# Web Appendix (Not for Publication)

The Collateral Channel under Imperfect Debt Enforcement

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## 1. A simple model of secured credit under imperfect debt enforcement

We propose a simple model of secured credit under imperfect debt enforcement to rationalize the theoretical underpinnings of Section 2 in the paper. In particular the model aims at illustrating how a country's ability to enforce debt contracts affects the sensitivity of economic activity to changes in collateral values.

### *1.1. The environment*

The world economy consists of multiple closed countries in which production is realized in two sectors. Each sector is represented by entrepreneurs who incur debt from competitive lenders to invest in real assets $K_t$. Entrepreneurs have access to a production technology that returns $A$ per unit of real assets invested, unless their real assets are liquidated before completion of the project in which case it only returns $a < A$. Lenders have access to funds at gross interest rate $R$.[1] Setting $A > R$, investment in real assets of a project is profitable. We assume that all agents are risk neutral and infinitely lived.

The framework contains two frictions. First, real assets operated by an entrepreneur are imperfectly redeployable to other entrepreneurs. Their liquidation value is a fraction $\tau = \{\underline{\tau}, \overline{\tau}\}$ of their fundamental value, which we assume to be 1. Entrepreneurs in the sector with low and high collateral value are indexed by $\underline{\tau}$ and $\overline{\tau}$, respectively. Second, debt enforcement

[1] $R$ would be the world interest rate in a small open economy framework.

is imperfect due to standard moral hazard considerations. The entrepreneur may default on the loan and divert cash flows. In case of default, the lender goes to courts to enforce the debt contract. Courts decide to keep the firm as going concern with probability $p$ or to liquidate firm's real assets. We assume that liquidation is inefficient even for sectors whose real assets are liquidated at their fundamental values, namely:

**Assumption 1.** $\Delta > 1$ *with* $\Delta \equiv A - a$

As the efficient outcome is that the firm continues to operate as a going concern, the parameter $p \in [0, 1]$ captures the quality of debt enforcement and indexes countries. We also suppose that default on the loan may be profitable for the entrepreneur:

**Assumption 2.** $R > \Delta$

### *1.1.1. Sequence of events*

At the *beginning* of period $t$, entrepreneurs invest their wealth $W_t$ in real assets $k_t^c$, and signs a formal debt contract defined by the triple $(r_t, D_t, k_t^c)$, where $r_t$ is the gross lending rate, $D_t$ the amount of debt and $k_t^c$ the quantity of collateralized assets.[2] Then they invest their external funds $D_t$, runs their project of size $K_t = W_t + D_t$ and obtain cash flows of $aK_t$. The sequence of events in the *middle* of period $t$ for an entrepreneur and a lender is described in Figure W.1.

**Insert FIGURE W.1 here**

The entrepreneur decides whether to meet her debt obligations or to renegotiate the debt contract with the lender. In case of debt repayment, the project continues at full size and the profit income is $\pi_{e,t}^p = AK_t - r_t D_t$ for the entrepreneur and $\pi_{\ell,t}^p = (r_t - R)D_t$ for the lender. The renegotiation process follows Jermann and Quadrini (2009). In case of debt renegotiation, the two contractual parties bargain over an amount $e_t$ to be paid by the entrepreneur to prevent

[2]The assumption that only the assets financed with internal funds are collateralized can be rationalized in several ways: i) by assuming that installing capital takes time and is costly and that secured credit is extended only against installed capital and/or contracting is costly. In this context a *standard* credit multiplier requires an infinite number of debt contracts and capital installation. ii) by assuming that the production technology requires first an investment in tangible capital in order to run intangible capital, the latter being much more productive than tangible capital but not pledgeable as collateral. However, even in the framework with an infinite sequence of contracts, we would still obtain Proposition 1 under mild assumptions.

the lender from going to courts. If they reach an agreement, the entrepreneur and the lender obtain $\pi^n_{e,t} = AK_t - e_t$ and $\pi^n_{\ell,t} = e_t - RD_t$, respectively. If they do not find an agreement, the entrepreneur absconds with cash flow $aK_t$ and courts enforce the debt contract. Courts transfer the firm as a going concern to the lender with probability $p$ or the collateralized assets for liquidation. The lender (entrepreneur) obtains $\overline{\pi}^d_{\ell,t} = \Delta K_t - RD_t$ if the firm is kept as a going concern ($\underline{\pi}^d_{e,t} = aK_t$) but $\underline{\pi}^d_{\ell,t} = \tau W_t - RD_t$ in case of liquidation ($\overline{\pi}^d_{e,t} = aK_t + \Delta D_t$).[3] The Nash bargaining problem solves:[4]

$$\max_{e_t \geq 0} \left(\pi^n_{e,t} - E\pi^d_{e,t}\right)\left(\pi^n_{\ell,t} - E\pi^d_{\ell,t}\right)$$

where the expected payoffs in case of default $E\pi^d_{e,t}$ and $E\pi^d_{\ell,t}$ are threat points for the entrepreneur and the lender, respectively. The payment agreed upon the contractual parties is:

$$e_t = \frac{2p\Delta K_t + (1-p)[\Delta + \tau]W_t}{2} \tag{1}$$

At the *end* of period $t$, the real assets fully depreciate and the entrepreneur saves a fixed fraction $\beta$ of her end-of-period wealth (i.e. the profit income of her project).[5]

