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CAPITAL MISALLOCATION AND FINANCIAL DEVELOPMENT: A SECTOR-LEVEL ANALYSIS

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CAPITAL MISALLOCATION AND FINANCIAL DEVELOPMENT: A SECTOR-LEVEL ANALYSIS

By D. Marconi¹ and Christian Upper²

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Abstract

This study investigates the relationship between capital misallocation and financial development in a panel of six countries at different levels of development (China, India, Mexico, Korea, Japan and US). Although many frictions may be important sources of misallocation, the recent theoretical and empirical literature demonstrates that financial frictions may be quite relevant, particularly at intermediate levels of economic development, when more resources are needed to finance the expansion of more productive firms and sectors, affecting the shape and the speed of structural transformation. We compute the marginal productivity of capital across 25 industrial sectors in the six countries considered, over the period 1980-2014. In the empirical analysis, we exploit both aggregate and sector-level variation of capital misallocation across countries and time to assess to what extent financial development affects the allocative efficiency of capital. We find that more developed financial systems perform better at allocating capital investment. In economies with low levels of financial development, faster capital accumulation is associated with a worsening of allocative efficiency. This effect reverses for higher levels of financial development. Sectors with high R&D expenditures or high capital investment benefit most from financial development, whereas sectors more dependent on external financing are less sensitive. These effects are not only statistically significant, they are also large in economic terms. For example, our results suggest that bringing the Mexico's level of financial development to that of the United States would almost entirely cut the gap in allocative efficiency between the two countries. China and India would also make significant gains.

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Introduction

Financial intermediaries perform a number of functions that should stimulate growth. First, they channel funds from savers to investors. Banks and other financial intermediaries such as fund managers and insurance firms bundle savings and allocate them to investment projects. This allows them to finance investment projects that would be too large to handle for any individual saver. For savers, financial intermediation provides a degree of diversification that is not available from un-intermediated investments. Second, financial intermediaries screen investment projects and allocate capital to those with sufficiently high payoffs. Third, they monitor these investments and exert corporate governance. Last but not least, they offer payment and liquidity services, which eases the exchange of goods and services and mitigates the transfer problem that arises from imperfectly timed incoming and outgoing payments. Given all these useful functions, one would expect a straightforward positive relationship between financial development and growth. It is thus little surprising that the empirical evidence reviewed in Levine (2005) and in the recent metastudy by Havránek et al. (2015) suggests that countries with more developed banks and financial markets grow faster. That said, there appear to be diminishing returns to financial development and there might be a point beyond which a further expansion of financial intermediation either has no or even an adverse impact on economic growth (Rioja & Valev, 2004; Aizenman et al, 2015; Arcand et al, 2015; Cecchetti & Kharroubi, 2012; Sahay et al, 2015).

A positive relationship between financial development and growth begs the question on the precise channels through which finance affects growth. Levine (2005) conjectures that this needs to come primarily through how financial development affects the allocation of resources in an economy rather through higher capital accumulation, as the empirical growth literature has found that the latter per se is not an important determinant of long-term growth. Levine's conjecture is in line with a sizable body of studies that finds that financial frictions result in capital misallocation (Banerjee and Duflo, 2005; Buera et al., 2011; Midrigan and Xu, 2014; Sahay et al., 2015). Their impact could be quite large. For instance, calibrations of the model in Buera et al indicate that differences in financial frictions can explain up to 80% of the difference in output per worker between Mexico and the United States.³ While established firms may overcome financial frictions through the internal generation of funds (Buera et al., 2011), this option is not open to firms newly

³ The importance of financial frictions for misallocation has been questioned by Gilchrist et al (2013), who find that the dispersion in (observed) borrowing costs in the US manufacturing sector is too small to generate sizable losses in total factor productivity (TFP). That said, their sample consists of firms large enough to issue publicly-traded debt in one of the most financial developed economies in the world. As the authors acknowledge, the impact of financial frictions could be much larger in financially less developed economies.

entering a market or upgrading to a technology requiring investments far in excess of past profits. Self-financing also takes time, which means that sizable misallocations could exist for prolonged periods even if it disappears eventually (Moll, 2014).

But even if a more developed financial system is conducive to growth, this does not mean that more finance is always good. The first reason is that “more” doesn’t mean “better”. Levine (2005) defines financial development as the financial system getting better at the functions outlined at the beginning of this section. Of course, this is not observable and only loosely related to proxies such as the size of financial intermediation. More recent work has attempted to tackle the issue by constructing more sophisticated indicators of financial development. In this paper, we use the financial development index constructed by Sahay et al (2015), which is based on previous work by Čihák et al (2013). The indicator measures the depth, accessibility and efficiency⁴ of both financial institutions and markets. Financial institution depth, for instance, is measured by the amount of private sector credit outstanding, pension fund and mutual fund assets and the total volume of insurance premiums; access by the number of bank branches and ATMs per population; and efficiency by net interest margins and bank profitability measures. To be sure, these variables are only loosely related to the ability of the financial system to perform the functions outlined above, but they nonetheless represent a considerable advance over measures exclusively based on size.

The second reason for more being not necessarily better is related to unwanted effects of financial sector growth on resource misallocation. This could be because more financial intermediation tilts the composition of investment to less productive projects that are easier to finance, crowding out effects or reduced incentives to entry and exit. For instance, Cecchetti and Kharroubi (2017) document that if the financial sector grows beyond a certain threshold TFP falls, especially in industries with high R&D expenditure or lot of intangible assets. Similarly, the large capital inflows into Portugal after the creation of the euro resulted in a rapid growth in the non-tradable sector (Reis, 2014) and in a reduced exit of low productivity firms (Dias et al., 2015), two factors that help explain the dismal performance of the Portuguese economy in the wake of the global financial crisis. In Spain, the decline in real rates after the creation of the euro appears to have raised the dispersion of the return on capital across firms, a clear sign of capital misallocation (Gopinath et al 2015).⁵ More generally, Borio et al (2015) show that rapid credit growth is associated with an

⁴ Čihák et al (2013) also include a measure of financial stability.

⁵ This finding is controversial, though. García-Santana et al (2016) also find a sizable misallocation of factors in the Spanish economy during the 1994-2007 expansion, but argue that this did not reflect financial factors as industries heavily dependent on finance did not show a larger degree of misallocation than those less reliant on external funding. Instead, the size of misallocation appears to be correlated with the degree to which a sector is prone to government intervention. García-Santana et al. do not consider capital or labour misallocations across industries. Similarly, using a

inefficient allocation of labour across sectors in a large panel of advanced economies. Such labour misallocations can have long-lasting effects, particularly when the credit boom ends in a financial crisis.

In the present paper, we analyse how financial development affects capital allocation across industries. We adopt the wedge-accounting framework of Chari et al (2007) that was later extended to a multi-sectoral setting by Aoki (2012). In this model, any distortions that lead to a misallocation of resources compared to the frictionless benchmark are captured by implicit taxes or subsidies faced by the representative firm in each industry. We calculate these implicit taxes and subsidies for a panel of six countries at different level of development, namely China, India, Mexico, Korea, Japan and US, from data on value added, capital and labour inputs in 25 industries obtained from WORLDKLEMS databases for the period 1980-2014.⁶ In the empirical analysis, we exploit both aggregate and sector-level variation of capital misallocation across countries and time to assess to what extent financial development affects the allocative efficiency of capital. To our knowledge, this is the first attempt to relate cross-sector capital misallocation and financial development across countries. The cross-country analysis is crucial to identify the heterogeneity of misallocation patterns in relation to the different level of financial development. The availability of comparable data limited our set of countries.

