of the asset allocation effect when they empirically analyze the relevance of the finance effect to explain the negative real effects of banking crises.

Second, we apply a two-stage procedure. In the first stage, we analyze how intangible intensity varies during banking crisis periods. In the second stage, we study the contribution of this variation to economic growth. This approach provides direct evidence of the behavior of intangible investments during banking crises and allows us to control for the endogeneity of intangible investments in the growth equation. Papers analyzing the finance effect during banking crises (Krozsner *et al.,* 2007; Dell' Ariccia *et al.,* 2008) apply one-stage procedure and do not provide direct evidence of the quantitative change in the credit supply.

Third, we use both firm-level and industry-level data to analyze the relevance of finance and asset allocation effects on the real effect of banking crises. This allows us to calculate alternative measures of firm performance. The availability of a panel database over the 1989-2007 period for more than 2,500 industrial firms in 20 different industries also allows us to control for specific firm and industry effects.

The results show that firms' intensity of investments in intangible assets diminishes during banking crises and that this reduction negatively affects economic growth in sectors that are more in need of external finance. Moreover, this effect is stronger in countries with high institutional quality and financial development. We also find a reduction in overall capital efficiency, which diminishes growth during banking crises. The negative effect on growth of intangible intensity remains, however, after controlling for overall capital efficiency. We therefore conclude that banking crises reduce economic growth through both the finance effect, via a reduction in credit supply, and the asset allocation effect, via a reduction in firms' intangibility intensity. Empirically, the asset allocation effect is a more important driver than the finance effect for the reduction in firm and industry growth during banking crises. Our results are robust when we control for the endogeneity of banking crises, using different definitions of the crisis period and different estimation techniques.

The rest of the paper is organized as follows. Section 2 presents a discussion of the arguments that link banking crises to changes in intangible intensity. Section 3 describes the sample and the variables used in the empirical analysis; Section 4 presents the main results and robustness checks and, finally, Section 5 concludes.

2. INTANGIBLE INTENSITY DURING BANKING CRISES

Theoretical studies argue that financial development promotes the efficiency of capital allocation due to the reduction in asymmetric information problems, the screening out of bad projects, and monitoring efforts to ensure that funds are used for productive purposes (Greenwood and Jovanovic, 1990). Wurgler (2000) confirms this implication in a pioneering cross-country study. Pang and Wu (2009) show that this pattern is clearer for industries that are more dependent on external finance. Claessens and Laeven (2003) use sectoral data for 44 countries to show empirically the importance of the mix of tangible and intangible assets for economic growth during normal periods. They find that industries with higher levels of intangibility intensity grow more in countries characterized by better quality of property rights and that this effect is due to the higher investment efficiency provided by a stronger legal framework. They argue that a firm operating in a market with weaker property rights may be led to invest more in fixed assets relative to intangible assets because it is relatively more difficult to secure returns from intangible assets than from fixed assets. It negatively affects growth. Quantitatively, the finance and asset allocation effects appear to be equally important drivers of growth in sectoral value added.

All the above studies analyze the asset allocation effect during normal periods. What happens with intangible intensity during episodes of banking crises is an empirical question because both an increase and a decrease might be theoretically expected.

On the one hand, banking crises might increase intangible intensity as debt usually finances tangible assets whereas intangible investments are more often financed with equity (Hall, 2002). There are several reasons why intangible investments are difficult to finance with debt. First, adverse selection problems in the debt market are likely to be most pronounced for intangible assets. Intangible assets involve much greater uncertainty about returns than tangible assets. It is also likely that firms have better knowledge than lenders about the inherent riskiness of projects. In such an environment, lenders may choose to ration credit rather than raise interest rates, in the hope of not exacerbating adverse selection problems (Stiglitz and Weis, 1981). Second, debt financing can lead to ex-post changes in behavior (moral hazard). Compared to tangible assets, intangible assets are subject to more risk-shifting problems. When creditors anticipate this behavior, they may ration credit or insist that covenants be attached to debt to restrict the firm's behavior (Jensen and Meckling, 1976). Third, intangible assets provide little or no inside collateral value. The lower liquidation value of intangible assets increases the cost of financial distress from using debt and creates another difficulty to finance intangible assets with debt (Berger and Udell, 1990; Boot *et al*., 1991).

As a banking crisis mainly damages investment financed with debt, we might expect tangible investments to suffer a greater reduction during banking crises than intangible investments. In this case, we would expect an increase in intangible intensity during banking crises.

On the other hand, several reasons might lead to a reduction of firms' intangible intensity during banking crises. First, banks and debtors may use lending relationships to reduce adverse selection

and moral hazard problems associated with intangible assets. This would explain why some intangible assets may be financed with debt. Banking crises may therefore destroy the benefits of such close lending relationships and damage intangible investments to a greater proportion. If the relationship bank goes bankrupt, some of its borrowers might be obliged to borrow from non-relationship banks. Non-informed banks will prefer to allocate their funds to the better known and less risky, although less profitable, projects of relationship firms (Detragiache *et al.*, 2000). The consequence is a reduction of firms' intangible intensity.

Second, if banks are more concerned about avoiding bankruptcy, they may induce a more conservative investment behavior in debtors when renewing their debt. This would lead debtors to reduce risky assets, making intangible investments more difficult. More conservative behavior by banks may be induced by bank managers or supervising authorities. When bankruptcy probability increases, as happens in episodes of systemic banking crises, risk-averse bank managers intensify their preference for avoiding variance-increasing projects. Moreover, if bank supervision intensifies during banking crisis periods and banks are obliged by supervisors to behave more prudently, intangible intensity will be reduced during banking crises.

The existence of opposing arguments prevents us from making an explicit hypothesis on the asset allocation effect during banking crises and leads us to treat it as an empirical question.

The potential variation in intangible intensity during banking crises may affect economic growth. Claessens and Laeven (2003) show for normal periods that more intangible intensity in the asset mix of firms promotes greater industry growth and that better protection of property rights favors intangible investments. Expanding this evidence for periods of banking crises, we would expect a reduction (increase) of intangible intensity during episodes of systemic banking crises to damage (improve) economic growth and increase (reduce) the negative real effects associated with the reduction in credit supply during banking crises.

We therefore distinguish two channels to explain the negative real effects associated with banking crises: the finance and the asset allocation effects. In the empirical analysis, we separate the contribution of each channel to economic growth during episodes of systemic banking crises.

3. DATA, METHODOLOGY, AND VARIABLES

3.1. Data

We use firm balance-sheet and income statement annual data (In US dollars and in real prices) from COMPUSTAT Global Vantage database. As COMPUSTAT have data only from 1989 onwards, our analysis period starts in 1989 and ends in 2007. COMPUSTAT Global provides data covering publicly traded companies in more than 80 countries, representing over 90% of the world's market

capitalization, including coverage of over 96% of European market capitalization and 88% of Asian market capitalization. We select firms belonging to 20 industrial sectors on a two-digit SIC level.

Initially, we select countries that have experienced at least one systemic banking crisis using the Laeven and Valencia (2008) Database.[2] This Database contains information on 85 systemic banking crises that occurred in 78 developed and developing countries during the 1989-2007 period. Unfortunately, we have to eliminate several crises because of the limited firm and country-level data in COMPUSTAT. First, we eliminate 49 countries that are not available in COMPUSTAT. Second, we drop 11 countries for which we do not have firm-level financial data to construct the measures of the firms' economic growth, external financial dependence, and intangibility intensity. The final sample is made up of a panel database of 2,530 industrial firms from 18 countries. We analyze a total of 19 systematic crises and use 12,431 firm-year observations.

We separate crisis from non-crisis periods following Krozsner *et al.* (2007). We define three different periods, namely: pre-crisis, crisis, and post-crisis period. Since it is difficult to identify the crisis period and, more specifically, the end of the banking crisis, we consider the crisis period being (t, t+2), where t is the inception date of the crisis provided by the Laeven and Valencia (2008) database. To guarantee that the pre-crisis period is not affected by crisis years, we separate the crisis period by three years from the pre-crisis period. That is, we define the pre-crisis period as (t_1, t-3), with t_1 being the first year in our sample period (generally, 1989 or earliest available). Finally, the post-crisis period is defined as (t+3, T), with T being the final year in our sample (generally, 2007).[3]

3.2. Methodology

We run estimations using a firm-level and industry-level panel database. We apply a two stage procedure. In a first stage, we regress firm-level and industry-level observations of intangible intensity on variables that capture the existence of banking crises, controlling for other relevant factors. In a second stage, we analyze how the variation in intangible intensity during banking crises affects growth after controlling for the finance effect. Moreover, our methodology must control for a variety of specific factors and reverse causality problems between the economic downturn, banking crisis and the change in firms' intangible intensity.

The regression specifications when we use firm-level data are:

[2] Laeven and Valencia (2008) define a banking crisis as systemic when the country's corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time. As a result, non-performing loans increase and all or most of the aggregate banking system capital is exhausted. In some cases, the crisis is triggered by depositor runs on banks, though in most cases it is a general realization that systemically important financial institutions are in distress.