## *1.2. The collateral channel under imperfect debt enforcement*

Proposition 1 describes the credit multiplier arising in this framework and highlights the collateral channel under imperfect debt enforcement:

**Proposition 1.** *Under Assumptions 1 and 2, entrepreneurs in sector $\tau$ in country $p$ invest*

[3] The collateralized and uncollateralized assets are $k^c_t = W_t$ and $D_t$, respectively.

[4] The expected surplus of reaching an agreement is $\pi^n_{e,t} - E\pi^d_{e,t} = AK_t - e_t - [aK_t + (1-p)\Delta D_t] = \Delta K_t - (1-p)\Delta(K_t - W_t) - e_t = \Delta[pK_t + (1-p)W_t] - e_t$ for the entrepreneur and $\pi^n_{\ell,t} - E\pi^d_{\ell,t} = e_t - [p\Delta K_t + (1-p)\tau W_t]$ for the lender. The payment agreed upon the contractual parties follows.

[5] Therefore the entrepreneur consumes a fixed fraction $1-\beta$. This assumption can be rationalized with log preferences. It is well known that infinitely-lived agents with log utility have a saving function of the form $S_t = \beta\pi_{e,t}$ where $\beta$ stands for the time discount factor and $\pi_{e,t} \in \{\pi^p_{e,t}, \pi^n_{e,t}, \pi^d_{e,t}\}$ is the profit income of the project.

*$K_t = \nu(\tau, p)W_t$ in real assets with a credit multiplier given by*

$$\nu(\tau, p) = \frac{2R + (1-p)[\Delta + \tau]}{2[R - p\Delta]} \tag{2}$$

*The credit multiplier features a collateral channel as sectors with a high collateral value are more leveraged and invest more. Moreover, the collateral channel is stronger in countries with weak debt enforcement.*

**Proof.** One can easily show that because liquidation is inefficient under Assumption 2, a default triggers an expected utility loss for the entrepreneur (as $E\pi^d_{e,t} < \pi^n_{e,t}$) and for the lender (as $E\pi^d_{\ell,t} < \pi^n_{\ell,t}$). Therefore both parties have an incentive to find an agreement on a new payment $e_t$ in case of debt renegotiation. However, an entrepreneur $\tau$ renegotiates only when it is a profitable option, that is when the following incentive-compatibility constraint is violated:

$$AK_t - r_t D_t \geq AK_t - e_t \tag{IC}$$

The left-hand side of (IC) is the profit income $\pi^p_{e,t}$ of the project in case of debt repayment. The right-hand side is the return of the project net of the agreed payment $\pi^n_{e,t}$. Therefore, if (IC) is satisfied, entrepreneurs always repay competitive lenders who charge a lending rate $r_t = R$ (zero-profit condition). As $A > R$, (IC) is binding. Then the credit multiplier (2) follows directly from (1) and (IC). There follows the collateral channel (i.e. $\nu(\overline{\tau}, p) - \nu(\underline{\tau}, p) > 0$). However the collateral channel is stronger in countries with weak debt enforcement as $\frac{\partial[\nu(\overline{\tau},p) - \nu(\underline{\tau},p)]}{\partial p} = -\frac{(\overline{\tau}-\underline{\tau})(R-\Delta)}{2[R-p\Delta]^2} < 0$ under Assumption 2. □

The intuition behind Proposition 1 is straightforward. Entrepreneurs may find optimal to renegotiate the debt contract. Firstly, the lender provides funds up to the net present value of agreed payment (i.e. $D_t = \frac{e_t}{R}$) to deter such opportunistic behavior. Secondly, entrepreneurs with a high collateral value have to pay more to lenders in order to reach an agreement because lenders' threat to cause the agreement to fail $E\pi^d_{\ell,t}$ is stronger. As a result, they have larger debt and investment capacity. However, lenders' threat determined by entrepreneurs' collateral value is more effective in countries characterized by a lower quality of debt enforce-

ment as liquidation is more likely. This explains why the collateral channel is stronger in countries with a lower quality of debt enforcement.