Our choice of countries represents a balance between data quality⁷ and the desire to include as many emerging market economies as possible in the analysis. We believe that a relatively small sample including countries with a relatively low degree of financial development can teach us much more about how financial development affects growth than a broader sample covering primarily advanced economies.

Unlike most of the previous literature,⁸ we measure the misallocation of capital and labour across different sectors rather than across individual firms within one industry. For example, we are concerned whether investment is concentrated in the (less productive) construction rather than the IT industry, and not whether less productive construction firm A invests more than more productive construction firm B. We believe that limiting the analysis to within-sector misallocation is like throwing out the baby with the bath as any analysis that focuses on within-industry

broader sample of industries than Gopinath et al, Gamberoni et al (2016) find that a reduction in the cost of credit tends to be associated with a reduction, not an increase, in misallocation.

⁶ A similar approach has been used by Dabla-Norris et al (2015) for a sample of advanced economies and di Stefano and Marconi (2016) for China and India. Neither, however, link the distortions to financial development.

⁷ **Something on the alternative data source.**

⁸ Industry-level studies include Hsieh and Klenow (2009), Bartelsman et al (2013), Dias et al (2015) and Gopinath et al (2015)). They focus on misallocation between different firms within the same industry mainly for methodological reasons, as it reduces the impact of differences in demand across industries.

misallocation only is unlikely to be able to capture the effect of crowding out or the tilting of credit towards low productivity tangible assets.

Our estimates using economy-wide data shows that more developed financial systems are better able to channel capital to more productive sectors. If financial development is below a certain threshold – which happens to lay between the levels of financial development in the emerging market and advanced economies in our sample – then faster capital accumulation is associated with a worsening of allocative efficiency. In more developed financial systems, higher capital accumulations tends to go hand in hand with a better allocation of resources, confirming that financial markets and institutions are key to channel investment towards more productive sectors. Our results are in line with previous findings in the literature, such as Ciccone and Papaioannou (2010), who conclude that financial development facilitates the reallocation of capital from declining industries to industries with good investment opportunities, and Fisman and Love (2007), who find that industries with good growth opportunities, grow more rapidly in countries with well-developed financial markets. We are not able to confirm the results in the literature that there is a threshold above which a higher level or rapid growth in financial development results in a less efficient allocation of resources, probably because of our sample's heavy tilt towards emerging market economies.

One of the advantages of our methodology is that it allows us to estimate how individual sectors contribute to allocative efficiency, and how this is linked to financial development. We find that the sectors that are more investment intensive and or invest more in R&D benefit more from a more developed financial system. Adding up our sector-level results allows us to compute the TFP gains that a country would experience by bringing its financial development to the US level. These gains would be substantial for the emerging market economies in our sample, namely China, India and Mexico.

The paper is structured as follows. The next section lays out our analytical framework. Sections 2 and 3 present the data and our estimated allocation measures, respectively. Sections 4 and 5 form the core of our paper, presenting estimates at the country (section 4) and sector (section 5) level. A final section concludes.

Measuring misallocation

We adopt the framework developed by Aoki (2012). In each country i , there are N sectors that combine in a Cobb-Douglas fashion to generate aggregate real value added:

$$V_{it} = \prod_{j=1}^N V_{ijt}^{\phi_{ijt}} \quad (1)$$

Where V_{it} denotes aggregate real value added (or GDP), V_{ijt} denotes sector's j value added, and $\sum_{j=1}^N \phi_{ijt} = 1$. Under the assumption that nominal GDP, $P_{it}V_{it}$, is entirely exhausted into the value added of the N sectors, ϕ_{ijt} corresponds to the nominal share of sector j in country i at time t .⁹

In each country, labor (L) and capital (K) stocks are exogenous. Firms in sector j hire capital (K_{ij}) and labor (L_{ij}) inputs to maximize profits, taking the price of output (P_{ij}), the price of capital (P_{ki}), the price of labor (P_{Li}) as given. Firms also faces sector-specific frictions on capital (τ_{Kij}) and labour (τ_{Lij}) that make the effective price of factors to vary across sectors. Firms have Cobb-Douglas production functions, exhibiting constant returns. The maximization problem of the representative firm in sector j is then:

$$\max_{\{K_{ij}, L_{ij}\}} P_{ij} A_{ij} K_{ij}^{\alpha_j} L_{ij}^{1-\alpha_j} - (1 + \tau_{Kij}) P_{ki} K_{ij} - (1 + \tau_{Lij}) P_{Li} L_{ij}; j=1, \dots, n. \quad (2)$$

Capital intensities, α_j , vary across sectors and total factor productivity (TFP), A_{ij} , is allowed to vary both across sectors and countries. From first order conditions and market clearing conditions on the factor markets, we can express capital and labour wedges as follows:¹⁰

$$wedge_{Kij} \equiv K_GAP_{ij} = \left(\frac{K_{ij}}{K_i} \right)^* / \left(\frac{K_{ij}}{K_i} \right) = \frac{(1 + \tau_{Kij})}{\sum_s (1 + \tau_{Kis}) K_{is} / K_i} \quad (3)$$

$$wedge_{Lij} \equiv L_GAP_{ij} = \left(\frac{L_{ij}}{L_i} \right)^* / \left(\frac{L_{ij}}{L_i} \right) = \frac{(1 + \tau_{Lij})}{\sum_s (1 + \tau_{Lis}) L_{is} / L_i} \quad (4)$$

In this framework, the wedge is the ratio between the optimal and the effective share of the factor in sector j ; it is a measure of the relative productivity of the factor in sector j . If the ratio is greater (lower) than one it means that the factor is more (less) productive than the average in sector j , and something is impeding (incentivizing) the sector to hire more of that factor.

Capital and labour misallocations translate into aggregate TFP losses that can be computed as follows:

⁹ Product exhaustion implies $P_{it}V_{it} = \sum_{j=1}^N P_{ijt}V_{ijt}$, using equation (1), output maximization implies $\phi_{ijt} = \frac{P_{ijt}V_{ijt}}{P_{it}V_{it}}$.

¹⁰ For the derivation of these expressions, see Di Stefano and Marconi (2016).

$$TFPL_K_i = \left| \sum_j \phi_{ij} * \alpha_j \left[\frac{\ln\left(\frac{K_{ij}}{K_i}\right) - \ln\left(\frac{K_{ij}}{K_i}\right)^*}{-\ln(K_GAP_{ij})} \right] \right| \quad (5)$$

$$TFPL_L_i = \left| \sum_j \phi_{ij} * (1 - \alpha_j) \left[\frac{\ln\left(\frac{L_{ij}}{L_i}\right) - \ln\left(\frac{L_{ij}}{L_i}\right)^*}{-\ln(L_GAP_{ij})} \right] \right| \quad (6)$$

where $TFPL_K_i$ is the fraction of aggregate TFP losses due to the misallocation of the capital in country i and $TFPL_L_i$ is the loss due to the misallocation of labour. The sum of both gives the total productivity loss experienced by economy i and corresponds to the amount of output forgone by not shifting capital and labor inputs from less productive to more productive sectors. This means that at each point in time, given the same total amount of capital and labor inputs, the economy could produce more if sectors could hire capital and labor according to their relative productivity. To the extent to which differences in the average product of capital and labour reflect technological barriers to factor reallocation, or other inefficiencies such as investment costs, this framework provides an upper bound on the losses from misallocation.