[3] We check that results do not vary when we use alternative definitions of the crisis period, such as (t-3, t+3) and (t-5, t+5).

First stage:

$$Intangible\ Intensity_{ijkt} = \alpha_0 + \alpha_1 * Assets_{ijkt-1} + \alpha_2 * Crisis_{kt} * External\ Dependence_{ijk\ pre\text{-}crisis} * Institutional\ Quality^{IV}_{k} + \theta_{kj} + \lambda_{jt} + \varphi_{kt} + \mu_{1ijk} + \varepsilon_{1ijkt} \quad [1]$$

Second stage:

$$Growth\ (Assets/Sales/EBIT)_{ijkt} = \beta_0 + \beta_1 * Assets/Sales/EBIT_{ijkt-1} + \beta_2 * Crisis_{kt} * External\ Dependence_{ijk\ pre\text{-}crisis} * Financial\ Development_{k1989} + \beta_3 * Crisis_{kt} * Intangible\ Intensity^{IV}_{ijkt} * Institutional\ Quality^{IV}_{k} + \theta_{kj} + \lambda_{jt} + \varphi_{kt} + \mu_{2ijk} + \varepsilon_{2ijkt} \quad [2]$$

$Intangible\ Intensity_{ijkt}$ is the intangible intensity of firm i in sector j from country k at year t. As firm-level control variable we include firm size defined as the natural logarithm of the market value of firms' total assets ($Assets_{ijkt-1}$). We use one lag of this variable to avoid potential endogeneity problems.[4]

$Crisis_{kt}$ is a dummy variable that takes a value of one for the years of the crisis period in country k and zero for years in the pre-crisis and post-crisis periods. To identify the causality between banking crisis and intangible intensity, we interact banking crisis with the firm's external dependence and the country's institutional quality. The superscript IV indicates that the variable is instrumented. We focus only on their exogenous component using the pre-crisis values of external dependence and different instruments for our proxies of country's institutional quality. We then test whether firms with a greater external financial dependence reduce their intangible intensity during banking crises in countries with better institutional quality. Our premise is that banking crises have a greater negative effect on the availability of funding for intangible investments in firms that are more dependent on external finance and in countries with better institutional quality. Firms that are less dependent on external finance are less sensitive to a reduction on bank lending caused by a banking crisis (Dell'Ariccia *et al*. 2008). Firms in countries with poorer institutional quality invest less on intangible assets as their returns are more easily expropriated by competitors (Claessens and Laeven, 2003). Therefore, a higher reduction of intangible intensity during banking crises in firms that are more dependent on external finance in countries with better institutions indicates that at least part of the causality runs from the banking crisis to intangible intensity.

A negative (positive) coefficient of α_2 in this model would indicate a reduction (increase) of intangible intensity during banking crises.

In the second stage, we analyze the impact on economic growth of the change in intangible intensity during banking crises. We use annual real growth in assets, sales and earnings before interest and

[4] Parisi *et al.* (2006); Benfratello *et al.* (2008), among others, include firm size to analyze firm innovation.

taxes (EBIT) as three alternative dependent variables. As explanatory variables of annual firm growth, we include one lag of firm assets, sales or EBIT ($Assets_{ijkt-1}$/$Sales_{ijkt-1}$/ $EBIT_{ijkt-1}$), respectively, to control for potential convergence effects. Additionally, we include two interaction terms. First, we interact the crisis dummy variable with the firm's external dependence and the country's financial development to control for the reduction of credit supply (finance effect). We focus on the exogenous component of financial development using values in the first year available, 1989. Controlling for the level of external financial dependence aims to avoid the usual reverse causality problem between economic growth and banking crisis. This method was initially applied by Rajan and Zingales (1998) and extended in Krozsner *et al*. (2007) and Dell'Ariccia *et al.* (2008) for crisis periods. The premise of this approach is that, if firms more dependent on external finance are hurt more severely during a banking crisis, then it is likely that banking crises have independent negative effects on real economic activity. Moreover, a banking crisis in a system in which banks are important should have a greater contractionary impact on the amount of funds available for investment than in countries where the banking system is less developed. For this reason, the interaction between external dependence and financial development during banking crises captures the finance effect associated with the reduction in credit supply. The coefficient β_2 of this interaction term, extensively analyzed in Krozsner *et al.*, (2007), is expected to be negative.

Second, we include the interaction between the crisis dummy variable, the firm's intangible intensity, and a proxy of the country's institutional quality. This triple interaction term captures the impact on growth of the asset allocation effect during banking crises. We instrument intangible intensity in this model to take into account its endogeneity and focus only on its exogenous component. We include in the triple interaction term a proxy of institutional quality because firms operating in a market with stronger institutions may be led to increase the intensity of intangible assets during non-crisis periods when it is relatively easier to secure returns from these more profitable investments (Claessens and Laeven, 2003). So, the impact of the variation in intangible intensity on economic growth following a banking crisis would be greater in countries with more developed institutions. We also use instruments for the observed values of each proxy of countries' institutional quality to identify its exogenous component. A negative (positive) sign in the coefficient β_3 would be consistent with a worse (better) allocation between intangible and tangible assets during episodes of systemic banking crises.

In both equations we include four specific effects: country-industry, industry-year, country-year, and firm-specific effects. The four sets of specific effects should control for most shocks affecting firm intangibility and growth. θ_{kj} is a country–industry specific effect to control not only for characteristics that are specific to either an industry or a country, but also for characteristics that are specific to an industry when it is located in a particular country, as long as these are persistent in time. These include, for instance, the effect of persistent differences in size, concentration, financial frictions, external dependence, or government intervention and support, derived from different factor endowments, market size, or institutional characteristics that may generate different intangible intensity and growth patterns across industries and countries. λ_{jt} is an industry-year specific effect to control for worldwide industry shocks. φ_{kt} is a country-year specific effect. It includes, for instance, the

severity of the banking crisis, the level of financial development, aggregate country-specific shocks. This approach has the advantage that is less likely to suffer from omitted variable bias or model specification than traditional regressions. Moreover, inclusion of these specific effects avoids the need for the crisis dummy variable, external dependence, financial development, and institutional quality variables to enter the regression on their own. It allows us to focus only on the terms of their interaction.

In both equations, we apply random effects estimations to control for unobservable firm-specific effects. So, μ_{ijk} is a firm-specific effect, which is assumed to be constant for firm i over t and ε_{ijkt} is a white-noise error term. We replicate estimations at industry level. In this case, we aggregate the firm data to obtain information at industry level. We estimate regressions using OLS and controlling for the three specific effects (θ_{kj}, λ_{jt}, and φ_{kt}) to avoid omitted variable bias.[5]

3.3. Variables

3.3.1. Intangibility Intensity

The measure of firm intangibility intensity is defined as the annual ratio of intangible assets-to-net fixed assets (Claessens and Laeven, 2003). Mean values in Table 1 show that Japan, Sweden, Finland, and Norway are the countries in our sample with highest intangible intensity during non-crisis periods. Zimbabwe has the lowest intangible intensity in our sample. The average intangible intensity across countries diminishes from 5.55% in non-crisis periods to 3.55% in crisis periods. This reduction is statistically significant at the one percent level. In particular, ten countries experience a statistically significant reduction in intangible intensity during banking crises (Colombia, India, Indonesia, Jamaica, Japan, Norway, South Korea, Thailand, Turkey, and Venezuela), whereas five countries increase their intangible intensity during the crisis period (Argentina, Czech Republic, Malaysia, Philippines, and Zimbabwe). In three countries, we do not observe a significant change in intangible intensity from non-crisis to crisis periods (Finland, Mexico, and Sweden).

Table 2 reports the variation in intangible intensity across industries from non-crisis to crisis periods. Thirteen industries reduce their intangible intensity during crisis periods whereas five industries increase it (Textile and mill products; Petroleum and coal products; Leather and leather products; Stone, clay, glass, and concrete products; and Electrical and electronic equipment). Only the Food and kindred products, and the Rubber and miscellaneous plastic industries do not have statistically significant changes in their intangible intensity. Obviously, a simple comparison of means incorporates confounding effects. We need to run the multivariate analysis indicated in model [1] to control for reverse causality between banking crisis and intangible intensity, and for other country, industry, year, and firm-specific effects.

[5] Dell'Ariccia *et al*. (2008) use this procedure to control for other factors affecting the relationship between banking crises and economic growth using industry-level data.

Table 1

Economic Growth and Intangible Intensity during Crisis and Non-Crisis Periods across Countries

Mean values of intangible intensity and the measures of economic growth – the annual real growth rate of assets, sales, and EBIT- for each country during crisis and non-crisis periods. The sample consists only of crisis countries. It includes 2,530 industrial firms from 18 countries that have experienced 19 systemic banking crises over the 1989-2007 period. Firm level data are from COMPUSTAT Global database. The pre-crisis period is [t_1, t-3], where t_1 is the first year of the sample period (1989 or earliest available) and t is the crisis inception year reported on Laeven and Valencia (2008). The crisis period is defined as [t, t+2]. The post-crisis period is [t+3, T], where T is the end of the sample period (generally, 2007). ***, **, and * indicate whether the t-Test of difference in means between non-crisis and crisis periods is statistically significant at, respectively, 1%, 5% and 10% level.