We now investigate the effect of the collateral channel under imperfect debt enforcement on economic activity. Specifically, we study the sensitivity of industry growth to changes in collateral value when debt enforcement becomes less efficient. As entrepreneurs always repay their debt, the value added of sector $\tau$ located in country $p$ is the profit income of the project:

$$\pi^{p}_{e,t}(\tau, p) = [(A - R)\nu(\tau, p) + R]W_t \tag{3}$$

from Proposition 1. Entrepreneurs save a fixed fraction $\beta$ of their end-of-period wealth (3) so that they have access to internal funds $W_t = \beta\pi^{p}_{e,t-1}(\tau, p) = \beta[(A - R)\nu(\tau, p) + R]W_{t-1}$ at the beginning of period $t$. Therefore the growth in value added of sector $\tau$ located in country $p$ can be simply written as:

$$g(\tau, p) = \frac{W_t}{W_{t-1}} = \beta[(A - R)\nu(\tau, p) + R]$$

The effect of a weakening of debt enforcement on the sensitivity of sectoral growth to changes in collateral values is determined by the sign of the following cross derivatives

$$\frac{\partial[g(\overline{\tau}, p) - g(\underline{\tau}, p)]}{\partial p} = \beta(A - R)\frac{\partial[\nu(\overline{\tau}, p) - \nu(\underline{\tau}, p)]}{\partial p} < 0$$

From Proposition 1, this expression is negative. Therefore Proposition 1 has the following implication:

**Corollary 1.** *An industry with a low collateral value grows relatively more slowly in countries characterized by weak debt enforcement. Stated differently, weaker debt enforcement amplifies the sensitivity of industry growth to fluctuations in collateral values.*

This mechanism of amplification comes from the fact that the collateral liquidation value is relatively more important for entrepreneurs to incur debt in countries with weak debt enforcement. Therefore, due to weak debt enforcement, entrepreneurs with a low collateral value are relatively more credit-constrained which implies that they generate less profit out

of internal funds and thus invest less next period.

# 2. The collateral channel under imperfect debt enforcement: an allocation perspective

In this section, we focus on another type of economic outcome. We adopt an allocation perspective and ask how resources are allocated across industries with different collateral values within a country characterized by a certain quality of debt enforcement. In this perspective, the dependant variable in regression (2) of the main paper is measured as the mean share of value added of industry $i$ to GDP in country $c$ over the period 1981-2000.

## *2.1. Theoretical prediction*

Given the same environment as in Section 1.1, we first derive a theoretical prediction for the allocation perspective of the collateral channel under imperfect debt enforcement. Let us define the share of industry $\tau$ in the economy as $s_t(\tau, p) \equiv \frac{\pi^p_{e,t}(\tau,p)}{Y_t(p)}$ where GDP in country $p$ is the sum of value added in all sectors given by $Y_t(p) = \int_0^1 \pi^p_{e,t}(\tau, p)d\tau$. The effect of a weakening of debt enforcement on the sensitivity of sectoral allocation to changes in collateral values is determined by the sign of the following cross derivatives

$$\frac{\partial^2 s_t(\tau,p)}{\partial\tau\partial p} = \frac{\frac{\partial^2\pi^p_{e,t}(\tau,p)}{\partial\tau\partial p}Y_t(p) - \frac{\partial\pi^p_{e,t}(\tau,p)}{\partial\tau}\int_0^1 \frac{\partial\pi^p_{e,t}(\tau,p)}{\partial p}d\tau}{Y_t(p)^2} < 0$$

From Proposition 1, this expression is negative.[6] Therefore Proposition 1 has the following implication:

**Corollary 2.** *An industry with a low collateral value represents a relatively smaller share of the economy in countries characterized by weak debt enforcement.*

The intuition goes in the same way for Corollary 2 as for Corollary 1.

[6] We find $\frac{\partial\pi^p_{e,t}(\tau,p)}{\partial\tau} > 0$, $\frac{\partial\pi^p_{e,t}(\tau,p)}{\partial p} > 0$ and $\frac{\partial^2\pi^p_{e,t}(\tau,p)}{\partial\tau\partial p} < 0$ using the profit income (3) and the credit multiplier (2).

