Productivity during recessions with banking crises: Inter-Industry evidence

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HIGHLIGHTS

- Recessions are associated with a decline in per-worker productivity.
- The effect is stronger if the recessions are accompanied by banking crises.
- Financial frictions make the negative effect on productivity even stronger.

ARTICLE INFO

ABSTRACT

Using sectoral data from 104 countries over 40 years we show that per-worker productivity declines during recessions. The adverse effect is particularly strong if recessions are accompanied by banking crises and especially in sectors and countries with greater financial frictions.

1. Introduction

An implication of Shumpeter's "creative destruction" is that productivity increases during recessions as the economy is "cleansed" of the least productive firms and resources are reallocated to more productive firms (Caballero and Hammour, 1994, 1996). However, Barlevy (2003) argues that the cleansing effect may not operate as described when recessions are accompanied by financial market frictions. Firms that rely more on external finance may be forced to scale down regardless of how productive they are. Hence, reallocation of resources may go from more productive to less productive firms leading to a decline in productivity. Recessions could involve complex adjustments that include both effects described above so the overall impact must be determined empirically. In this paper, we test how per-worker productivity is affected by recessions studying sectoral data from 104 countries for a 40-year period. We find evidence of a decline in productivity during recessions. In particular, we show that recessions accompanied by banking crises cause productivity to decline the most, especially in sectors with less tangible assets and in countries with greater financial frictions.

Our paper builds on Braun and Larrain (2005) who show that financial frictions play a role in the impact of recessions on sectoral value added. We extend their work with a focus on productivity rather than value added and on recessions that involve banking crises. Similarly, we extend the literature on the effect of banking crises on the economy, e.g. Dell'Ariccia et al. (2008) and Kroszner et al. (2007), by focusing on productivity which has not been studied before. For motivation, Table 1 shows that productivity grew 3.04% during non-recession years, −2.05% during recessions, and −5.5% when the recession had a banking crisis. A further breakdown shows a greater decrease in productivity growth for sectors with low tangibility of assets and in countries with low accounting standards.

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Table 1
Average productivity growth by sector during the business cycle.

	Full sample	Asset tangibility		Accounting standards	
		Low	High	Low	High
No recession	3.04	3.17	2.92	3.78	4.11
Recession	−2.05	−2.37	−1.95	−2.18	−0.88
Recession and banking crisis	−5.50	−5.73	−4.92	−7.38	−1.30

Notes: Productivity is defined as output per worker; Asset tangibility: Capacity to transfer assets to investors. Accounting standards: Measure of information quality and access to external investors.

2. Methodology

We implement the Rajan and Zingales (1998) methodology by using an industry-level external financial dependence (EFD) index to identify the effect of recessions and banking crises on productivity. The assumption is that an industry's EFD index is contingent on the industry's technological and economic characteristics which persist across time and countries, and that the causes of recession are not systematically related to the industry's EFD. We use Fisman and Love's (2007) measure of the EFD who argue that financial markets allocate resources to industries with *better growth opportunities* allowing them to grow faster than by just using internal financing. Hence, they use Compustat data to create a proxy of EFD defined as the average real sales growth rate per industry in the US where financial markets have few frictions and growth opportunities are highly correlated with observed industry growth.[1]

Using a similar model as Braun and Larrain's (2005), we estimate:

$$Growth_{i,c,t} = \alpha_1 size_{i,c,t-1} + \alpha_2 recession_{c,t} + \alpha_3 Crisis_{c,t}$$
$$+ \alpha_4 recession_{c,t} * EFD_i + \alpha_5 Crisis_{c,t} * EFD_i$$
$$+ \alpha_6 recession_{c,t} * EFD_i * Crisis_{c,t}$$
$$+ FixedEffects + \varepsilon_{i,c,t} \qquad (1)$$

where $Growth_{i,c,t}$ is the 1-year log change in productivity of industry i, in country c, at time t; $size_{i,c,t-1}$ is the share of industry i in country c's total production in year $t-1$; $recession_{c,t}$ indicates if a country c is experiencing a recession in year t; $crisis_{c,t}$ identifies banking crises. To control for unobserved heterogeneity, we include fixed effects for each industry (δ_i), country (δ_c), and year (δ_t), as well as for country–industry, and industry–year. One parameter of interest, α_4, captures the relationship between productivity growth and financial dependence during recessions. Also, α_6 captures the effect of external dependence on productivity growth during periods of recessions with banking crisis.