Country	Banking Crises	Intangible Intensity		Growth of Assets		Growth of Sales		Growth of EBIT	
		(1) Non-Crisis	*(2) Crisis*	*(3) Non-Crisis*	*(4) Crisis*	*(5) Non-Crisis*	*(6) Crisis*	*(7) Non-Crisis*	*(8) Crisis*
Argentina	1995,2001	0.0173	0.0790***	-0.0035	-0.0014	0.0085	-0.3760***	0.0134	-0.0667***
Colombia	1998	0.0229	0.0096***	0.0028	-0.0326***	-0.0028	-0.0280***	0.0062	-0.0857
Czech Rep.	1996	0.0074	0.0224***	-0.0004	0.0266***	-0.0017	-0.0160***	0.0438	-0.0140**
Finland	1991	0.1188	0.1156	0.0096	-0.0034***	0.0026	-0.0036	0.0151	-0.0862***
India	1993	0.0065	0.0012***	0.0084	0.0325***	-0.0041	0.0057***	0.0305	-0.0021***
Indonesia	1997	0.0072	0.0042***	0.0020	-0.0626***	0.0089	-0.0834***	0.0044	-0.1819***
Jamaica	1996	0.0178	0.0001***	-0.0135	0.0080***	-0.0125	-0.0045***	-0.0132	-0.0177***
Japan	1997	0.1660	0.0118***	0.0048	0.0153***	0.0069	0.0039*	0.0151	-0.0624
Malaysia	1997	0.0290	0.0763***	0.0048	-0.0158***	0.0042	-0.0354***	0.0227	-0.2164***
Mexico	1994	0.0478	0.0336	-0.0040	-0.1166***	-0.0050	-0.2114***	-0.0022	-0.1486***
Norway	1991	0.1109	0.0454***	0.0135	-0.0072***	n.a.	n.a.	0.0336	0.0010***
Philippines		0.0123	0.0129**	-0.0166	-0.0176***	0.0048	-0.0442***	0.0069	-0.1515
South Korea	1997	0.0099	0.0039***	0.0147	-0.0103***	0.0062	-0.0182***	0.0188	-0.1720***
Sweden	1991	0.1256	0.1231	0.0062	-0.0032***	-0.0196	-0.0031***	0.0226	-0.0471***
Thailand	1997	0.0072	0.0024***	0.0077	-0.0290***	0.0040	-0.0451***	0.0134	-0.2453***
Turkey	2000	0.0403	0.0324***	-0.0133	-0.0481***	-0.0173	-0.0555***	0.0003	-0.0859***
Venezuela	1994	0.0146	0***	-0.0194	-0.0419***	-0.0225	-0.0387***	-0.0329	-0.0580***
Zimbabwe	1995	0.0001	0.0007***	0.3276	-0.0291***	-0.2993	-0.0385***	0.2420	-1.3906
Mean Difference Test		**0.0555**	**0.0355*** **	**0.0058**	**-0.0162*** **	**-0.0018**	**-0.0351*** **	**0.0181**	**-0.1083*** **

Table 2

Economic Growth and Intangible Intensity during Crisis and Non-Crisis Periods across Industries

Mean values of intangible intensity and the measures of economic growth – the annual real growth rate of assets, sales, and EBIT- for each industrial sector during crisis and non-crisis periods. The sample consists only of crisis countries. It includes 2,530 industrial firms from 18 countries that have experienced 19 systemic banking crises over the 1989-2007 period. Firm level data are from COMPUSTAT Global database. The pre-crisis period is [t_1, t-3], where t_1 is the first year of the sample period (1989 or earliest available) and t is the crisis inception year reported on Laeven and Valencia (2008). The crisis period is defined as [t, t+2]. The post-crisis period is [t+3, T], where T is the end of the sample period (generally, 2007). ***, **, and * indicate whether the t-Test of difference in means between non-crisis and crisis periods is statistically significant at, respectively, 1%, 5% and 10% level.

SIC Code	Industry	Intangible Intensity		Growth of Assets		Growth of Sales		Growth of EBIT	
		(1) Non-Crisis	*(2) Crisis*	*(3) Non-Crisis*	*(4) Crisis*	*(5) Non-Crisis*	*(6) Crisis*	*(7) Non-Crisis*	*(8) Crisis*
20	Food and kindred products	0.0554	0.0530	0.0462	-0.0214***	-0.0164	-0.0247***	0.0148	-0.0775***
21	Tobacco manufactures	0.4630	0.0187***	0.0079	-0.0514***	0.0069	-0.0218***	-0.0004	0.0105***
22	Textile and mill products	0.0076	0.0099***	-0.0052	-0.0177***	-0.0095	-0.0219***	0.0042	-0.1586
23	Apparel and other textile products	0.0248	0.0038***	0.0127	-0.0182***	0.0077	-0.0252***	0.0153	-0.1514***
24	Lumber and wood products	0.0353	0.0084***	0.0119	-0.0202***	-0.0051	-0.0300***	0.0146	-0.1422
25	Furniture and fixture	0.0140	0.0017***	0.0082	-0.0226***	0.0133	-0.0369***	0.0075	-0.1722***
26	Paper and allied products	0.0332	0.0092***	-0.0011	-0.0120***	0.0038	-0.0231***	0.0125	-0.0858***
27	Printing and publishing	0.0834	0.0149***	0.0072	-0.0076***	-0.0030	-0.0554***	0.0156	-0.1848***
28	Chemicals and allied products	0.0315	0.0216***	0.0000	-0.0064**	-0.0064	-0.0540***	0.0159	-0.0622***
29	Petroleum and coal products	0.0306	0.1522***	-0.0004	0.0816***	0.0100	-0.0360***	0.0141	-0.0190***
30	Rubber and miscellaneous plastics	0.0569	0.0514	0.0053	-0.0073***	-0.0029	-0.0260***	0.0133	-0.1155
31	Leather and leather products	0.0119	0.0124**	-0.0011	-0.0310***	0.0069	-0.0337***	0.0032	-0.0119***
32	Stone, clay, glass, and concrete products	0.0361	0.0488***	-0.0002	-0.0285***	-0.0026	-0.0378***	0.0089	-0.1565***
33	Primary metal industries	0.0194	0.0145***	-0.0044	-0.0185***	0.0082	-0.0257***	0.0253	-0.1204***
34	Fabricated metal products	0.0236	0.0134***	0.0051	-0.0180***	0.0005	-0.0246***	0.0166	-0.0997***
35	Industrial machinery and equipment	0.1062	0.0663**	-0.0143	-0.0066	-0.0175	-0.0324	0.0265	-0.1426
36	Electrical and electronic equipment	0.0360	0.1038***	0.0046	-0.0090***	-0.0050	-0.0417***	0.0223	-0.1024
37	Transportation equipment	0.0260	0.0120***	0.0077	-0.0184***	0.0062	-0.0238***	0.0191	-0.1343***
38	Instruments and related products	0.0530	0.0230***	0.0133	-0.0159***	-0.0187	-0.0315	0.0259	-0.0952***
39	Miscellaneous manufacturing industries	0.0623	0.0127***	0.0068	-0.1455***	0.0022	-0.1428***	0.0223	-0.1146***
	Mean Difference Test	**0.0555**	**0.0355*** **	**0.0058**	**-0.0162*** **	**-0.0018**	**-0.0351*** **	**0.0181**	**-0.1083*** **

3.3.2. Firm's Growth

We use three different measures of firm's growth: annual real growth of firm's assets, annual real growth of firm's sales, and annual real growth in firm's earnings before interest and taxes (EBIT). These variables have been widely used as measures of firm's economic growth in previous empirical studies (Demirgüç-Kunt and Maksimovic, 1998; Krozsner *et al.* 2007). EBIT is most closely related to value added, this being the industry measure of performance most commonly used in studies analyzing economic growth (Krozsner *et al*., 2007).

Table 1 shows that average growth in assets, sales, and EBIT diminishes, respectively, by 3.79%, 18.5%, and 6.98% from non-crisis to crisis periods. Most of the countries experience a significant reduction in growth: thirteen, twelve or sixteen countries, depending on whether we use, respectively, assets, sales, or EBIT growth. Table 2 shows that all industries reduce their sales growth from non-crisis to crisis periods. This reduction is only not statistically significant in the Instruments and related products industry. In terms of assets and EBIT, eighteen and fourteen industries, respectively, experience on average statistically significant reduction in asset and EBIT growth during crisis periods.

3.3.3. External Dependence

We measure firm's external dependence as the fraction of capital expenditures not financed with cash-flow from operations. In order to avoid potential endogeneity problems, we define this measure as the averaged value during the pre-crisis period. Our measure differs from the one used by Rajan and Zingales (1998). They construct the proxy at industry-level for a sample of US firms and assume that each industry has the same external dependence across all the countries.[6] In contrast to the Rajan–Zingales index, our firm-specific measure of external dependence captures differences in technology and product mix across firms, industries and countries. We check that our basic results do not change when we use the same measure of external dependence as Rajan and Zingales (1998).