## *2.2. Basic empirical results*

We test Corollary 2 based on the estimation of the empirical equation (2) with industry's value added to GDP as dependent variable. The OLS estimates are shown in the first four columns of Table 4 and the Instrumental Variables (IV) estimates in the last four columns. We report standard errors clustered two-way by industry and country computed using procedure of Cameron, Gelbach, and Miller (2011).[7]

**Insert TABLE W.1 here**

The estimation of our baseline specification using OLS is presented in the first column of Panel A in Table W.1. It includes our variable of interest, i.e. the interaction between the industry's real assets' redeployability and the country's quality of debt enforcement (*Redeployability* × *Debt enforcement*) as well as country and industry dummy variables. The coefficient estimate on our variable of interest has a negative sign and is significant at the 5% level. In line with Corollary 2, these results indicate that industries with a low collateral value represent a relatively smaller share of the economy in countries characterized by weak debt enforcement. In columns 2 and 3, we control for other industry characteristics that could influence the expected value of collateral to lenders upon default. In column 4, we further control for the standard determinants of the production structure of an economy. In the allocation regression, we add interactions between industry factor intensities and country factor endowments (*Capital intensity* × *Capital*, *Skill intensity* × *Skill*, *Natural resources intensity* × *Natural resources*). In line with the Hecksher-Ohlin-Samuelson theorem, Romalis (2004) shows that these interaction terms explain a large part of the within-country variation in the structure of exports across industries. These factors might as well explain variations in the structure of the domestic production. Due to the lack of availability of data on factor endowments for all countries, our regression sample drops from 62 to 41 countries. Interestingly, our coefficient of interest remains unchanged qualitatively and quantitatively when estimated on this sub-sample including these additional controls.

[7] In some IV estimations the covariance matrix of moment conditions has not full rank when standard errors are clustered two-way by industry and country and we compute standard errors clustered by country instead.

As for growth regressions, we are concerned with the potential endogeneity of debt enforcement. We therefore perform an instrumental variables (IV) estimation with legal origins as instruments for debt enforcement. Our estimates using GMM are reported in columns 5 to 8 of Panel A in Table W.1. We see that the results are qualitatively unaffected by the instrumentation procedure. Across the different specifications, our coefficient of interest is higher in absolute value. This result can be attributed to an attenuation bias due to measurement errors in debt enforcement quality. The p-values of the Hansen $J$ test are above 0.1. Therefore the overidentification test validates our identification strategy requiring that the interaction between the legal origin of a country's bankruptcy law and industry's repedeployability is truly exogenous. In the robustness checks, we will thus only report GMM estimates. It should be noted that the allocation effect through which the collateral channel under imperfect debt enforcement operates is economically sizable. The point estimate of column 8 of Panel A in Table W.1 implies that the *Glass and products* industry would become 0.34 percentage points smaller in terms of value added to GDP relative to the *Pottery, china and earthenware* industry if a country like Sweden would reach the level of debt enforcement quality of Guatemala. In comparison, the value added of the average industry in the sample represents 0.64 percents of GDP.

In Panel B, we run the same regressions but with industry size in the manufacturing sector as dependent variable. We obtain similar results as in Panel A.[8]

## *2.3. Robustness checks*

We do the same robustness checks for the allocation perspective as we performed in the paper for growth regressions. We first investigate several issues related to potential measurement errors on our measure of redeployability. The regressions reported in Table W.2 show that whether or not our measure of redeployability entails measurement errors the results are not significantly affected qualitatively.[9]

[8]The basic empirical results are also robust to using the log of industry's real value added (averaged over the period 1981-2000) as an alternative dependent variable.

[9]The absolute values of the estimates vary across regressions mainly due to changes in the range of the redeployability measure.

**Insert TABLE W.2 here**

Industry allocation may be affected by the same alternative channels as for sectoral growth that might spuriously drive the allocation results. By including them in Table W.3, we see that our coefficient of interest remains negative and significant at the 5% level when the alternative channels are accounted for. Moreover, the coefficients are not significantly different from the coefficient estimated in the baseline regression.

**Insert TABLE W.3 here**

In Table W.4, we analyze the robustness of our main result using a series of tests. Again, the coefficient estimate on *Redeployability* × *Debt enforcement* is negative and significant at the 5% level in 6 out of 8 regressions (10% in the remaining cases).

**Insert TABLE W.4 here**

# Appendix

## *A.1. Sources and description of data*

**Industry size.** Due to differences in country coverage between datasets of debt enforcement and economic activity, our dataset includes 67 countries (instead of the 88 potential countries). For some of these countries data on economic activity for the years 1980 and 2000 (and in-between) are missing. The sample in the basic allocation regression reduces to 62 countries associated to 1641 observations (instead of 1736=62×28 possible observations). The countries included in the allocation regressions with the number of industries available for each country are listed in Table W.A1 in this Appendix.

Industry value added to GDP is the average share of real value added to real GDP of industry $i$ in country $c$ for the period 1981-2000 $[\sum_{t=1981}^{2000}(va_{ict}/RGDP_{ct} \times POP_{ct})/20]$. Industry size in the manufacturing sector is defined as share of industry real value added to total real value added in the manufacturing sector $[\sum_{t=1981}^{2000}(va_{ict}/\sum_{i=1}^{28} va_{ict})/20]$. In column 6 (column 7) of the robustness checks, the dependent variable is the share of investment (output) in industry $i$ and country $c$ to total investment (output) in the manufacturing sector of country $c$

averaged over the years 1980-2000. In column 8, the dependent variable is the share of exports in industry $i$ and country $c$ to total exports in country $c$ averaged over the years 1980-2000.