Data

We compute wedges and aggregate TFP losses using data on sector-level value added, labour input, capital input, and factor payments from the WORLD-KLEMS databases for China, India, Korea, Mexico, Japan and the United States. The sample period varies across countries: 1980-2009 for India and Japan; 1980-2010 for China, 1980-2010 for US, 1980-2012 for Korea and 1990-2014 for Mexico. We consider 25 sectors (excluding public administration): agriculture, 13 manufacturing sectors, mining, construction, utilities, real estate and 7 service sectors (the complete list of sectors is reported in the appendix Table A1).

Factor intensities are computed from labour inputs and capital compensation. According to WORLD-KLEMS data, capital intensity tends to be higher in less developed countries, which seems at odd with the relative technological backwardness of these countries. We believe that this find is likely to reflect measurement problems, likely because of greater labour market informality in these countries. To overcome this problem, we use factor intensities computed from US data, and take period averages across sectors. As shown in Figure A1 in the appendix, using US factor

intensities gives a lower bound estimate of aggregate capital misallocation in countries other than US.¹¹

To capture the level of financial development (FD), we use the broad-based measure developed by Sahay et al. (2015). Their FD index is a synthetic measure of the development of institutions (banking and nonbanking) and markets across three dimensions: depth, access and efficiency. We consider the broad index as well as the sub-indexes for depth, access and efficiency of both institutions and markets, to uncover which dimension, if any, is more relevant to improve the allocation of capital across sectors.

Misallocation at a glance

Figure 1 provides a summary of the TFP losses in our sample countries obtained from equation (5) and (6). Summing (5) and (6) gives total TFP losses. Adding these to the actual TFP level reported in the Penn World tables gives the TFP levels that could have been achieved by removing allocative inefficiencies (TFP*). According to our estimates, over the sample period, misallocation reduced TFP growth by 0.8 percentage points in India, 0.5 points in China and Mexico, 0.4 in South Korea and 0.1 in Japan and US.

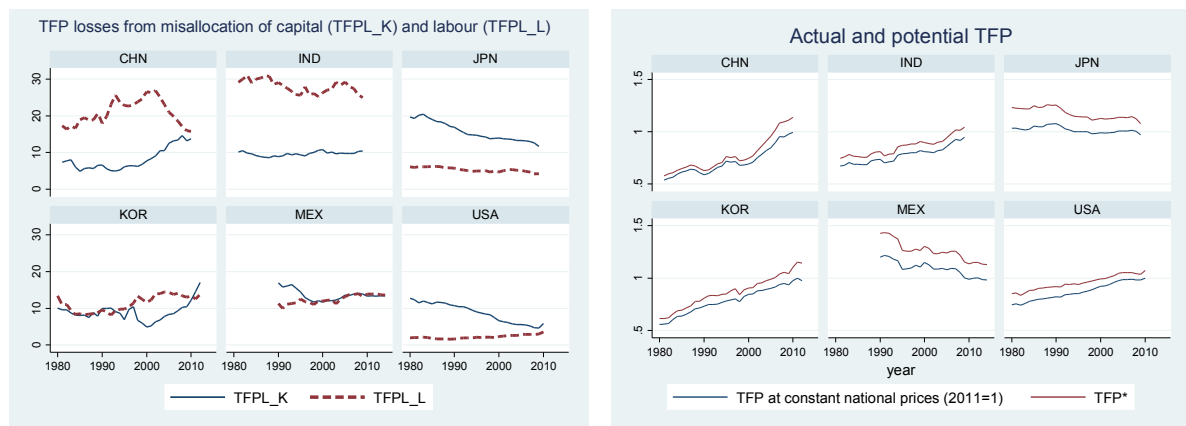


Figure 1. TFP losses from factors' misallocation, actual and potential TFP

Source: authors' calculations on WORLD KLEMS data and Penn World Tables.

The sources of misallocation differ between advanced and less advanced economies. In China and India, labor misallocation is the major source of aggregate inefficiency, whereas in more advanced economies, like Japan and the US, capital misallocation is the major driver. This is in line with the finding of the development literature that an abundance of workers in an inefficient agriculture

¹¹ Using factor intensities of a benchmark country such as the US is standard in the literature, see for instance Hsieh and Klenow (2009). For further discussion on this issue, see also Di Stefano and Marconi (2016).

sector creates aggregate inefficiencies in countries at earlier stages of economic development. At later stages, as the economy develops and labor shifts to the more productive manufacturing or services sectors, capital allocation starts playing a more decisive role. It is important to note that while capital misallocation has shown a downward trend in Japan and US, it trended up or stayed constant elsewhere. And even more interesting is the fact that such a divergence in misallocation trends goes hand in hand with divergent speeds in capital accumulation (TABLE 1).

TABLE 1. ANNUAL RATE OF GROWTH OF CAPITAL STOCK AND ALLOCATIVE INEFFICIENCY OVER THE PERIOD 1990-2010

	Growth of capital stock	Rate of change of inefficiency
China	13.40	3.75
India	7.27	0.82
Korea	9.36	2.48
Mexico	2.77	-0.99
Japan	1.72	-1.95
USA	2.51	-3.02

The sectors that contribute most to capital misallocations are Construction and Real Estate (figure 2). Excluding them makes allocative inefficiency appear less severe in all countries but Japan, with particularly large reductions in South Korea, Mexico and the United States. Nonetheless, even taking into account the disproportionate role of the Construction and Real Estate sectors, we still notice different trends in capital misallocation across countries.

Panel (b) in Figure 2 offers a snapshot of sector-level patterns of misallocation across countries. We aggregate the capital gaps into 5 macro-sectors (Manufacturing, Services, Construction and Real Estate, Agriculture, and Mining). Positive (negative) values indicate a deficit (surplus) of capital in the sector. In deficit sectors the marginal productivity of capital is above average, hence it would be optimal either to allocate more capital to those sectors, or to increase the productivity of capital in the sectors in surplus of it.

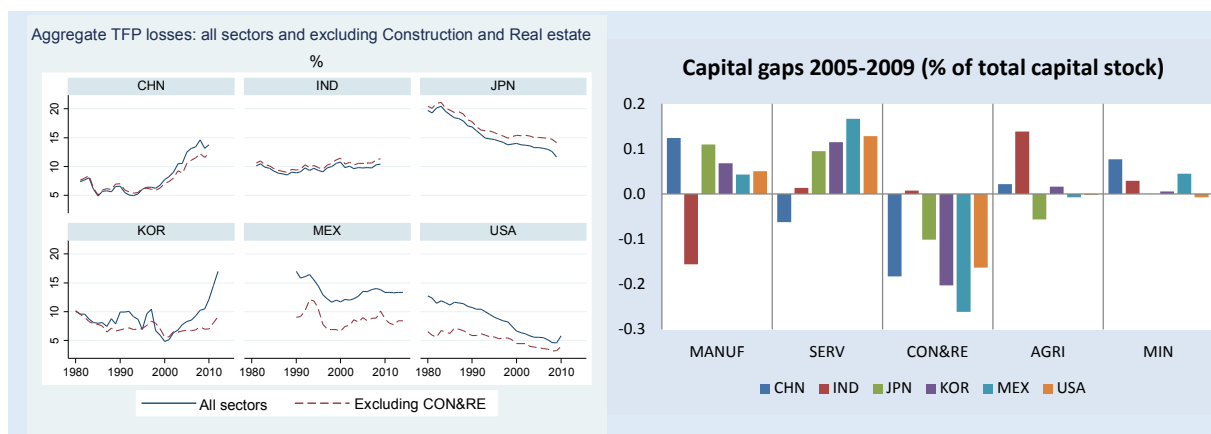


Fig. 2 Capital misallocation at a glance

Source: authors' calculations on WORLD KLEMS data.