3.3.4. Financial Development and Institutional Quality

We measure country's financial development as the amount of private credit by deposit money banks over GDP. We consider this measure in 1989, the first year available, to avoid any potential endogeneity problems. This measure has widely been used in previous papers (Rajan and Zingales, 1998; Beck *et al.* (2000); Krozsner *et al.* 2007, among others). We check that results do not vary

[6] Rajan and Zingales (1998) argue that the financial structure of US industries is an appropriate benchmark because the relatively open, sophisticated, and developed US financial markets should allow US firms to face fewer obstacles to achieving their desired financial structure than firms in other countries. This approach offers a valid and exogenous way of identifying the extent of an industry's external dependence anywhere in the world. An important assumption underlying it is that external dependence reflects technological characteristics of the industry that are relatively stable across space and time.

when we average financial development over the pre-crisis period or when we instrument it using the legal origin variables.

We include a set of proxies of the country's institutions. Following Claessens and Laeven (2003), we use as index of property rights the rating of protection of property rights constructed by the Heritage Foundation. It ranges from 1 to 5, with higher values indicating greater protection of property rights. We examine the robustness of our results to alternative proxies: (1) the index of Economic Freedom from the Heritage Foundation; It measures the extent to which individuals and firms feel free to conduct their businesses; It ranges from 1 to 5, with greater values indicating better protection of freedom; 2) the index of control of corruption from Kaufmann *et al*. (2005).

As the Law and Finance literature suggests that better institutional quality promotes financial development (La Porta *et al*. 1997, 1998), we do not include simultaneously financial development and proxies of institutional quality with a similar interaction. All these variables are therefore introduced sequentially to avoid potential correlation problems. Moreover, we only consider the exogenous component of all these variables using instruments for them and thus controlling for potential simultaneity bias. Each proxy of institutional quality is regressed on the instruments proposed by Beck *et al*. (2000): five legal origin dummy variables (English, French, German, Scandinavian, and Socialist). To test the suitability of using an Instrumental Variables (IV) estimator, we perform the Durbin-Wu-Hausman test. The test verifies the null hypothesis that the introduction of IVs has no effect on the estimates of the regression's coefficients. We report IV estimations when the test is rejected at the 10 percent level or less. The results are robust to the proxy used.

4. EMPIRICAL RESULTS

4.1. Effect of Banking Crises on Intangible Intensity

We now analyze how banking crises affect the firm's intangible intensity. The results for model [1] are reported in Table 3. Columns (1)-(4) show the results using firm-level data and columns (5)-(8) show the results using industry-level data.

We find that banking crises have a disproportional exogenous negative effect on intangible intensity in countries with more developed institutions. The coefficients of the interaction terms are negative and significant at the one percent level in all estimations, indicating that the intangible intensity of more financially dependent firms experiences a greater reduction during crisis years in more institutional developed countries. The results are similar for the three proxies of institutional quality (property rights, the index of economic freedom, and the index of control of corruption) and using both firm-level and industry level data. We check in columns (4) and (8) that the results remain unchanged when we use the country's financial development instead of the quality of institutions.

Claessens and Laeven (2003) show that, during non-crisis periods, firms invest more in intangible assets in countries with higher protection of property rights. Their results imply that the degree to which firms allocate resources in an optimal way depends on the strength of the country's property rights and that firms' asset allocation is an important channel through which property rights affect growth. We now find that a banking crisis has a stronger negative impact on intangible intensity in countries where better institutional quality favored more intangible investment during non-crisis periods. The reduction in intangible intensity indicates that the investments that are more easily financed with debt, tangible investments, are less damaged during banking crises than intangible investments, where adverse selection and moral hazard problems make the use of debt more difficult. This result is consistent with a banking crisis destroying close lending relationships that allowed banks to provide debt to finance intangible assets. It would also be consistent with banks requiring a more conservative behavior in debtors when they are renewing debt under credit constraints.

The reduction in intangible intensity during banking crises is economically significant. Using, for instance, estimations in column (1) of Table 3, on average, in a country experiencing a banking crisis, a firm at the 75th percentile of external dependence and located in a country at the 75th percentile of property rights protection experiences a 166.8% greater contraction in intangible intensity during a banking crisis period than a firm at the 25th percentile of external dependence and located in a country at the 25th percentile of property rights protection. This is a large effect compared with an overall mean decline in intangible intensity of 36.04% between non-crisis and crisis periods.

Table 3
Banking Crises and Intangible Intensity

This table shows the results of the effect of banking crises on intangibility intensity. Intangible intensity is the ratio of intangible assets to net fixed assets. We control for the value of total assets lagged one year. Crisis is a dummy variable that takes a value of one for years in the crisis period and zero otherwise. External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. We use three different measures of the quality of institutions: the index of quality of property rights, the index of economic freedom, and an index indicating the level of control of corruption in each country. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. We show IV estimations for institutional variables when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for institutional variables are dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. We apply a random-effects model to control for unobserved firm specific effects in the firm-level regressions. Industry-level regressions are estimated by OLS. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	***Firm-Level Data***				***Industry-Level Data***			
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Lagged Assets	0.0132*** (8.99)	0.0132*** (8.99)	0.0132*** (8.99)	0.0132*** (8.99)	0.0059** (2.43)	0.0059** (2.43)	0.0059** (2.43)	0.0059** (2.43)
*Crisis * External Dependence*Property Rights*	-0.0005*** (-2.98)				-0.0006*** (-5.63)			
*Crisis * External Dependence*Economic Freedom*		-0.0003*** (-2.98)				-0.0004*** (-5.64)		
*Crisis * External Dependence*Control of Corruption*			-0.0003*** (-2.98)				-0.0004*** (-5.64)	
*Crisis * External Dependence*Financial Development*				-0.0004*** (-2.98)				-0.0005*** (-5.65)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0559	0.0559	0.0559	0.0559	0.0032	0.0032	0.0032	0.0032
Wald Test	158.44***	150.21***	158.45***	158.46***	-	-	-	-
F-Test	-	-	-	-	15.47***	15.37***	15.49***	15.52***
# Observations	11,959	11,959	11,959	11,959	1,550	1,550	1,550	1,550
Durbin-Wu-Hausman Test	8.85***	-	8.86***	-	31.72***	-	31.80***	-

4.2. Intangible Intensity and Economic Growth

We now analyze whether the variation in intangible intensity during banking crises affects economic growth. Following model [2], we control in all regressions for the finance effect, i.e., the variation in the credit supply during banking crises, and for the potential endogeneity of intangible intensity. We apply two procedures to control for the potential endogeneity of intangible intensity: First, we use the pre-crisis values of intangible intensity instead of the observed values, and second, we apply a two-stage least squares (2SLS) procedure.

Table 4 reports the results when we control for the endogeneity of intangible intensity using its average value in the pre-crisis period. The interaction term between external development and financial development during banking crises presents negative coefficients in all estimations, with four out of the six estimations being statistically significant. This result confirms the relevance of the finance effect in a banking crisis and is consistent with Krozsner *et al*. (2007). It suggests that banking crises have a disproportionately worse effect on economic growth in industrial firms that are more in need of external finance, especially in countries with sounder financial systems. This finding supports the idea that operating in a well-developed financial environment is positive during non-crisis periods but also provokes a more negative impact of banking crises on economic growth due to a greater reduction in the amount of funds provided by banks.

Table 4
Banking Crises and Economic Growth: Using Pre-crisis Values of Intangible Intensity

This table shows the results of the effect of banking crises on economic growth. We use three measures of firm and industry economic growth: the real growth of assets (Panel A), the real growth of sales (Panel B), and the real growth of EBIT (Panel C). We control, respectively, for the one lag annual value of total assets, sales, and EBIT. Crisis is a dummy variable that takes a value of one for years in the crisis period and zero otherwise. External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. Intangible intensity is the ratio of intangible assets to net fixed assets. We endogeneize the intangible intensity using the average value over the pre-crisis period instead of the observed values. Property rights is the index proxying the protection of the property rights. We show IV estimations for property rights when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for property rights are the dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. Both stages in the 2SLS procedure are estimated by a random-effects model to control for unobserved firm specific effects in the firm-level regressions. Both stages of industry-level regressions are estimated by OLS in the 2SLS procedure. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	PANEL A: Growth of Assets		PANEL B: Growth of Sales		PANEL C: Growth of EBIT	
	Firm-Level	***Industry-Level***	***Firm-Level***	***Industry-Level***	***Firm-Level***	***Industry-Level***
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Lagged Assets	-0.0040*** (-9.75)	-0.0084*** (-3.51)				
Lagged Sales			-0.0009 (-1.39)	-0.0021 (-1.30)		
Lagged EBIT					0.1594*** (20.59)	0.0862*** (7.40)
*Crisis*External Dependence*Financial Development*	-0.0005*** (-2.81)	-0.0002*** (-2.72)	-0.0003 (-1.29)	-0.0003*** (-3.15)	-0.0001 (-1.57)	-0.0006 (-1.64)
*Crisis*Intangible Intensity $^{PRE\text{-}CRISIS}$*Property Rights*	-0.0524*** (-3.98)	-0.2241*** (-3.87)	-0.0935*** (-4.79)	-0.3133*** (-4.23)	-0.3023** (-2.01)	-0.5430** (-2.47)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0003	0.0298	0.0021	0.0195	0.3064	0.0940
Wald Test	128.63***	-	30.33***	-	449.04***	-
F-Test	-	6.51***	-	6.18***	-	12.39***
# Observations	12,431	1,538	12,396	1,536	11,123	1,514
Durbin-Wu-Hausman Test	15.87***	15.01***	22.95***	17.89***	4.02**	6.09**

In terms of the asset allocation effect, the interactions of intangible intensity and the protection of property rights during banking crises have negative and significant coefficients in all estimations. This indicates that industrial firms using relatively more intangible assets experience a greater decline in economic growth during systemic banking crises and that the negative growth effect is stronger in countries with better protection of property rights. This result suggests that the reduction in intangible intensity during periods of banking crises impacts negatively on growth and exacerbates the downturn in more institutionally-developed countries.