3. Data

Industry data are obtained from the UNIDO Industrial Statistics 2009 data set, with 3-digit ISIC sectoral level data from 1963 to 2004 (which is the last year available with 3-digit sectoral level data from this data set). We have about 67,000 observations across 104 countries. Our measure of productivity growth is total value added/employees in a sector and has an average yearly growth rate of 1.9%.

As Braun and Larrain (2005), we use a Hodrick–Prescott filter to construct the variable *Recession* = 1 from the year after the most recent peak of the cyclical GDP to the year of the trough when the GDP cyclical component falls one standard deviation below zero, and zero otherwise. In our sample, countries suffer from recessions about every 5 years. For banking crises, we use Reinhart and Rogoff's (2013) data to construct a variable *Crisis* which equals 1 for each year of a banking crisis and zero otherwise. Hence, if a banking crisis lasts two years, *Crisis* would equal 1 for each of the two years. There are 79 banking crises in our sample.

We use three measures of financial market frictions. First, *Asset Tangibility* which is an industry-level proxy for the capacity to transfer assets to investors used by Braun (2005), who shows that industries with high asset tangibility perform better in markets with high financial access frictions. The other two measures are at the country-level: the *Creditors Rights* index used by Djankov et al. (2007) ranging from 0 to 4 to indicate the degree to which lenders are protected from debtors' bankruptcy and *Accounting Standards* from La Porta et al. (1997) that reflects the information quality and access to external investors.

4. Results

According to regression (1) in Table 2, recessions have a negative and significant effect on productivity but the effect does not vary with the degree of external dependence. However, we find that sectors with greater external dependence are affected more during recessions with banking crises. The estimated coefficient −0.728 means that the effect of a recession with banking crisis in the median sector of external dependence (Fabricated Metal Products) reduces the growth rate of productivity by 1.963 percentage points (see lower panel of Table 2). Comparing the effect between sectors with high dependence (85 percentile) and low dependence (15 percentile) shows the differential effect is −2.92%. That means, the growth rate of productivity in a sector of high external dependence falls by 2.92% *more* than in a sector of low dependence. Thus, the reduction in productivity in a recession with a banking crisis is larger in more financially dependent sectors which is one of our main results.

Table 2 also displays the results of two subsamples separated based on the sectoral tangibility of assets. In the low-tangibility subsample of industries we find a larger decrease in productivity in more externally dependent sectors. As the bottom of regression 2 shows, productivity falls by an additional 4.95 percentage points in high dependence sectors with low tangibility assets. Comparing these results to the "high tangibility of assets" subsample (regression 3), shows that industries with very tangible assets are not especially affected by recessions with banking crisis even if they are highly dependent on external finance.

We also test if country-level financial frictions, proxied by *Accounting Standards* and *Creditor Rights*, make a difference. Table 3 shows that recessions with banking crises have a particularly adverse effect on productivity in countries with low accounting standards in more externally dependent industries (regression 1). The results using *Creditors Rights* are similar.

5. Conclusions

We show that recessions reduce labor productivity on the sectoral level in a sample of about 100 countries during a period of 40 years. Further, the negative effect on labor productivity is

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[1] Fisman and Love (2007) show that their index outperforms Rajan and Zingales's (1998) EFD index based on the external financial needs of US companies.

Table 2
Recessions with banking crises and productivity growth.