Note: For India CON&RE include only Construction as data on Real Estate are not available. The service sector excludes Public Administration.

To clarify the concept further, consider two extreme cases: China and India. In India, the capital gap of the manufacturing sector is negative, showing a surplus of capital, whereas that of the service sector is positive, indicating a lack of capital.¹² In China, the reverse is true. Efficient allocation in India would require either to allocate more capital to the service sector or to raise the productivity in the manufacturing sector; the reverse would be necessary in China (for a comparison between the two countries see also Di Stefano and Marconi, 2016).

Misallocation and financial development: evidence on aggregate inefficiency

In this section we explore whether financial underdevelopment is responsible for the large degree of capital misallocation that we observe in emerging market economies. Since capital, especially physical capital, to a lesser extent human capital, once installed tends to be quite immobile across sectors. We therefore examine how financial development affects the allocation of new capital. More precisely, we test whether financial underdevelopment slows down the reallocation of capital towards more productive industries.

In principle, financial underdevelopment should create strong incentives for capital accumulation, as credit constrained firms often have high rates of returns (Banerjee and Moll (2010)). At the same time, though, the financial frictions associated with an underdeveloped financial system may

¹² Bollard et al (2013) find that Indian manufacturing became more productive after the reforms of the early 2000s, but only because individual plants became more productive. The authors do not find evidence for significant productivity-enhancing reallocation across plants.

prevent this capital from flowing to the most productive sectors. For instance, financial underdevelopment may bias capital accumulation to sectors that are not competitive or have a larger number of incumbent firms that could generate internal funds (in light with the arguments of Buera et al (2011) or Gopinath et al (2016)) or are better connected politically (see García-Santana et al (2016)). By reducing the financial frictions that prevent (some) productive sectors from attracting capital, financial development could reduce the degree of capital misallocation in the economy.

In the empirical analysis, we exploit both the aggregate and sector-level variation of capital misallocation across countries and time to assess to what extent financial development, both in terms of financial institutions and markets, affects the allocative efficiency of capital. We begin by looking at the relationship of aggregate TFP losses, capital accumulation and financial development. In order to keep as much time series observations as possible, our specification relies on annual data. The main disadvantage is that we retain all the business cycle fluctuations as well as problem of measurement errors, which may be considerable on annual data for developing countries (Bond et al., 2010). In order to reduce the impact of these problems we run the regressions on different aggregate measures of inefficiency, excluding the sectors that might be more sensitive to both business cycle fluctuations and measurement errors.¹³

Equation (5) defines TFPL_K as a weighted average of capital gaps, with both weights and gaps depending on relative prices and the cross-sector allocation of labor and capital. Our empirical specification aims at capturing the role of financial frictions in reducing or amplifying TFPL_K as capital accumulation proceeded, while controlling for other factors that affected structural transformation and factor allocation. Since unit root tests suggest that TFPL_K is integrated of order one we specify our regression in first differences:¹⁴

$$\Delta tfp_K_{it} = \alpha_i + \beta_1 \Delta k_{it} + \beta_2 FIN_{it} + \beta_3 \Delta k_{it} * FIN_{it} + \beta_4 FIN_{it}^2 + \beta_5 \Delta k_{it}^2 + \mathbf{X}'_{it-1} \gamma + \varepsilon_{it}, \quad (7)$$

where Δtfp_K_{it} denotes the log change of TFPL_K in country i in year t, Δk_{it} the log change of the aggregate capital stock and FIN_{it} financial development. The variable $\Delta k_{it} * FIN_{it}$ captures the interaction effects between the growth rate of capital and the level of financial development. To ensure that the interaction term is not spuriously capturing left-out squared terms arising from the correlation between Δk_{it} and FIN_{it} , we follow Balli and Sørensen (2013) and include also the quadratic terms. \mathbf{X}'_{it-1} is a vector of control variables lagged one period. These include the log

¹³ We obtained similar results applying the Hodrick-Prescott filter and running regressions on trend variables. Results are available from the authors upon request.

¹⁴ We cannot rely on the Arellano-Bond estimator because it is designed for datasets with many cross-sectional units and few time periods.

change of employment in agriculture (to capture the speed of the structural shift from agriculture to other sectors), the GDP deflator (to capture relative price changes), the log change in the degree of openness (representing exogenous pressures to structural change), the share of capital accounted for by the construction and real estate sectors (to control for an important source of distortions) and a dummy variable that takes value one if the country experienced a banking crisis.¹⁵ We also include country fixed effects α_i to allow for variation in initial conditions across countries and control for other unobserved (and relatively sticky) country-specific factors affecting frictions across sectors.

Table 2 reports estimates for equation (7). The heading of the column indicates the index or sub-index of financial development considered in each regression. The first column reports the result for the broad measure of financial development (*FD*), that covers both financial institutions and markets. The second and third columns consider the development of financial institution (*FI*) and financial markets (*FM*), respectively. Columns 4-9 report results for the sub-components access (*A*), depth (*D*) and efficiency (*E*) of either *FI* or *FM*.

TABLE 2. MISALLOCATION AND FINANCIAL DEVELOPMENT: FIXED-EFFECT REGRESSIONS WITH AR(1) DISTURBANCES. ALL SECTORS, EXCLUDING PUBLIC ADMINISTRATION.

FIN:	FD	FI	FM	FIA	FMA	FID	FMD	FIE	FME
Fixed capital growth	5.52*** (1.56)	5.35*** (1.59)	3.48** (1.39)	4.94*** (1.26)	3.02** (1.23)	3.16** (1.38)	1.22 (1.13)	1.92 (1.71)	1.41 (1.50)
FIN	0.92** (0.42)	0.86 (0.53)	0.61* (0.31)	0.52 (0.40)	0.34* (0.18)	0.51 (0.34)	0.24 (0.20)	0.09 (0.32)	0.08 (0.23)
FIN*Fixed capital growth	-9.30*** (1.86)	-8.30*** (1.76)	-6.18*** (1.59)	-7.03*** (1.23)	-6.98*** (1.59)	-6.51*** (1.64)	-2.60** (1.08)	2.2 (1.91)	-1.85 (1.19)
Fixed capital growth_squared	-10.92** (4.59)	-12.35** (4.77)	-7.88* (4.46)	-17.10*** (4.59)	-12.81*** (4.68)	-8.43* (4.73)	-6.38 (4.47)	3.24 (4.45)	-4.01 (4.49)
FIN_squared	-0.53* (0.31)	-0.47 (0.40)	-0.37 (0.25)	-0.21 (0.31)	-0.1 (0.19)	-0.29 (0.28)	-0.12 (0.15)	0.27 (0.34)	-0.02 (0.17)
N	160	160	160	160	160	160	160	160	160
r2_a	0.24	0.22	0.19	0.27	0.22	0.19	0.14	0.11	0.12
Threshold for FIN evaluated at sample mean for fixed capital growth									
	0.45	0.46	0.40	0.39	0.20	0.32	n.s	n.s	n.s
Sample means for financial development indicators									
Advanced countries	0.64	0.70	0.58	0.73	0.44	0.60	0.54	0.57	0.75
Developing countries	0.35	0.32	0.38	0.14	0.27	0.21	0.22	0.65	0.68

Note: *p<0.1; **p<0.05; ***p<0.01. Standard errors reported in parentheses. The dependent variable is the log change of TFP losses from capital misallocation computed on all sectors, excluding public administration. The regressions also include: the log change of the share of labour in agriculture; the inflation rate, measured as $\log(1 + \text{rate of change of } \pi)$.