Table 5 reports the results when we control for the endogeneity of firm's intangible intensity in the growth equation using 2SLS with the initial value of intangible intensity serving as the instrument. The initial value is considered an appropriate instrument of intangible intensity because it is related to the values of intangible intensity and does not directly affect and is not directly affected by annual economic growth.[7] We also check that results do not change when other instruments such as the country's legal origin or the average intangible intensity of other companies in the same two-digit SIC code industry in the same country are used.

In the first stage of a typical 2SLS, we regress intangible intensity on the instrument and the other exogenous variables, i.e.:

$$\begin{aligned} \textit{Intangible Intensity}_{ijkt} = {} & \gamma_0 + \gamma_1 * \textit{Assets}_{ijkt-1} \\ & + \gamma_2 * \textit{Crisis}_{kt} * \textit{External Dependence}_{ijk\ Pre\text{-}crisis} * \textit{Institutional Quality}^{IV}_{k} \\ & + \gamma_3 * \textit{Crisis}_{kt} * \textit{External Dependence}_{ijk\ Pre\text{-}crisis} * \textit{Financial Development}_{k1989} \\ & + \gamma_4 * \textit{Intangible Intensity}_{ijk\ Initital} \\ & + \theta_{kj} + \lambda_{jt} + \varphi_{kt} + \mu_{3ijk} + \varepsilon_{3ijkt} \end{aligned} \qquad [3]$$

In the second stage, we replace intangible intensity by its predicted value (Intangible Intensity^{IV}) from the preceding regression to estimate model [2]. Both stages are estimated applying a random effects model to eliminate unobserved firm-specific effects when we use firm-level data and an OLS model when we use industry-level data.

The results of the 2SLS estimations reported in Table 5 are similar to those in Table 4. The interaction between external dependence and financial development during banking crises has negative and statistically significant coefficients when we use firm level data to analyze growth in assets and growth in EBIT. Otherwise, the coefficients are not statistically significant. The above negative significant coefficients are consistent with the relevance of the finance effect to explain, at least in part, the negative real effects of banking crisis. The interaction between intangible intensity and property rights

[7] The coefficient of correlation of the initial value of intangible intensity with annual intangible intensity is 0.0405***; its coefficient of correlation with firm's growth of assets is -0.0128***, with firm's growth of sales is 0.0003, and with firm's growth of EBIT is 0.0013.

during banking crises has negative and statistically significant coefficients in all the estimations. It confirms the relevance of the asset allocation effect to explain the negative real effects of banking crisis.

These 2SLS estimations suggest that the asset allocation effect is even more significant than the finance effect. The interaction term capturing the asset allocation effect has statistically significant coefficients in all the estimations whereas the interaction capturing the finance effect has negative statistically significant coefficients in columns (1) and (5). The asset allocation effect is also economically greater. Using, for instance, the estimations in column (1) of Table 5 to estimate the economic impact of the asset allocation effect, on average, in a country experiencing a banking crisis, a firm at the 75th percentile of intangible intensity and located in a country at the 75th percentile of property rights protection experiences a 23.90% greater contraction in real annual growth of assets during the banking crisis period than a firm at the 25th percentile of intangible intensity and located in a country at the 25th percentile of property rights protection.

Table 5
Banking Crises and Economic Growth: Applying a 2SLS Procedure

This table shows the results of the effect of banking crises on economic growth. We use three measures of firm and industry economic growth: the real growth of assets (Panel A), the real growth of sales (Panel B), and the real growth of EBIT (Panel C). We control, respectively, for the one lag annual value of total assets, sales, and EBIT. Crisis is a dummy variable that takes a value of one for years in the crisis period and zero otherwise. External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. Intangible intensity is the ratio of intangible assets to net fixed assets. We endogeneize the intangible intensity and apply 2SLS serving the initial value of intangible intensity as instrument. Property rights is the index proxying the protection of the property rights. We show IV estimations for property rights when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for property rights are the dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. Both stages in the 2SLS procedure are estimated by a random-effects model to control for unobserved firm specific effects in the firm-level regressions. Both stages of industry-level regressions are estimated by OLS in the 2SLS procedure. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	PANEL A: Growth of Assets		PANEL B: Growth of Sales		PANEL C: Growth of EBIT	
	Firm-Level *(1)*	***Industry-Level*** *(2)*	***Firm-Level*** *(3)*	***Industry-Level*** *(4)*	***Firm-Level*** *(5)*	***Industry-Level*** *(6)*
Lagged Assets	-0.0037*** (-2.80)	-0.0081*** (-3.89)				
Lagged Sales			0.0001 (0.05)	-0.0024 (-1.49)		
Lagged EBIT					0.1558*** (19.53)	0.0892*** (7.63)
Crisis External Dependence*Financial Development*	-0.0005*** (-2.72)	-0.0006 (-1.43)	0.0003 (0.25)	-0.0005 (-1.09)	-0.0001** (-2.04)	-0.0001 (-0.64)
*Crisis *Intangibility Intensity ^{2SLS} * Property Rights*	-0.1130*** (-4.78)	-0.3586*** (-9.00)	-0.2055*** (-4.11)	-0.4780*** (-6.89)	-0.4643*** (-2.94)	-0.9661*** (-5.15)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0004	0.0627	0.0014	0.0488	0.3023	0.1041
Wald Test	79.45***	-	41.89***	-	403.22***	-
F-Test	-	18.13***	-	12.10***	-	16.20***
# Observations	11,864	1,537	11,918	1,535	10,664	1,513
Durbin-Wu-Hausman Test	22.82***	80.99***	16.93***	47.54***	8.66***	26.57***

Also using estimation in column (1) to estimate the economic impact of the finance effect, on average, in a country experiencing a banking crisis, a firm at the 75th percentile of external dependence and located in a country at the 75th percentile of financial development experiences a 3.17% greater contraction in real annual growth of assets during the banking crisis period than a firm at the 25th percentile of external dependence and located in a country at the 25th percentile of financial

development. This is a lower effect than the one observed for the asset allocation effect. The difference between the economic impact of the asset allocation effect and the finance effect is even greater when we use estimations in columns (2) to (6).

4.3. Intangible Intensity or Efficiency of Capital Allocation?

In this section we test whether the effect attributed to the reduction in intangible investments during banking crises is due to a reduction in the overall efficiency of capital allocation, not specifically related to intangible assets, i.e., a failure during banking crises in directing resources towards uses –either tangible or intangible– that bring in higher marginal returns. The relevance of capital allocation for economic growth during normal periods has been highlighted in several papers. Wurgler (2000) shows that the country's financial development improves the real economy by facilitating the allocation of capital to more profitable investments. Pang and Wu (2009) find that the positive influence of financial development on the efficiency of capital allocation is clearer for industries that are more dependent on external finance.

A priori, it is not clear how the efficiency of capital allocation behaves during banking crises. On the one hand, the reduction in funds available for firms to invest during banking crises may favor the liquidation of mediocre projects and, therefore, increase the efficiency of capital allocation. Almeida and Wolfenzon (2005) provide indirect evidence on this idea showing that an increase in external financing needs during normal periods is associated with a more efficient capital allocation because it increases the liquidation of low productivity projects. On the other hand, banking crises may destroy the benefits of close lending relationships between banks and firms. If the relationship bank goes bankrupt, some of its borrowers might be obliged to borrow from non-relationship banks. These borrowers would face an adverse selection problem as non-informed banks will prefer to allocate their funds to the better known, but less profitable, projects of relationship firms (Detragiache *et al.*, 2000). The consequence might be a reduction in the efficiency of capital allocation.