**Control variables.** The sector factor intensities *Capital intensity*, *Skill intensity*, *Natural resources intensity intensity* are taken from Table II in Braun (2005).The stock of physical capital per worker in each country is constructed using the perpetual inventory method described in Hall and Jones (1999) where the investment data and the number of workers for each country $c$ are taken from Penn World Tables (Heston, Summers, and Aten, 2006). Data on aggregate natural resources endowment per capita are obtained from World Bank (1997). *Capital* and *Skill* are the log of the mean physical capital per worker and the mean human capital in country $c$ for the period 1981-2000, respectively. *Natural resources* is the log of natural resources per capita. The definition of other controls can be found in the Appendix of the main paper.

## *A.2. Sample*

**Insert TABLE W.A1 here**

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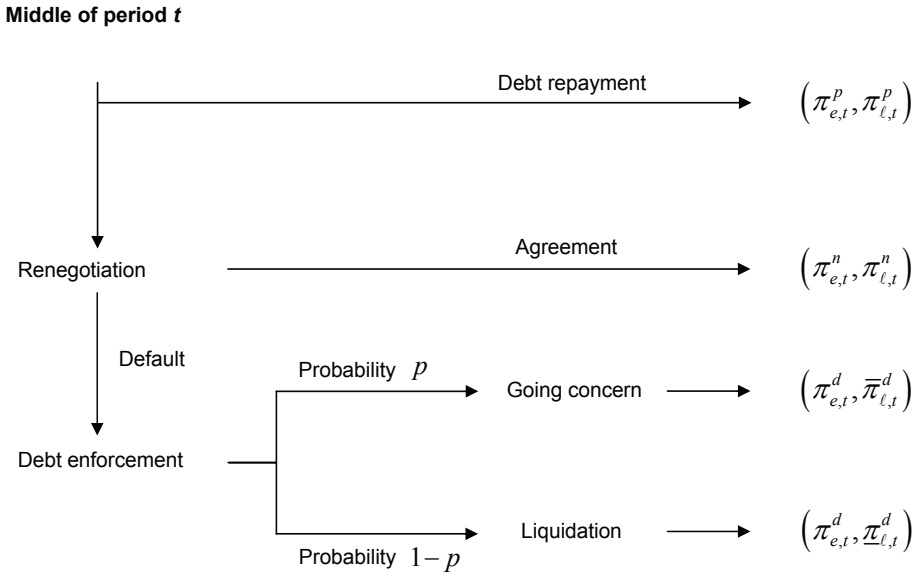
# Figure

FIGURE W.1.
Sequence of Events in the Middle of Period $t$



# Tables

TABLE W.A1

Sample in Allocation Regressions

The sample includes countries present in regressions using *Debt enforcement* without controlling for the standard determinants of comparative advantages where the dependent variable is the value added to GDP over the period 1981-2000. a: denotes countries missing in regressions where standard determinants of comparative advantages are used.

| **Country** | **Number of industries** | **Country** | **Number of industries** | **Country** | **Number of industries** |
|---|---|---|---|---|---|
| Argentina | 28 | Greece | 28 | New Zealand | 28 |
| Australia | 28 | Guatemala | 28 | Oman[a] | 27 |
| Austria | 28 | Hong Kong[a] | 27 | Panama[a] | 27 |
| Bulgaria[a] | 28 | Honduras | 26 | Peru | 28 |
| Brazil | 13 | Hungary[a] | 28 | Philippines | 28 |
| Botswana[a] | 5 | Indonesia | 28 | Poland[a] | 28 |
| Canada | 28 | Ireland | 26 | Portugal | 28 |
| Switzerland | 5 | Iran[a] | 28 | Romania[a] | 28 |
| Chile | 28 | Israel[a] | 28 | Russian Federation[a] | 28 |
| China[a] | 26 | Italy | 28 | Singapore[a] | 24 |
| Colombia | 28 | Jordan | 27 | El Salvador | 28 |
| Costa Rica | 28 | Japan | 28 | Slovakia[a] | 26 |
| Czech Republic[a] | 24 | Korea[a] | 28 | Slovenia[a] | 23 |
| Denmark | 28 | Kuwait[a] | 27 | Sweden | 28 |
| Algeria[a] | 28 | Sri Lanka | 28 | Thailand | 28 |
| Ecuador | 28 | Latvia[a] | 26 | Tunisia | 27 |
| Egypt | 28 | Morocco[a] | 26 | Turkey | 28 |
| Spain | 28 | Mexico | 28 | Uruguay | 28 |
| Finland | 28 | Malaysia | 28 | Venezuela | 28 |
| France | 27 | Netherlands | 26 | South Africa | 28 |
| United Kingdom | 28 | Norway | 28 | | |