¹⁵ Mexico went through a bank crisis in 1994-96, China in 1998, Korea in 1997-98, Japan in 1997-2001, and the United States in 2007-2011.

GDP deflator); the log change of the degree of openness; the log share of capital stock in real estate and construction and a dummy variable to control for banking crises. Standard errors are robust to serial correlation.

Results confirm the presence of a non-linear relationship between capital accumulation and capital misallocation that depends on the level of financial development. The positive coefficient on *fixed capital growth* (β_1) indicates that faster capital accumulation is associated with a deterioration of allocation efficiency. This effect is non-linear and vanishes for high rates of capital accumulation, as indicated by the negative coefficient on the *squared fixed capital growth* (β_4). That said, the threshold above which this offsets the positive linear term is very large and far outside the support of our sample distribution. More importantly, the negative impact of *fixed capital growth* vanishes and even reverses higher levels of financial developments, as indicated by the negative coefficient β_3 on the interaction term between *fixed capital growth* and *FD*.¹⁶ The bottom three rows of table 2 show that the threshold for *FD* above which higher investment is associated with a higher rather than lower allocation efficiency (evaluated at the sample mean for fixed capital growth) tend to fall between the average levels of *FD* in advanced and emerging market countries in the sample.¹⁷

FD also appears to have a negative direct relationship with allocative efficiency, beyond the impact through fixed capital growth. But the evidence for this adverse effect is not very strong. The estimated coefficient is significant only at the 10% level and become insignificant when including time fixed effects.¹⁸ The effect is also relatively small in economic terms and quickly offset by the beneficial effects for positive rates of capital accumulation.

The results for the various subindices for *FD* suggest that the development of financial institutions (column FI) matters more than that of financial markets (column FM). Access to financial institutions (column FIA) appears to be particularly important. Indeed, the emerging group score very low in terms of access to financial institutions (FIA) and depth of financial institutions (FID). Regression results reported in the last three columns show that the depth of financial markets (FMD), as well as the efficiency of institutions (FIE) and markets (FME), are not able to capture the heterogeneity across our sample countries.

For robustness check, we run regression (7) with two different dependent variables. We first exclude the financial services sector from the computation of TFP losses (Table 3). The reason is

¹⁶ The marginal effect is given by $\frac{\partial \Delta k}{\partial t f p l} = \beta_1 + \beta_3 F I N + \beta_5 \Delta k$, hence: $= F I N_{threshold} = -(\beta_1 + \beta_5 \bar{\Delta k}) / \beta_3$.

¹⁷ The ADV group is composed of Korea, Japan and US. The DEV one is composed of China, India and Mexico.

¹⁸ Including time fixed effects leaves all other parameter estimates are unaffected. Results are available upon request.

possible measurement error in the estimated productivity of the financial services sector, as outputs do not take into account the amount of risk. It turns out that coefficient estimates and their significance are very similar to those obtained on all sectors.

TABLE 3. MISALLOCATION AND FINANCIAL DEVELOPMENT: FIXED-EFFECT REGRESSIONS WITH AR(1) DISTURBANCES. ALL SECTORS, EXCLUDING PUBLIC ADMINISTRATION AND FINANCIAL SERVICES.

FIN:	FD	FI	FM	FIA	FMA	FID	FMD	FIE	FME
Fixed capital growth	6.82*** (1.87)	6.23*** (1.93)	4.34** (1.67)	4.88*** (1.49)	3.36** (1.43)	3.47** (1.69)	1.54 (1.43)	-3.34 (2.08)	1.39 (1.88)
FIN	0.92* (0.51)	0.58 (0.65)	0.71* (0.38)	0.35 (0.51)	0.28 (0.21)	0.5 (0.45)	0.21 (0.26)	0.1 (0.43)	0.07 (0.28)
FIN*Fixed capital growth	-12.00*** (2.22)	-10.31*** (2.2)	-8.35*** (1.89)	-8.19*** (1.46)	-8.93*** (1.84)	-8.28*** (2.00)	-3.88*** (1.33)	3.3 (2.30)	-2.42* (1.46)
Fixed capital growth_squared	-12.25** (5.48)	-13.17** (5.74)	-8.69 (5.33)	-16.18*** (5.43)	-13.10** (5.42)	-8.48 (5.74)	-7.81 (5.58)	-2.05 (5.46)	-3.43 (5.46)
FIN_squared	-0.49 (0.39)	-0.23 (0.50)	-0.39 (0.30)	-0.06 (0.40)	0.05 (0.23)	-0.27 (0.36)	-0.07 (0.20)	-0.33 (0.44)	0.01 (0.21)
N	160	160	160	160	160	160	160	160	160
r2_a	0.29	0.26	0.24	0.29	0.25	0.24	0.20	0.15	0.16
Threshold for FIN evaluated at sample mean for fixed capital growth									
	0.44	0.44	0.52	0.34	0.19	0.32	n.s	n.s	n.s
Sample means for financial development indicators									
Advanced countries	0.64	0.70	0.58	0.73	0.44	0.60	0.54	0.57	0.75
Developing countries	0.35	0.32	0.38	0.14	0.27	0.21	0.22	0.65	0.68

Note: *p<0.1; **p<0.05; ***p<0.01. Standard errors reported in parentheses. The dependent variable is the log change of TFP losses from capital misallocation computed on all sectors, excluding public administration and financial services. The regressions also include: the log change of the share of labour in agriculture; the inflation rate, measured as $\log(1 + \text{rate of change of GDP deflator})$; the log change of the degree of openness; the log share of capital stock in real estate and construction dummy variable to control for banking crises. Standard errors are robust to serial correlation.

A second robustness check excludes construction and real estate (table 4). This affects results in two respects. First, it raises the thresholds beyond which financial development stops being beneficial. This suggests that many of the adverse effects of financial development come from increased lending to the comparatively unproductive construction and real estate sectors. Second, the direct impact of financial development (coefficient β_2) becomes now statistically insignificant, indicating that financial institutions and markets do not play any role in reallocating resources when capital accumulation stagnates in sectors other than construction and real estate.