We follow Wurgler (2000) and Pang and Wu (2009) to define the measure of efficiency of allocation of capital. Specifically, we define the capital efficiency as the elasticity of firm's investments to firm's value added. We estimate this measure of capital efficiency for each industry j in each country k using annual firm's EBIT as proxy of value added, and separated for three sub-periods, (pre-crisis, crisis, and post-crisis). The model for each sub-period is: [8]

$$\text{Ln}\left(I_{ijkt}/I_{ijkt-1}\right) = \pi + \eta_{jk\ pre\text{-}crisis} * \text{Ln}\left(V_{ijkt}/V_{ijkt-1}\right) + \varepsilon_{4ijkt} \quad \text{where } t \in (t_1, t\text{-}3) \qquad [4]$$

$$\text{Ln}\left(I_{ijkt}/I_{ijkt-1}\right) = \pi + \eta_{jk\ crisis} * \text{Ln}\left(V_{ijkt}/V_{ijkt-1}\right) + \varepsilon_{5ijkt} \quad \text{where } t \in (t, t+2) \qquad [5]$$

$$\text{Ln}\left(I_{ijkt}/I_{ijkt-1}\right) = \pi + \eta_{jk\ post\text{-}crisis} * \text{Ln}\left(V_{ijkt}/V_{ijkt-1}\right) + \varepsilon_{6ijkt} \quad \text{where } t \in (t+3, T) \qquad [6]$$

[8] Wurgler (2000) estimates elasticity of efficiency for each country. Pang and Wu (2008) estimate this measure for each industry in each country in a similar way to us.

I is the amount of firm's investment, *V* is the proxy we use for firm's value added: EBIT.[9] Ln (I_{ijkt}/I_{ijkt}) is the change in firm's investment from *t-1* to *t.* Ln(V_{ijkt}/V_{ijkt-1}) denotes the change in EBIT from *t-1* to *t*. Efficiency of capital allocation is given by the parameter $\eta_{jk,}$ that is, the elasticity of capital allocation with respect to EBIT for industry j in country k in the respective sub-period. The argument behind the use of elasticity as a proxy for capital allocation efficiency is the following: efficient investments of capital mean that capital is allocated more to growing activities and less to declining ones. The higher the value of η_{jk}, the higher the efficiency of capital allocation.

Table 6 shows that the efficiency of capital allocation diminishes during episodes of systemic banking crises. Investment elasticity to EBIT diminishes from a value of 0.1644 in non-crisis periods to -0.1041 in crisis periods. This reduction is statistically significant at the one per cent level. Most countries and industries experience on average a reduction in the efficiency of capital allocation during systemic banking crises. Seven countries experience a significant reduction in investment elasticity to EBIT, versus three that significantly increase their investment elasticity to EBIT. Although variations at industry level are less significant, seven industries suffer significant reductions in investment elasticity to EBIT during banking crises, versus four industries that significantly increase their investment elasticity to EBIT.

Table 6
Capital Allocation Efficiency during Crisis and Non-Crisis Periods across Countries and Industries

Mean values of the efficiency of investments on EBIT for each country and industrial sector during crisis and non-crisis periods. The sample consists only of crisis countries. It includes 2,530 industrial firms from 18 countries that have experienced 19 systemic banking crises over the 1989-2007 period. Firm level data are from COMPUSTAT Global database. The pre-crisis period is [t_1, t-3], where t_1 is the first year of the sample period (1989 or earliest available) and t is the crisis inception year reported on Laeven and Valencia (2008). The crisis period is defined as [t, t+2]. The post-crisis period is [t+3, T], where T is the end of the sample period (generally, 2007). ***, **, and * indicate whether the t-Test of difference in means between non-crisis and crisis periods is statistically significant at, respectively, 1%, 5% and 10% level.

Panel A: Capital Allocation Efficiency Across Countries

Country	Banking Crises	Investment Elasticity to EBIT	
		Non-Crisis	*Crisis*
Argentina	1995,2001	0.2027	-0.1989**
Colombia	1998	0.0638	0.0249
Czech Rep.	1996	0.2834	-0.8821**
Finland	1991	0.0417	-2.1488*
India	1993	-0.0000	0.3162***
Indonesia	1997	0.1747	0.0215***
Jamaica	1996	0.0173	0.2042
Japan	1997	0.1808	0.0306
Malaysia	1997	0.1425	-0.4154
Mexico	1994	0.1309	0.1460**
Norway	1991	0.3095	0.5317
Philippines	1997	0.0968	0.0800
S. Korea	1997	0.2588	-0.1000*
Sweden	1991	0.1184	0.0101
Thailand	1997	0.0850	-0.0271***
Turkey	2000	0.4880	-0.1689***
Venezuela	1994	0.1817	4.3646**
Zimbabwe	1995	1.1388	0.0127
Mean Difference Test		**0.1644**	**-0.1041*** **

Panel B: Capital Allocation Efficiency Across Industries

SIC Code	Industry	Investment Elasticity to EBIT	
		Non-Crisis	*Crisis*
20	Food and kindred products	0.1755	0.5944
21	Tobacco manufactures	0.9558	-0.8809**
22	Textile and mill products	0.0582	-0.0544
23	Apparel and other textile products	-0.0027	0.0659**
24	Lumber and wood products	0.0298	-0.0061
25	Furniture and fixture	0.0527	0.0069
26	Paper and allied products	0.1290	-0.0381
27	Printing and publishing	0.1218	0.1094
28	Chemicals and allied products	0.0263	0.1095*
29	Petroleum and coal products	0.1910	-0.4995**
30	Rubber and miscellaneous plastics	0.4793	-2.1370**
31	Leather and leather products	-0.0019	0.0042
32	Stone, clay, glass, and concrete products	0.1064	0.1090
33	Primary metal industries	0.2900	-0.1307***
34	Fabricated metal products	0.1223	-0.0707**
35	Industrial machinery and equipment	0.1631	-0.0240**
36	Electrical and electronic equipment	0.1794	0.0383
37	Transportation equipment	0.2041	0.0024**
38	Instruments and related products	0.0442	0.1851***
39	Miscellaneous manufacturing industries	-0.1179	0.3304*
		0.1644	**-0.1041*** **

A simple descriptive analysis of means, however, does not control for reverse causality between banking crises and changes in intangible intensity. To isolate the exogenous component of the

[9] We check that results do not vary when sales are used as a proxy of firm's value added.

variation in intangible intensity, we estimate a similar model to that used to analyze the variation of intangible intensity. The model is:

$$Efficiency_{jk\ subperiod\ L} = \beta_1 * Assets_{jk\ pre\text{-}crisis} + \beta_2 * Crisis_{kL} * External\ Dependence_{jk\ pre\text{-}crisis} * Institutional\ Quality^{IV}_{k} + \theta_{kj} + \lambda_{jL} + \varphi_{kL} + \varepsilon_{7jkL} \quad [7]$$

where L refers to each of the three sub-periods (pre-crisis, crisis, and post-crisis). As explanatory variables, we include the natural logarithm of the assets of industry j averaged for the pre-crisis period to control for the exogenous component of industry size. The triple interaction term captures the variation in the efficiency of capital allocation during crisis periods compared to non-crisis periods. The interaction with external dependence aims to avoid reverse causality problems between banking crises and changes in efficiency as more industries that are more dependent on external finance are those that are most affected by a banking crisis. We also interact with the exogenous component of the country's institutional quality as better institutions promote higher capital allocation efficiency, so a greater variation would be expected in the event of a banking crisis.

Table 7
Banking Crises and Overall Capital Allocation Efficiency

This table shows the results of the effect of banking crises on overall capital allocation efficiency. The dependent variable is the investment elasticity on EBIT. We control for the average value of total assets in the pre-crisis period. Crisis is a dummy variable that takes a value of one for the crisis period and zero otherwise. External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. We use three different measures of the quality of institutions: the index of quality of property rights, the index of economic freedom, and an index indicating the level of control of corruption in each country. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. We show IV estimations for institutional variables when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for institutional variables are dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. OLS estimations with industry-level data are applied. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Dependent variable: Investment Elasticity				
Explanatory Variables	***(1)***	***(2)***	***(3)***	***(4)***
Assets $_{PRE\text{-}CRISIS}$	0.0214 (1.10)	0.0214 (1.10)	0.0214 (1.10)	0.0214 (1.10)
*Crisis * External Dependence * Property Rights*	-0.0009* (-1.88)			
*Crisis * External Dependence * Economic Freedom*		-0.0005* (-1.90)		
*Crisis * External Dependence * Control of Corruption*			-0.0006* (-1.89)	
*Crisis * External Dependence * Financial Development*				-0.0007* (-1.89)
Industry-Country Dummies	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes
R- Squared	0.0213	0.0213	0.0213	0.0213
F-Test	1.20	.	.	1.20
# Observations	259	259	259	259
Durbin-Wu-Hausman Test	3.52**	-	-	-

As in previous models, we add a set of country, industry and time-specific effects in order to guarantee that the results are not driven by an omitted variables problem (θ_{kj} , λ_{jL} , *and* φ_{kL}). As data is at industry-level, we apply OLS estimations.

Table 7 reports the results. The coefficients of the triple interaction terms are negative and significant at the one percent level in all estimations. The negative coefficients suggest that during banking crises industries more in need of external finance tend to have lower investment elasticity in countries with higher quality of institutions. The results are robust to the proxy used for the country's institutional quality or when we use financial development instead of institutional quality.