TABLE W.1

THE COLLATERAL CHANNEL UNDER IMPERFECT DEBT ENFORCEMENT: AN ALLOCATION PERSPECTIVE

All regressions include both country and industry fixed effects and a constant (coefficient estimates not reported). In Panel A (Panel B), the dependent variable is the average share of each 3-digit ISIC industry's real value added to each country's GDP (total value added in the manufacturing sector) over the period 1981-2000. The main variable of interest *Redeployability* × *Debt enforcement* denotes the product of these two variables. *Redeployability* defined by expression (**??**) in the text is the redeployability of real assets owned by each 3-digit ISIC U.S. industry between 1981-2000. *Debt enforcement* is a time-invarying variable constructed by Djankov, Hart, McLiesh, and Shleifer (2008) and denotes the efficiency of debt enforcement procedures in each country. *Tangibility* from Braun (2005) is the median ratio of net property, plant and equipment to total assets over U.S. firms in each 3-digit ISIC industry. *Depreciation* and *Obsolescence* from Ilyina and Samaniego (2011) are the industry rate of capital depreciation and the embodied technical change in capital measure based on Cummins and Violante (2002). Columns 1 to 4 report the OLS estimates. Columns 5 to 8 report IV results obtained by GMM with *Debt enforcement* instrumented by the legal origin of a country's bankruptcy laws. Standard errors clustered two-way by industry and country (columns 1-5 in Panel A, columns 1-6 in Panel B) and standard errors clustered by country (columns 6-8 in Panel A, columns 7-8 in Panel B) are reported in parentheses. **: significant at 1% level. *: signficant at 5% level. $^{+}$: signficant at 10% level.

| | OLS | | | | IV | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **A. Dependent variable:** industry value added to GDP | | | | | | | | |
| **Redeployability × Debt enforcement** | **−0.043*** | **−0.053**** | **−0.043*** | **−0.049*** | **−0.072**** | **−0.088**** | **−0.073**** | **−0.076**** |
| | **(0.018)** | **(0.018)** | **(0.019)** | **(0.021)** | **(0.026)** | **(0.018)** | **(0.017)** | **(0.013)** |
| Tangibility × Debt enforcement | | −0.025* | | −0.024 | | −0.034** | | −0.023$^{+}$ |
| | | (0.013) | | (0.015) | | (0.010) | | (0.012) |
| Depreciation × Debt enforcement | | | 0.002** | 0.002** | | | 0.003** | 0.003** |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| Obsolescence × Debt enforcement | | | 0.006$^{+}$ | 0.004 | | | 0.009** | 0.006** |
| | | | (0.003) | (0.003) | | | (0.003) | (0.003) |
| Capital intensity × Capital | | | | 0.006 | | | | 0.007 |
| | | | | (0.010) | | | | (0.010) |
| Skill intensity × Skill | | | | 0.002 | | | | 0.000 |
| | | | | (0.003) | | | | (0.002) |
| Natural resources intensity × Natural resources | | | | 0.001 | | | | 0.001$^{+}$ |
| | | | | (0.001) | | | | (0.000) |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hansen J test (p-value) | – | – | – | – | 0.447 | 0.445 | 0.407 | 0.830 |
| Observations | 1641 | 1641 | 1641 | 1101 | 1641 | 1641 | 1641 | 1101 |
| Countries | 62 | 62 | 62 | 41 | 62 | 62 | 62 | 41 |

TABLE W.1 (continued)

| | OLS | | | | IV | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **B. Dependent variable:** industry size in the manufacturing sector | | | | | | | | |
| **Redeployability × Debt enforcement** | **−0.239*** | **−0.297**** | **−0.235*** | **−0.269*** | **−0.396**** | **−0.339**** | **−0.421**** | **−0.384**** |
| | **(0.106)** | **(0.098)** | **(0.102)** | **(0.110)** | **(0.148)** | **(0.108)** | **(0.081)** | **(0.070)** |
| Tangibility × Debt enforcement | | −0.146* | | −0.139+ | | −0.147* | | −0.173** |
| | | (0.064) | | (0.079) | | (0.069) | | (0.060) |
| Depreciation × Debt enforcement | | | 0.012** | 0.013** | | | 0.020** | 0.019** |
| | | | (0.004) | (0.004) | | | (0.003) | (0.003) |
| Obsolescence × Debt enforcement | | | 0.030* | 0.016 | | | 0.032** | 0.022** |
| | | | (0.013) | (0.012) | | | (0.011) | (0.006) |
| Capital intensity × Capital | | | | 0.020 | | | | 0.037 |
| | | | | (0.068) | | | | (0.047) |
| Skill intensity × Skill | | | | 0.011 | | | | 0.012 |
| | | | | (0.016) | | | | (0.010) |
| Natural resources intensity × Natural resources | | | | 0.005 | | | | 0.005* |
| | | | | (0.004) | | | | (0.002) |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hansen J test (p-value) | – | – | – | – | 0.414 | 0.440 | 0.512 | 0.887 |
| Observations | 1641 | 1641 | 1641 | 1101 | 1641 | 1641 | 1641 | 1101 |
| Countries | 62 | 62 | 62 | 41 | 62 | 62 | 62 | 41 |