TABLE 4. MISALLOCATION AND FINANCIAL DEVELOPMENT: FIXED-EFFECT REGRESSIONS WITH AR(1) DISTURBANCES. ALL SECTORS, EXCLUDING PUBLIC ADMINISTRATION, CONSTRUCTION AND REAL ESTATE

FIN:	FD	FI	FM	FIA	FMA	FID	FMD	FIE	FME
Fixed capital growth	7.09*** (1.47)	5.60*** (1.51)	5.85*** (1.29)	4.34*** (1.13)	4.74*** (1.20)	4.07*** (1.28)	3.86*** (0.96)	2.32* (1.40)	3.40** (1.32)
FIN	0.05 (0.35)	0.31 (0.46)	0.26 (0.27)	-0.05 (0.37)	0.00 (0.19)	0.39 (0.29)	0.27* (0.15)	-0.55** (0.27)	0.09 (0.21)
FIN*Fixed capital growth	-6.52*** (1.71)	-4.83*** (1.74)	-5.14*** (1.44)	-3.12** (1.23)	-4.76*** (1.62)	-3.46** (1.51)	-2.85*** (0.95)	-0.27 (1.69)	-1.48 (1.11)
Fixed capital growth_squared	-18.14*** (4.34)	-16.33*** (4.68)	-14.81*** (4.10)	-15.63*** (4.46)	-16.86*** (4.71)	-13.32*** (4.55)	-12.18*** (5.58)	-9.04** (5.46)	-9.35** (5.46)
FIN_squared	-0.04 (0.25)	-0.29 (0.33)	-0.17 (0.21)	-0.05 (0.27)	0.09 (0.18)	-0.34 (0.22)	-0.19* (0.11)	0.55* (0.28)	-0.07 (0.15)
N	160	160	160	160	160	160	160	160	160
r2_a	0.16	0.12	0.15	0.13	0.13	0.10	0.12	0.07	0.08
Threshold for FIN evaluated at sample mean for fixed capital growth									
	0.74	0.73	0.77	0.76	0.55	0.69	0.81	n.s.	n.s
Sample means for financial development indicators									
Advanced countries	0.64	0.70	0.58	0.73	0.44	0.60	0.54	0.57	0.75
Developing countries	0.35	0.32	0.38	0.14	0.27	0.21	0.22	0.65	0.68

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors reported in parentheses. The dependent variable is the log change of TFP losses from capital misallocation computed on all sectors, excluding public administration, construction and real estate. The regressions also include: the log change of the share of labour in agriculture; the inflation rate, measured as $\log(1 + \text{rate of change of GDP deflator})$; the log change of the degree of openness and a dummy variable to control for banking crises. Standard errors are robust to serial correlation.

Misallocation and financial development: evidence on sector-level data

Results reported in the previous section show that financial development is mostly associated with an improvement in allocative efficiency when capital accumulation is positive. In this section, we exploit cross-country-cross-sector and cross-time variation of capital wedges to uncover which sectors benefit the most from financial development. Our hypothesis is that industries more dependent on external financing, with a higher share of R&D or with fewer tangible assets will benefit most from a more sophisticated financial sector as they are less likely to be based on easy-to-value collateral. We test this hypothesis using the difference-in-difference methodology introduced by Rajan and Zingales (1998). Our dependent variable is the 3-year average natural log

of the wedge on capital in sector j in country i , as given in (3). A higher wedge suggests that a sector is more disadvantaged than the country average, i.e. it is facing above-average implicit or explicit taxes. Our explanatory variables are the interactions of industry j 's characteristics (e.g. its exposure to financing needs or R&D intensity, etc.) and country i 's financial development, correcting for country and industry effects. If the hypothesis is correct, the estimated coefficients should be negative, which means that the higher industry j 's dependence on external financing or R&D intensity, the more its wedge will fall as financial development increases.

Our basic specification is the following:

$$\ln(wedge)_{Kji,t} = c_{ij} + d_t + \beta(RZ_j * FIN_{i,t}) + \delta_1 FIN_{i,t} + \delta_2 FIN_{i,t}^2 + X_{ij,t-3}'\gamma + \varepsilon_{ij,t}, \quad (8)$$

where $\ln(wedge)_{Kji,t}$ is the natural log of the wedge on capital in sector j and country i . We take 3-year averages to eliminate some noise in the data, although the results for annual data are broadly similar. c_{ij} are country-sector fixed effects, intended to capture all the time-invariant country-specific policies and other institutional characteristics that affect sector wedges. d_t are year dummies capturing global macroeconomic shocks. RZ_j is a variable that captures the relevant industry j 's characteristic to be interacted with country i 's financial development (FIN). In particular, we consider four characteristics: the dependency on external financing of the sector, given by the difference between capital expenditures (CAPEX) and Cash flow from operations (CASH) over capital expenditures; the skill intensity of the sector, the R&D intensity of the sector and the investment intensity. All the variables are measured using US data. We take averages over the period of data availability. Table 5 reports definition and sources of the abovementioned variables; Table 6 show their correlation.

Finally, $X_{ij,t-3}$ is a vector of additional variables that may affect capital wedges. We consider two controls: the wedge on labor and the value-added share of the sector, both taken at time $t-3$. The sample consists of non-overlapping three-year periods.

TABLE 5. INTERACTED VARIABLES BASED ON US INDUSTRY DATA

Variable	Source
$EDep_j = \frac{CAPEX_j - CASH_j}{CAPEX_j}$	CAPITAL IQ (S&P) 1980-2015
$SkI_j = \frac{HIGH\ SKILL\ LABOUR_j}{TOTAL\ EMPLOYMENT_j}$	WIOD (SEA) database 1995-2009
$R\&D_j = \frac{R\&D\ expenditures_j}{VALUE\ ADDED_j}$	OECD STAN database 2000-2014

$lnI_j = \frac{GFCF_j}{VA_j}$	WIOD (SEA) database 1995-2009
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TABLE 6. CORRELATION BETWEEN INDUSTRY CHARACTERISTICS

	Dependency from external finance	Skill intensity	R&D intensity	Investment intensity
Dependency from external finance	1			
Skill intensity	-0.48	1		
R&D intensity	-0.23	0.31	1	
Investment intensity	0.37	0.03	-0.2	1

Tables 7 report estimates of the coefficient of interest β from our basic specification (8). The rows show the different measures of financial development and the columns industry characteristics. For instance, row I shows the coefficient on the interaction between the overall financial development index (FD) and the dependency on external financing (column 1), skill intensity (column 2), R&D intensity (column 3) and investment intensity (column 4).

Results indicates that financial development, either in the form of more developed financial institutions or markets, tends to benefit the sectors that invest more in R&D, which are presumably the most innovative, or that have a higher fraction of investment relative to value added. The results for skill intensity are less strong, whereas the dependency from external finance as computed in Rajan and Zingales (1998) appears not to matter, except when interacted with the FM index.