Worse overall efficiency of capital allocation might explain the negative real effects attributed so far to the allocation between intangible and tangible assets. We thus check whether the negative effect on growth associated with the reduction in intangible intensity remains after controlling for the variation in the overall efficiency of capital allocation. To do so, we incorporate in the growth equation of model [2] an additional interaction term capturing the effect of the change on capital allocation efficiency during banking crises. As the efficiency capital allocation is measured at industry-level, regressions are only estimated using industry-level data. The model is:

$$
\begin{aligned}
Growth_{jk\ SubperiodL} = {} & \gamma_0 + \gamma_1 * Assets_{jk\ pre\text{-}crisis} \\
& + \gamma_2 * Crisis_{kL} * External\ Dependence_{jkpre\text{-}crisis} * Financial\ Development_{k1989} \\
& + \gamma_3 * Crisis_{kL} * Intangible\ Intensity^{IV}_{jkL} * Institutional\ Quality^{IV}_{k} \\
& + \gamma_4 * Crisis_{KL} * Capital\ Efficiency^{IV}_{jkL} * Institutional\ Quality^{IV}_{k} \\
& + \theta_{kj} + \lambda_{jL} + \varphi_{kL} + \varepsilon_{8jkL}
\end{aligned}
\qquad [8]
$$

We instrument the efficiency of capital allocation in a similar way to intangible intensity: 1) We use the pre-crisis values instead of the observed values in each sub-period, and 2) we apply a 2SLS procedure using as the instrument the pre-crisis value of capital allocation.[10]

Columns (3) and (6) in Table 8 show the results when the three interaction terms are included in the regression. The interaction between intangible intensity and property rights during banking crises remains significant in column (3) and (6) of Panels A and B. It has only non-significant coefficients when we analyze the growth in EBIT in Panel C. The predominance of the negative significant coefficients suggests that the mix of tangible and intangible assets has an additional effect to that included in the overall efficiency of capital allocation.

[10] Results do not change when other instruments, such as the country's legal origin or the average capital allocation efficiency for the same industry in other countries, are used.

Table 8

Banking Crises and Economic Growth: Intangible intensity and Overall Capital Allocation Efficiency

This table shows the results of the influence of intangible intensity on economic growth during banking crises after controlling for the overall capital allocation efficiency. The dependent variables are the real growth of assets (Panel A), sales (Panel B), and EBIT (Panel C). We control, respectively, for the one lag annual value of total assets, sales, and EBIT. Crisis is a dummy variable that takes a value of one for the crisis period and zero otherwise. External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. Intangible intensity and overall capital allocation efficiency are instrumented using their respective pre-crisis values and applying 2SLS serving its respective initial value as instrument. Property rights is the index proxying the protection of the property rights. We show IV estimations for property rights when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for property rights are the dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. OLS estimations with industry-level data are applied. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

PANEL A. Dependent Variable: Growth of Assets

Explanatory Variables	***Pre-Crisis*** *(1)*	***Pre-Crisis*** *(2)*	***Pre-Crisis*** *(3)*	***2SLS*** *(4)*	***2SLS*** *(5)*	***2SLS*** *(6)*
Assets $_{PRE\text{-}CRISIS}$	-0.0019	-0.0018	-0.0018	-0.0011	-0.0019	-0.0014
	(-1.48)	(-1.42)	(-1.47)	(-0.87)	(-1.48)	(-1.11)
*Crisis*External Dependence* Financial Development*	-0.0002***	0.0003	-0.0001*	-0.0003	0.0001	-0.0009
	(-2.74)	(0.71)	(-1.95)	(-0.66)	(0.42)	(-0.19)
*Crisis*Intangible Intensity*Property Rights*	-0.2082***		-0.1575***	-0.2191***		-0.1186***
	(-3.60)		(-2.72)	(-5.46)		(-2.70)
*Crisis*Capital Efficiency*Property Rights*		-0.0081***	-0.0065***		-0.0254***	-0.0190***
		(-4.80)	(-3.66)		(-5.37)	(-3.67)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0644	0.1198	0.1439	0.1175	0.1389	0.1608
F-Test	3.99***	6.28***	6.59***	6.41***	7.21***	7.00***
# Observations	262	234	234	245	232	220
Durbin-Wu-Hausman Test	12.94***	23.04***	15.54***	29.86***	28.81***	17.51***

PANEL B: Dependent Variable: Growth of Sales

Explanatory Variables	***Pre-Crisis*** *(1)*	***Pre-Crisis*** *(2)*	***Pre-Crisis*** *(3)*	***2SLS*** *(4)*	***2SLS*** *(5)*	***2SLS*** *(6)*
Sales $_{PRE\text{-}CRISIS}$	-0.0007	-0.0020	-0.0018	-0.0007	0.0006	-0.0001
	(-0.45)	(-1.28)	(-0.47)	(-0.44)	(0.46)	(-0.09)
*Crisis*External Dependence *Financial Development*	0.0003	-0.0006	-0.0002**	-0.0003	0.0002	-0.0003
	(1.28)	(-1.16)	(-2.39)	(-0.49)	(0.41)	(-0.06)
*Crisis*Intangible Intensity*Property Rights*	-0.2974***		-0.2495***	-0.3868***		-0.1407**
	(-3.74)		(-3.59)	(-6.66)		(-2.15)
*Crisis*Capital Efficiency*Property Rights*		-0.0058***	-0.0048***		-0.0235***	-0.0177***
		(-4.73)	(-3.87)		(-8.30)	(-4.65)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0424	0.0977	0.1441	0.1462	0.2437	0.2487
F-Test	2.90***	5.06***	6.41***	7.96***	13.09***	11.21***
# Observations	259	226	226	245	226	217
Durbin-Wu-Hausman Test	13.98***	22.37***	18.23***	44.40***	68.97***	34.50***

PANEL C. Dependent Variable: Growth of EBIT

Explanatory Variables	***Pre-Crisis*** *(1)*	***Pre-Crisis*** *(2)*	***Pre-Crisis*** *(3)*	***2SLS*** *(4)*	***2SLS*** *(5)*	***2SLS*** *(6)*
EBIT $_{PRE\text{-}CRISIS}$	0.0761***	0.0765***	0.0763***	0.0818***	0.0773***	0.0795***
	(5.12)	(6.73)	(6.72)	(5.31)	(6.81)	(5.54)
Crisis External Dependence* Financial Development*	-0.0006	-0.0001	-0.0004	-0.0002***	-0.0005	-0.0001**
	(-1.41)	(-0.08)	(-0.94)	(-3.17)	(-0.22)	(-2.34)
*Crisis*Intangible Intensity*Property Rights*	-0.4088		-0.3358	-0.7475***		-0.5661*
	(-1.34)		(-1.05)	(-3.27)		(-1.76)
*Crisis*Capital Efficiency*Property Rights*		-0.0195**	-0.0160*		-0.0635**	-0.0341
		(-2.17)	(-1.67)		(-2.51)	(-0.74)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.1116	0.1581	0.1585	0.1282	0.1663	0.2030
F-Test	29.00***	8.17***	7.16***	29.74***	8.54***	28.39***
# Observations	255	230	230	241	228	216
Durbin-Wu-Hausman Test	2.45	4.70**	2.90*	10.72***	6.32**	5.83***

4.4. Endogeneity of Banking Crises

In this section, we check the robustness of the results after controlling for the endogeneity of banking crises. Bank dependent sectors are likely to be more heavily represented in bank portfolios than less dependent sectors. Therefore, asymmetric sectoral shocks concentrated in bank dependent sectors might cause both the banking crisis and relatively poor growth in such sectors. This endogeneity is not controlled for by interacting the crisis dummy with the firm's external dependence (Dell'Ariccia *et al*. 2008).