Variables	(1) Entire sample	(2) Asset tangibility	(3)
		Low	High
Size $(t-1)$	−1.677[***]	−1.918[***]	−1.597[***]
	(0.121)	(0.232)	(0.127)
Recession	−0.0416[***]	−0.0356[**]	−0.0406[***]
	(0.00731)	(0.0145)	(0.00855)
Banking crisis	−0.000214	−0.00406	6.40e−05
	(0.00951)	(0.0212)	(0.0107)
Recession × EFD	0.197	−0.0107	0.332
	(0.163)	(0.303)	(0.231)
Banking crisis × EFD	0.154	0.314	−0.0176
	(0.226)	(0.433)	(0.300)
Recession × Banking crisis × EFD	−0.728[***]	−0.889[***]	−0.447
	(0.224)	(0.290)	(0.357)
Observations	64,569	31,151	30,016
R2-overall	0.101	0.0859	0.103
Change in growth rate during recession, measure at:			
Median EFD: 50 percentile	−1.963	−3.330	−0.425
High EFD: 85 percentile	−3.395	−5.759	−0.736
Low EFD: 15 percentile	−0.477	−0.810	−0.103
Differential effect: High–Low	−2.918	−4.949	−0.632
(p-value)	0.032	0.017	0.757

Notes: EFD external financial dependence. Asset tangibility: Capacity to transfer assets to investors.
[*]Statistical significance $p < 0.1$.
[**] Statistical significance $p < 0.05$.
[***] Statistical significance $p < 0.01$.

Table 3
Recessions, banking crises and productivity growth: the role of country-level financial frictions.

Variables	(1) Accounting standards	(2)	(3) Creditor rights	(4)
	Low	High	Low	High
Size $(t-1)$	−2.939[***]	−1.818[***]	−2.237[***]	−1.789[***]
	(0.381)	(0.366)	(0.225)	(0.282)
Recession	−0.0487[***]	−0.0295[***]	−0.0524[***]	−0.0414[***]
	(0.0121)	(0.0109)	(0.00977)	(0.0108)
Banking crisis	0.00733	−0.0124	−0.00345	0.0114
	(0.0150)	(0.0101)	(0.0121)	(0.0159)
Recession × EFD	0.305	0.0339	0.398[*]	−0.185
	(0.262)	(0.238)	(0.214)	(0.243)
Banking crisis × EFD	−0.290	−0.225	0.231	−0.255
	(0.336)	(0.221)	(0.274)	(0.432)
Recession × EFD × Banking crisis	−0.787[**]	0.125	−0.747[***]	−0.523
	(0.349)	(0.256)	(0.280)	(0.377)
Observations	15,395	16,476	36,723	17,557
R2-overall	0.160	0.207	0.109	0.142
Change in growth rate during recession, measure at:				
Median EFD: 50 percentile	−1.783	0.588	−1.290	−2.621
High EFD: 85 percentile	−3.084	1.017	−2.231	−4.534
Low EFD: 15 percentile	−0.434	0.143	−0.314	−0.638
Differential effect	−2.650	0.874	−1.918	−3.897
(p-value)	0.209	0.608	0.265	0.077

Notes: EFD external financial dependence. Creditors Rights: degree of lenders protection from debtors' bankruptcy; Accounting standards: Measure of information quality and access to external investors.
[*] Statistical significance $p < 0.1$.
[**] Statistical significance $p < 0.05$.
[***] Statistical significance $p < 0.01$.

most pronounced in industries that rely more on external finance when recessions are accompanied by banking crises. Therefore, we find supporting evidence for Barlevy's (2003) theory of resource relocation during recessions from higher productivity sectors (more dependent on external finance) to lower productivity sectors (less dependent on external finance). We explore further the role of financial frictions by including the tangibility of assets, accounting standards, and creditor rights in the analysis. In all cases, financial frictions amplify the negative effect of recessions with banking crises on productivity. In short, problems in the financial sector increase the negative impact of recessions on

productivity and work against a possible "cleansing" effect of recessions.

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