**TABLE 7. FINANCIAL DEPENDENCY, FINANCIAL DEVELOPMENT AND SECTOR WEDGES:
OLS REGRESSIONS WITH RAJAN-ZINGALES TYPE OF VARIABLES**

Industry characteristic:	Dependency from external finance	Skill intensity	R&D intensity	Investment intensity
I. Industry characteristic*FD	0.15 (0.101)	-0.79* (0.448)	-2.60*** (0.8)	-0.92*** (0.35)
Adj-R2	0.89	0.88	0.88	0.88
Differential in wedge	0.000	-0.039	-0.037	-0.020
II. Industry characteristic*FI	0.09 (0.136)	-0.91 (0.617)	-2.94*** (1.0)	-1.31*** (0.478)
Adj-R2	0.90	0.89	0.89	0.89
Differential in wedge	0.000	0.000	-0.063	-0.043
III. Industry characteristic*FM	0.16** (0.073)	-0.59* (0.34)	-1.95*** (0.6)	-0.62** (0.264)
Adj-R2	0.89	0.88	0.89	0.88
Differential in wedge	0.057	-0.027	-0.025	-0.012
N	1171	1327	1162	1327
Average wedge at 75th percentile	0.092	0.197	0.472	0.153

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors reported in parentheses. The dependent variable is the 3-year average of the log of sectoral wedges. The variables indicated in each column are interacted with one of the financial development indexes introduced by Sahay et al (2015): overall financial development (FD) in regression I; financial institutions (FI) in regression II; financial markets (FM) in regression III. The regressions also include a complete set of year dummies and country dummies interacted with industry dummies, the lag 3 of the financial indicator considered and its square, the lag 3 of the value-added share of the sector, and the lag 3 of the log wedge on labour. Standard errors are robust to heteroskedasticity. The last row reports the average wedge evaluated at the 75th percentile of the RZ variable indicated in the column heading.

But while the effect of financial development on sector wedges is statistically highly significant it is often relatively small economically, at least when industry characteristics are considered in isolation. To gauge the economic significance of our results, we compute how the wedges of sectors with particularly industry characteristics would change if FD moved from the 25th percentile to the 75th percentile. We compare the difference in how such a move affected the wedges for sectors with high readings of the industry characteristics (such as an R&D intensity at the 75th percentile) and those with low readings (at the 25th percentile). For example, the differential in wedge of -0.037 in row I (FD) and column 3 (R&D intensity) shows that a large boost to financial development would reduce the wedge of a sector that is R&D intensive relative to one that is not by 0.037. This is quite small considering that the average wedge of an R&D-intensive sector is 0.472. The economic significance for skill and investment intensities is somewhat larger.

But looking at individual industry characteristics in isolation may understate the importance of financial development. To overcome this problem we include those characteristics that turned out to be statistically significant when on their own in a single regression (Table 8).

TABLE 8. FINANCIAL DEPENDENCY, FINANCIAL MARKETS AND SECTOR WEDGES: OLS REGRESSIONS WITH RAJAN-ZINGALES TYPE OF VARIABLES

FIN:	FD	FI	FM
FIN*Dependency from external finance			-0.03 (0.10)
FIN*Skill intensity	0.59 (0.896)		-0.69 (0.71)
FIN*R&D intensity	-3.27*** (1.10)	-3.55*** (1.1)	-1.66** (0.80)
FIN*Investment intensity	-1.52** (0.729)	-2.29** (0.93)	-0.68 (0.64)
Adj-R2	0.88	0.89	0.89
N	1162	1162	988
Differential wedge			
R&D intensive sectors	-0.046	-0.076	-0.022
Investment ntensive sectors	-0.033	-0.076	0.000

Note: *p<0.1; **p<0.05; ***p<0.01. Standard errors reported in parentheses. The dependent variable is the 3-year average of the log of sectoral wedges. The variables indicated in rows are introduced all together and are interacted with one of the financial development indexes introduced by Sahay et al. (2015). The heading of the columns indicate the index considered in each regression: overall financial development (FD) in column I; financial institutions (FI) in column II; and financial markets (FM) in column III. The regressions also include a complete set of year dummies and country dummies interacted with industry dummies, the lag 3 of the financial indicator considered and its square, the lag 3 of the value-added share of the sector, and the lag 3 of the log wedge on labour. Standard errors are robust to heteroskedasticity.

The results indicate that the interaction terms with FD and FI remain significant for both R&D intensity and investment intensity. For the FM index, instead, the only interaction term that survives is that with R&D intensity, in line with the literature that emphasize that R&D intensive industries tend to rely more heavily on equity or bonds as a source of external finance if their output is harder to collateralize (Gambacorta et al, 2014). Skill intensity is not significant regardless of the measure of financial development.

The differential in wedge, reported at the end of the table, becomes larger. Looking at the FI index, moving from the 25th percentile (low development) to the 75th percentile (high development),

implies a reduction in the average wedge of about 16% for industries at the 75th percentile of R&D intensity (high intensity) and by about 50% for industries at 75th percentile of investment intensity.

Our sector-level results have so far shown that R&D and investment-intensive sectors benefit disproportionately from financial development, but not whether financial development reduces the misallocation of resources in an economy. Using parameter estimates reported in Table 8, we compute the counterfactual TFP losses under the assumption that financial development in each country shifts to the US level. That is, we assume that wedges changes such that:

$$\widehat{\Delta W}_{jc} = \hat{\beta}_{R\&D} R\&D_j (FIN_{USA} - FIN_c) + \hat{\beta}_{II} Invint_j (FIN_{USA} - FIN_c). \quad (7)$$

From these counterfactual wedges we then compute $\widehat{TFPL}_{K_{jc}}$ using equation (5) on compare these to the actual TFP losses estimated above. Table 9 reports $\Delta \widehat{TFPL}_{K_{jc}}$ for the year 2009. The results show that China, India and, above all, Mexico would benefit greatly from financial development, especially of financial institutions. Most notably, for Mexico the development of financial institutions to the US-level would completely eliminate the distortions in the allocation of capital.¹⁹ In the case of China and India, distortions would be reduced substantially but not eliminated, corroborating the idea that other frictions are at play. Finally, moving to a US-level of financial development would not change TFP losses much in Korea and Japan, where financial markets and institutions are well developed and yet levels of inefficiency are significantly higher than in the United States.

TABLE 9. TFP GAIN FROM IMPROVING FINANCIAL DEVELOPMENT TO US LEVEL (%)

¹⁹ This effect is surprisingly large, given that we only consider two channels through which financial development affects allocative efficiency (financing R&D and investment) and that the Mexican economy features a number of stifling regulations and monopolies. That said, a similarly large impact of eliminating financial frictions in the Mexican economy has been found by Buera et al (2011). Possible reasons for the large impact are (i) costs of financial development offsetting some of its benefits, the (ii) the low level of financial intermediation in the country compared to its peers (see Herman and Klemm (2017)), and (iii) misspecification and measurement error.

	TFP gain in 2009 under counterfactual scenario				Actual TFP losses
	FD	FI	FM	Credit to GDP	
China	4.8	7.9	0.5	2.1	17.8
India	3.2	5.5	0.4	5.8	11.6
Mexico	9.0	11.8	0.7	5.6	11.9
Korea	0.6	0.9	0.1	-1.2	10.5
Japan	0.6	-0.8	0.1	-1.3	9.6
USA	0.0	0.0	0.0	0.0	3.8

Note: Column 1-3 reports the difference expressed in percentage points between TFP losses arising from capital misallocation computed on actual data and those computed under counterfactual scenarios for FD, FI and FM. The CGDP column report the gains obtained using credit to GDP as a proxy of financial development. A positive number indicates a gain under the counterfactual scenario. The last column reports the TFP losses computed from actual data. Computations are based on equation (5) and exclude agriculture and public administration.

Beneficial financial development and malign credit booms

Our results have so far painted a rather benign picture of financial development, which is in line with part but not all of the previous literature. In particular, we do not find any evidence for a threshold above which higher financial development is associated with lower allocative efficiency or for speed limits, ie adverse effects that could materialize if the financial system develops too quickly.