TABLE W.2

ROBUSTNESS TESTS RELATED TO THE REDEPLOYABILITY MEASURE

All regressions include both country and industry fixed effects and a constant (coefficient estimates not reported) and are estimated by GMM with *Debt enforcement* instrumented by the legal origin of a country's bankruptcy laws. The dependent variable is the average share of each 3-digit ISIC industry's real value added to each country's GDP over the period 1981-2000. The main variable of interest *Redeployability* × *Debt enforcement* denotes the product of these two variables. In column 1, *Redeployability* is instrumented with the index of *Redeployability* calculated using data from 1971-1980. In column 2, data on capital expenditures of service industries are excluded for the computation of $Redeployability_a$, whereas in column 3 only data on capital expenditures of manufacturing industries are used to compute $Redeployability_a$. An alternative concordance between ISIC and BEA classifications is used in column 4 (see Appendix). In column 5, industries are defined according to the BEA classification. Standard determinants of comparative advantage as in Table W.1 are included as additional controls. Standard errors clustered two-way by industry and country (columns 2 to 5, Panel B) or by country (Panel A and column 1, Panel B) are reported in parentheses. **: significant at 1% level. *: signficant at 5% level. $^{+}$: signficant at 10% level.

| | IV | Without Services | Only Manufacturing | Alternative Concordance | BEA Code |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Dependent variable:** industry value added to GDP | | | | | |
| **Redeployability × Debt enforcement** | **−0.075**** | **−0.341**** | **−0.255**** | **−0.107**** | **−0.130**** |
| | **(0.015)** | **(0.073)** | **(0.057)** | **(0.018)** | **(0.026)** |
| Determinants of comparative advantage | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes |
| Hansen J test (p-value) | 0.717 | 0.563 | 0.617 | 0.956 | 0.817 |
| Observations | 1101 | 1101 | 1101 | 1101 | 675 |
| Countries | 41 | 41 | 41 | 41 | 41 |

TABLE W.3

TESTING ALTERNATIVE EXPLANATIONS

All regressions include both country and industry fixed effects and a constant (coefficient estimates not reported) and are estimated by GMM with *Debt enforcement* instrumented by the legal origin of a country's bankruptcy laws. The dependent variable is the average share of each 3-digit ISIC industry's real value added to each country's GDP over the period 1981-2000. The main variable of interest *Redeployability* × *Debt enforcement* is defined as in Table IV. Each interaction term is the product of the corresponding two variables. The industry-specific variables, which are built using U.S. data, are the following: (i) *Product complexity* is the Herfindhal index of intermediate input use from Cowan and Neut (2007); (ii) *R&D intensity* is the ratio of R&D expenditures over capital expenditures; (iii) *External finance dependence* is the median ratio of capital expenditures minus cash-flows from operations to capital expenditures; (iv) *Industry dummy* is a dummy variable for each 3-digit ISIC industry; (v) *Contract intensity* reports the industry share of intermediate inputs that cannot be bought on organized exchanges and are not reference-priced; (vi) *Benchmark economic activity* averaged over the period 1980-2000 measures the industry value added to GDP in United States. The country-specific variables are the following: (a) *Rule of law* measures the extent to which agents have confidence in and abide by the rules of society in 1996; (b) *Human capital* is log of the mean average years of schooling over the period 1981-2000; (c) *Financial development* is the average ratio of private credit by deposit money bank and other financial institutions to GDP in each country between 1981-2000; (d) *GDP per worker* is the log of the mean of real GDP per worker over the period 1981-2000; (e) *Initial GDP per capita* is the log of real GDP per capita in 1980. Standard determinants of comparative advantage as in Table W.1 are included as additional controls. Standard errors clustered by country are reported in parentheses. **: significant at 1% level. *: signficant at 5% level. $^{+}$: signficant at 10% level.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Dependent variable:** industry value added to GDP | | | | | | | | |
| **Redeployability × Debt enforcement** | **−0.037*** | **−0.076**** | **−0.065**** | **−0.059*** | **−0.070**** | **−0.058*** | **−0.044**** | **−0.059**** |
| | **(0.017)** | **(0.015)** | **(0.014)** | **(0.029)** | **(0.012)** | **(0.028)** | **(0.014)** | **(0.015)** |
| Product complexity × Rule of Law | 0.009** | | | | | | | |
| | (0.002) | | | | | | | |
| R&D intensity × Human capital | | 0.004* | | | | | | |
| | | (0.002) | | | | | | |
| External finance dependence × Financial development | | | 0.010** | | | | | |
| | | | (0.001) | | | | | |
| Industry dummy × GDP per worker | | | | – | | | | |
| | | | | – | | | | |
| Contract intensity × Rule of law | | | | | 0.010** | | | |
| | | | | | (0.002) | | | |
| Redeployability × Initial GDP per capita | | | | | | −0.011 | | |
| | | | | | | (0.008) | | |
| Benchmark allocation × Financial development | | | | | | | 0.692** | |
| | | | | | | | (0.140) | |
| Benchmark allocation × Initial GDP per capita | | | | | | | | 0.218** |
| | | | | | | | | (0.044) |
| Determinants of comparative advantage | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hansen J test (p-value) | 0.574 | 0.865 | 0.869 | 0.818 | 0.505 | 0.803 | 0.432 | 0.870 |
| Observations | 1101 | 1101 | 1101 | 1101 | 1101 | 1101 | 1101 | 1101 |
| Countries | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |

TABLE W.4

ADDITIONAL ROBUSTNESS TESTS

All regressions include both country and industry fixed effects and a constant (coefficient estimates not reported) and are estimated by GMM with *Debt enforcement* instrumented by the legal origin of a country's bankruptcy laws (except in Column 8 where the log of European settler mortality from Acemoglu, Johnson, and Robinson (2001) is used as an instrument). The dependent variable is the following: (i) Columns 1 to 5, and 9 to 11: the share of real value added of each 3-digit ISIC industry to GDP of each country; (ii) Columns 6 to 8: the share of real investment, output, and exports of each 3-digit ISIC industry to total investment, output and exports resp. in the manufacturing sector of each country. Each dependent variable is averaged over the following period: (a) 1981-2000 (Columns 1 to 9); (b) 1981-1990 (Column 10); (c) 1991-2000 (Column 11). *Redeployability* defined by expression (**??**) in the text is the redeployability of real assets owned by each 3-digit ISIC U.S. industry over the specified time period. *Debt enforcement* is a time-invarying country-specific variable and denotes the following: (i) the recovery rate for secured creditors (constructed by Djankov, Hart, McLiesh, and Shleifer (2008), Column 1, and by World Bank (2008), Column 2); (ii) the efficiency of the judicial system in the collection of an overdue debt measured by $(1500 - Time)/1500$ in Column 3, $(60 - Procedures)/60)$ in Column 4 and $(6 - \ln(Costs))/6$ in Column 5 (data from World Bank (2004) on time, the number of procedures and the official costs to recover debt through courts); (iii) the efficiency of debt enforcement procedures (constructed by Djankov, Hart, McLiesh, and Shleifer (2008), Columns 6 to 11). Standard determinants of comparative advantage as in Table W.1 are included as additional controls. Standard errors clustered two-way by industry and country or only by country (columns 1, 10 and 11) are reported in parentheses. **: significant at 1% level. *: signficant at 5% level. $^{+}$: signficant at 10% level.

| | Measure of debt enforcement | | | | | Dependent variable | | | Instrument | Time period | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Recovery Djankov | Recovery WB | Time | Procedures | Costs | Investment | Output | Exports | Settler mortality | 1980s | 1990s |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| **Redeployability × Debt enforcement** | **−0.065**** | **−0.084**** | **−0.143$^{+}$** | **−0.110*** | **−0.171*** | **−0.296$^{+}$** | **−0.366*** | **−0.457**** | **−0.105*** | **−0.070**** | **−0.096**** |
| | **(0.010)** | **(0.030)** | **(0.085)** | **(0.051)** | **(0.075)** | **(0.169)** | **(0.145)** | **(0.172)** | **(0.043)** | **(0.013)** | **(0.016)** |
| Determinants of comparative advantage | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hansen J test (p-value) | 0.879 | 0.337 | 0.555 | 0.426 | 0.386 | 0.525 | 0.538 | 0.408 | - | 0.745 | 0.786 |
| Observations | 1101 | 1373 | 1101 | 1101 | 1101 | 1028 | 1101 | 1108 | 681 | 1094 | 1044 |
| Countries | 41 | 52 | 41 | 41 | 41 | 38 | 41 | 41 | 25 | 41 | 40 |