To address its potential endogeneity, we instrument the crisis dummy using the predicted values of a probit explaining the probability of a banking crisis. Following Beck *et al*. (2006), we use the following explanatory variables of the probability of a banking crisis in country j in year t: the rate of change of inflation; the change in terms for trade in goods and services; banking credit lagged two periods; the rate of change of the exchange terms; the annual interest rate; the ratio M2 to total international reserves; the real growth rate of GDP; banking market concentration; the natural logarithm of per capita GDP; five dummy variables indicating the legal origin of each country (English common law; French civil law; German civil law; Scandinavian civil law; and the Socialist/Communist code), and a set of time dummy variables.[11]

Table 9
Effects of Banking Crises on Intangible Intensity Controlling for the Endogeneity of Banking Crises

This table shows the results of the effect of banking crises on intangibility intensity after controlling for the potential endogeneity of banking crises. Intangible intensity is the ratio of intangible assets to net fixed assets. We control for the value of total assets lagged one year. $Crisis^{PROB}$ is the fitted value of a probit defining the probability of a banking crises. The explanatory variables in the probit model are defined following Beck *et al*., (2006). External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. We use three different measures of the quality of institutions: the index of quality of property rights, the index of economic freedom, and an index indicating the level of control of corruption in each country. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. We show IV estimations for institutional variables when the Durbin-Wu-Hausman Test is rejected at 10% level or less Instruments for institutional variables are dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. We apply a random-effects model to control for unobserved firm specific effects in the firm-level regressions. Industry-level regressions are estimated by OLS. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	***Firm-Level Data***				***Industry-Level Data***			
	(1)	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***	***(7)***	***(8)***
Lagged Assets	0.0080*** (8.13)	0.0035*** (8.13)	0.0035*** (8.13)	0.0080*** (8.13)	0.0004 (0.15)	0.0004 (0.15)	0.0004 (0.15)	0.0004 (0.15)
$Crisis^{PROB}$ * *External Dependence* Property Rights*	-0.0001** (-2.16)				-0.0001*** (-2.67)			
$Crisis^{PROB}$ * *External Dependence* Economic Freedom*		-0.0001** (-2.16)				-0.0001*** (-2.67)		
$Crisis^{PROB}$ * *External Dependence* Corruption*			-0.0001** (-2.16)				-0.0001*** (-2.67)	
$Crisis^{PROB}$ * *External Dependence * Financial Development*				-0.0001** (-2.16)				-0.0001*** (-2.67)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0501	0.0501	0.0501	0.0501	0.0014	0.0014	0.0014	0.0014
Wald Test	79.51***	75.27***	79.52***	79.53***	-	-	-	-
F-Test	-	-	-	-	3.04**	3.03**	3.03**	3.03**
# Observations	7,522	7,522	7,522	7,522	947	947	947	947
Durbin-Wu-Hausman Test	4.65**	4.65**	4.66**	4.66**	7.13***	7.12***	7.13***	7.11***

[11] We also checked that results do not vary when we use country dummy variables or regulatory and institutional variables instead of the legal origin as instruments.

We replicate previous regressions using the fitted values of this probit ($Crisis^{PROB}$) instead of the observed values of the crisis dummy. Table 9 reports the results for the change of intangible intensity during banking crises. We obtain similar results to those reported in Table 3. Banking crises negatively affect intangible intensity in those sectors that are more in need of external finance; and this effect is stronger in countries with more highly-developed institutions or financial system. Again, the results are similar using both firm-level and industry-level data, and statistically significant at the one percent level.

Table 10 reports the results for the impact of intangible investments on growth in crisis periods. To save space we only report results using a 2SLS procedure and using as instrument the initial value of intangible intensity.[12] The results confirm those reported in Table 4 indicating that banking crises negatively affect economic growth in firms that are more in need of external finance and those that invest more on intangible assets. The results are similar for the three different measures of economic growth –total assets, sales and EBIT– and when we use both firm and industry-level data.

Table 10

Banking Crises and Economic Growth: Applying a 2SLS Procedure and Controlling for the Endogeneity of Banking Crises

This table shows the results of the effect of banking crises on economic growth after controlling for the potential endogeneity of banking crisis. We use three measures of firm and industry economic growth: the real growth of assets (Panel A), the real growth of sales (Panel B), and the real growth of EBIT (Panel C). We control, respectively, for the one lag annual value of total assets, sales, and EBIT. $Crisis^{PROB}$ is the fitted value of a probit defining the probability of a banking crises. The explanatory variables in the probit model are defined following Beck *et al*., (2006). External dependence is the averaged value over the pre-crisis period of the fraction of capital expenditures that are not financed with operative cash flow. Financial development is measured as the ratio of private credit by deposit money banks to GDP in 1989. Intangible intensity is the ratio of intangible assets to net fixed assets. We endogeneize the intangible intensity and apply 2SLS serving the initial value of intangible intensity as instrument. Property rights is the index proxying the protection of the property rights. We show IV estimations for property rights when the Durbin-Wu-Hausman Test is rejected at 10% level or less. Instruments for property rights are the dummy variables defining the legal origin in each country. In all estimations we include a set of industry-year, country-year and industry-country dummy variables, but results are not reported. Both stages in the 2SLS procedure are estimated by a random-effects model to control for unobserved firm specific effects in the firm-level regressions. Both stages of industry-level regressions are estimated by OLS in the 2SLS procedure. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	Growth of Assets		Growth of Sales		Growth of EBIT	
	Firm-Level	*Industry-Level*	*Firm-Level*	*Industry-Level*	*Firm-Level*	*Industry-Level*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Lagged Assets	-0.0034**	-0.0081***				
	(-2.33)	(-3.39)				
Lagged Sales			0.0026	-0.0022		
			(0.67)	(-1.00)		
Lagged EBIT					0.1442***	0.0780***
					(14.89)	(5.41)
$Crisis^{PROB}$* External Dependence*Financial Development*	-0.0005***	-0.0006	-0.0008	-0.0009	-0.0001**	-0.0004
	(-2.98)	(-1.10)	(-0.41)	(-1.41)	(-2.56)	(-0.16)
$Crisis^{PROB}$* Intangibility Intensity ^{2SLS}*Property Rights*	-0.1250***	-0.3586***	-0.1199**	-0.7428***	-0.5249***	-1.2673***
	(-4.44)	(-7.05)	(-2.41)	(-6.55)	(-2.93)	(-4.72)
Industry-Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0103	0.0664	0.0395	0.0697	0.2797	0.1049
Wald Test	85.26***	-	40.52***	-	249.05***	-
F-Test	-	13.67***	-	11.27***	-	16.55***
# Observations	7,465	1,537	7,445	940	6,909	9,20
Durbin-Wu-Hausman Test	20.47***	49.74***	26.07***	22.54***	10.31***	11.56***

The asset allocation effect is economically more important than the finance effect. Using, for instance, estimations in column (1) of Table 5 to estimate the economic impact of the asset allocation effect, on average, in a country experiencing a banking crisis, a firm at the 75th percentile of intangible intensity and located in a country at the 75th percentile of property rights protection experiences a 28.16%

[12] Results are robust to the alternative procedures previously used in the paper to control for the endogeneity of intangible intensity.

greater contraction in real annual growth of assets during the banking crisis period than a firm at the 25th percentile of intangible intensity and located in a country at the 25th percentile of property rights protection. Using numbers in column (1) to estimate the economic impact of the finance effect, on average, in a country experiencing a banking crisis, a firm at the 75th percentile of external dependence and located in a country at the 75th percentile of financial development experiences a 2.32% greater contraction in real annual growth of assets during the banking crisis period than a firm at the 25th percentile of external dependence and located in a country at the 25th percentile of financial development. This is a lower effect than the one observed for the asset allocation effect. Moreover, the finance effect is statistically significant in two out of the six estimations whereas the asset allocation effect is statistically significant in all the estimations.

4.5 Other Robustness Checks

In another analysis, we check for additional robustness of the results. First, we check if the impact of intangible intensity on economic growth depends on other institutional characteristics apart from property rights. We include sequentially interaction terms between the crisis dummy, intangibility intensity, and alternative proxies of institutional quality. As alternative proxies we include the index of Economic Freedom, the control of corruption, and the financial development in each country. The results, not reported to save space, do not change.

We also check that the results do not vary when we only compare the crisis and the post-crisis period. In these estimations we exclude data form the pre-crisis period. The results are similar to those previously obtained comparing crisis and non-crisis periods.

Finally, and in order to corroborate the results analyzing the harmful effect of banking crises on intangible investments, we define subsamples of countries: we exclude non-OECD countries and countries below the median value of per capita GDP. Results do not differ from those reported in previous sections.

5. CONCLUSIONS

The literature traditionally associates the negative real effects of banking crises with the reduction in credit supply. This paper provides empirical evidence on the relevance of the asset allocation effect to explain part of the negative real effects associated with a banking crisis. We find in 19 episodes of systemic crises that a banking crisis reduces firm and industry growth not only by limiting the amount of credit available to investment but also by worsening the allocation of investable resources. We observe during crisis periods a reduction in intangible intensity and in the channeling of funds to investments with the highest returns (overall capital efficiency). Both reductions indicate that investments in intangible assets, in particular, and risky investments, in general, are more difficult to

finance during episodes of systemic banking crises. The worsening of asset allocation intensifies the reduction in growth during banking crises and is greater in high-quality institutional environments. The asset allocation effect is quantitatively greater than the effect on credit supply for explaining the reduction in growth during banking crises in financially and institutionally developed countries.

This paper contributes to the Law and Finance literature. This literature indicates that a more developed financial system provides a large amount of funds for investment and that better protection of property rights improves asset allocation by firms during normal periods. Both effects promote economic growth. Our paper indicates that episodes of systemic banking crises have more negative real effects in countries in which a more financial developed system and better protection of property rights promote greater growth during normal periods.

Our results have relevant policy implications. If economies intend to increase growth rates by promoting innovation and investment in intangible assets, then it becomes increasingly important to avoid banking crises because these would become increasingly harmful. Moreover, the globalization of banking activity, with cross-border banks, may facilitate the substitution of financing intangible assets in more institutionally developed countries for the financing of tangible assets in less developed countries in the event of systemic banking crises. It may intensify the negative real effects of the asset allocation effect during banking crises in countries with better institutions.

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