A possible explanation for this discrepancy is our choice of dependent variable. Most of the previous research has focused on the ratio of private sector credit to GDP, a variable that is only one of four in Sahay et al's (2015) financial institutions subindex.²⁰ But estimating equation 7 substituting private credit/GDP for financial development gives broadly similar results.²¹ The coefficient on the interaction term of credit/GDP and fixed capital growth is negative and highly significant, offsetting the adverse impact of capital formation on allocative efficiency for high levels of financial development. We do not find any direct effect of credit growth on allocative efficiency. Moving to the sector-level regressions does not make a difference. For China and Mexico, the TFP gains moving to the US-level of private sector credit-to-GDP would be smaller than those for

²⁰ The variables are weighted by their contribution to the principle component of all the variables in a subindex. Unfortunately the authors do not publish the precise weights.

²¹ Details are available upon request.

moving to the US-level of financial institution development, while those for India would remain roughly unchanged. For Korea and Japan, moving to a US-level of private sector credit would increase misallocation, reflecting the fact that their level of credit to GDP in 2009 exceeded that of the United States.

An alternative explanation for why our results do not show any obvious harm from financial development for resource allocation is the particular choice of our sample. The evidence on the detrimental effects of credit growth on resource allocation are from samples comprising mainly or exclusively advanced economies (Borio et al (2016), Cecchetti and Kharroubi (2013) and 2016), Gopinath et al (2015)), whereas half of the economies in our sample are emerging markets with a much lower level of development.

Conclusions

We investigate the relationship between capital misallocation and financial development in a panel of six countries at different levels of development (China, India, Mexico, Korea, Japan and US), exploiting both aggregate and sector-level variation of capital misallocation across both countries and time. We find that more developed financial systems do a better job at allocating capital investment. In economies with low levels of financial development, faster capital accumulation is associated with a worsening of allocative efficiency. This effect reverses for higher levels of financial development. Sectors with high R&D expenditures or high capital investment benefit most from financial development, whereas sectors more dependent on external financing are less sensitive. These effects are not only statistically significant, they are also large in economic terms. For example, our results suggest that bringing the Mexico's level of financial development to that of the United States would almost entirely cut the gap in allocative efficiency between the two countries. China and India would also make significant gains.

Appendix Tables and figures

Table A1. SECTOR CLASSIFICATION

<i>Sector</i>	<i>NACE code</i>
AGRICULTURE, HUNTING, FORESTRY AND FISHING	AtB
MINING AND QUARRYING	C
FOOD , BEVERAGES AND TOBACCO	15t16
TEXTILES, TEXTILE , LEATHER AND FOOTWEAR	17t19
WOOD AND OF WOOD AND CORK	20
PULP, PAPER, PAPER , PRINTING AND PUBLISHING	21t22
COKE, REFINED PETROLEUM AND NUCLEAR FUEL	23
CHEMICALS AND CHEMICAL PRODUCTS	24
RUBBER AND PLASTICS	25
OTHER NON-METALLIC MINERAL	26
BASIC METALS AND FABRICATED METAL	27t28
MACHINERY, NEC	29
ELECTRICAL AND OPTICAL EQUIPMENT	30t33
TRANSPORT EQUIPMENT	34t35
MANUFACTURING NEC; RECYCLING	36t37
ELECTRICITY, GAS AND WATER SUPPLY	E
CONSTRUCTION	F
WHOLESALE AND RETAIL TRADE	G
HOTELS AND RESTAURANTS	H
TRANSPORT AND STORAGE AND COMMUNICATION	I
FINANCIAL INTERMEDIATION	J
REAL ESTATE SERVICES	70
BUSINESS SERVICES	71t74
PUBLIC ADMIN AND DEFENCE; COMPULSORY SOCIAL SECURITY	L
EDUCATION	M
HEALTH AND SOCIAL WORK	N

Fig A1 SENSITIVITY ON ALPHAS

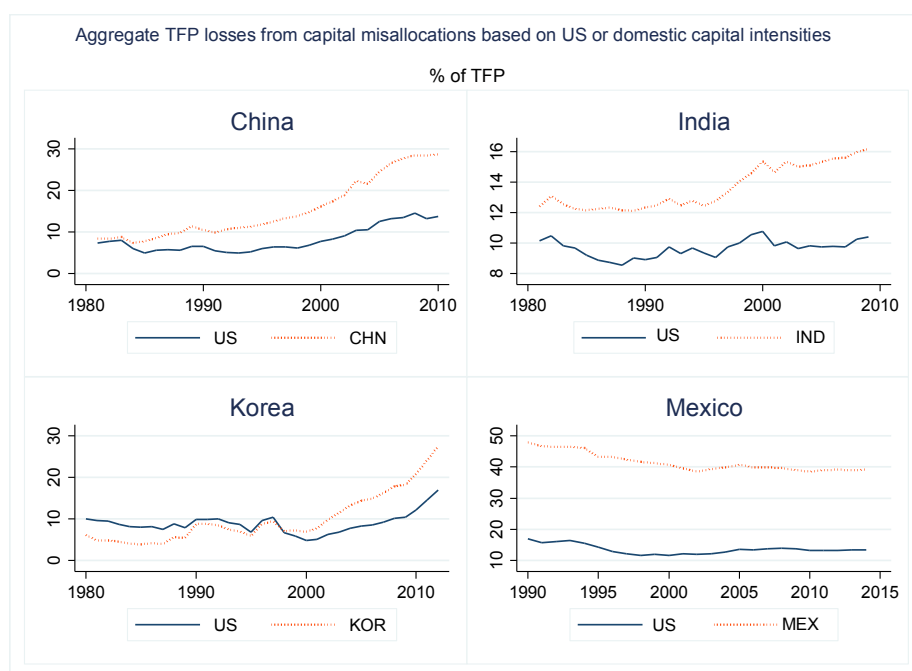


TABLE A2. MISALLOCATION AND FINANCIAL DEVELOPMENT COMPARING FINANCIAL INSTITUTIONS AND FINANCIAL MARKETS

Dependent variable rate of change of TFPL_K	All sectors	Excluding financial sector	Excluding construction and real estate
Fixed capital growth	7.16*** (1.631)	8.34*** (1.946)	6.97*** (1.501)
FI	1.21** (0.588)	0.99 (0.703)	0.34 (0.481)
FM	0.04 (0.372)	0.14 (0.448)	0.05 (0.3)
Fixed capital growth*FI	-8.50*** (2.279)	-9.38*** (2.709)	-2.33 (2.179)
Fixed capital growth*FM	-2.44 (1.964)	-4.06* (2.338)	-4.37** (1.858)
Fixed capital growth_sq	-15.10*** (4.729)	-16.18*** (5.586)	-17.39*** (4.502)
FI_sq	-0.58 (0.472)	-0.39 (0.569)	-0.39 (0.376)
FM_sq	-0.05 (0.3)	-0.1 (0.363)	0.03 (0.238)
N	160	160	160
r2_a	0.28	0.31	0.15

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors reported in parentheses. The dependent variable is the log change of TFP losses from capital misallocation computed on: (1) all sectors, excluding public administration; (2) all sectors excluding public administration and financial services; (3) all sectors excluding public administration and construction and real estate services. The regressions also include: the log change of the share of labour in agriculture; the inflation rate, measured as $\log(1 + \text{rate of change of GDP deflator})$; the log change of the degree of openness and a dummy. Standard errors are robust to serial correlation.

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