RED TAPE AND DELAYED ENTRY

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Abstract
Does cutting red tape foster entrepreneurship in industries with the potential to expand? We address this question by combining the time needed to comply with government entry procedures in 45 countries with industry-level data on employment growth and growth in the number of establishments during the 1980s. Our main empirical finding is that countries where it takes less time to register new businesses have seen more entry in industries that experienced expansionary global demand and technology shifts. Our estimates take into account that proxying global industry shifts using data from only one country—or group of countries with similar entry regulations—will in general yield biased results.

1. Introduction

Eliminating needlessly time-consuming government procedures ("red tape") to start up new businesses is high on policy agendas. One reason is that cutting the time needed to comply with government regulations is expected to foster the necessary entrepreneurship in industries with the potential to expand. It is therefore interesting to ask whether countries where new businesses can be registered more quickly have seen more entry in industries that experienced expansionary global demand and technology shifts. We address this question by combining data on the time needed to comply with government entry procedures in 45 countries with industry-level data on employment growth and growth in the number of establishments during the 1980s.

Our empirical approach is based on the multi-industry world-equilibrium model of Ciccone and Papaioannou (2007). In the simplified version we present here, country industries are subject to anticipated country specific as well as global

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demand and technology shifts. Because of demand for variety ("love for variety"), industry employment growth is accompanied by growth in product variety in the free-entry equilibrium. Time-consuming government procedures slow down the emergence of new varieties relative to the free-entry equilibrium. The model implies that countries where it takes longer to deal with government procedures see slower variety growth in industries with free-entry employment growth due to global supply and demand shifts.

To test this model implication we need proxies for (i) cross-country differences in the time needed to comply with government procedures when introducing a new variety; (ii) cross-country cross-industry variety growth; and (iii) cross-industry free-entry employment growth due to global technology and demand shifts. Our main proxy for country-level administrative delay is the time to obtain legal status to operate a firm from Djankov et al. (2002). Country-industry variety growth will be proxied by the growth rate of establishments from the UNIDO.

Our first proxy of free-entry industry employment growth due to global technology and demand shifts is US industry employment growth. This is a natural starting point as the US economy gets closest to the frictionless free-entry scenario, at least among countries with high-quality industry statistics. Still, Ciccone and Papaioannou (2007) show that using only this US-based proxy for global industry shifts will in general lead to biased results. This is because US industry employment shifts reflect global as well as US-industry shifts, which introduces measurement error into the empirical analysis. If measurement error reflects only US idiosyncrasies, it will lead us to understate the negative effects of time-consuming government procedures on entry. But if US employment growth is a better proxy for technology and demand shifts in countries with short administrative delays than countries with long delays, measurement error could lead us to overstate the negative effects of administrative entry delay. These biases can be avoided by instrumenting the US-based proxy with a second proxy of industry shifts that does not reflect US trends or trends specific to countries with a certain level of administrative entry delays. We use an estimate of free-entry industry employment growth in a (hypothetical) country facing world-average demand and technology shifts. This estimate can be obtained as non-US world-average employment growth by industry controlling for employment growth (possibly) not reflecting global demand and technology shifts in countries with long administrative entry delays. The necessary cross-country industry employment data are available from UNIDO.

Our main empirical finding is that countries where legal status to operate firms can be obtained more quickly see significantly more entry in industries that experienced expansionary global demand and technology shifts. This remains the case when we allow entry in expanding industries to be related to labor market regulation, property rights protection, or economic development. The result continues to hold when we account for the effects of country-level financial development and investor protection on entry in finance-dependent industries emphasized in Rajan and Zingales (1998) and Perotti and Volpin (2004).

The recent construction of market regulation indicators for a broad cross-section of countries (e.g., Djankov et al. 2002, 2003; Botero et al. 2004) has made it possible to examine the effects of regulation on cross-country economic performance. Given our focus on the link between country-level entry regulation and industry-level entry, the two most closely related papers in this literature are the empirical studies of Fisman and Sarria-Allende (2004) and Klapper, Laeven, and Rajan (2006). Fisman and Sarria-Allende show that countries with more costly product market regulation see slower entry in industries with growth opportunities as proxied by US industry sales growth. Klapper, Laeven, and Rajan show that European countries with more costly entry regulations experience slower growth in the number of firms in industries with high entry in the US (they find similar results using the UK or the European average as a benchmark). Our work differs in two main respects. First, we combine two proxies of global industry-level demand and technology shifts to avoid the biases when using proxies from a particular country only.[1] Second, the theoretical framework underlying our empirical approach leads us to focus on the time delay—rather than the cost—associated with entry regulations.

2. Theory

The world consists of a continuum of open economies with mass N. Each economy is inhabited by households with preferences over differentiated goods produced in a continuum of industries with mass I. Across industries, preferences are $U_t = \int_0^I C_{it} di$, where C_{it} is consumption of industry-i composites at time t. Industry-i composites are made up of differentiated goods produced in different countries, $C_{it} = \left(\int_0^N B_{int} C_{int}^{(\sigma-1)/\sigma} dn\right)^{\sigma/(\sigma-1)}$, where C_{int} is consumption of the industry-i country-n composite, B_{int} is a preference shifter, and $\sigma > 0$ is the elasticity of substitution between composites produced in different countries. Country-industry composites are in turn made up of an (endogenous) measure of varieties V_{int}, $C_{int} = \left(\int_0^{V_{int}} c_{invt}^{(\varepsilon-1)/\varepsilon} dv\right)^{\varepsilon/(\varepsilon-1)}$, where c_{invt} denotes consumption of variety v in country-industry n, i and $\varepsilon > 1$ is the elasticity of substitution between varieties of the same country. Labor is supplied inelastically and is immobile internationally.

1. Using cross-country averages does not avoid such biases because, if regulation matters, cross-country averages will tend to reflect industry demand and technology shifts faced by countries with less regulated markets.

Production of a quantity $z_{invt} \geq 0$ of any variety requires a quantity of labor l_{invt} equal to

$$l_{invt} = \frac{z_{invt}}{A_{int}} + f_{in}, \tag{1}$$

where $A_{int} > 0$ captures the efficiency of production and $f_{in} = f_i f_n$ is an overhead labor requirement that we allow to vary across countries (as captured by f_n) and industries (captured by f_i). Hence, technology differs across country-industries but is assumed to be the same for all varieties in a country-industry. To simplify further we also take the preference shifter and technology parameter to be the product of an industry-specific and a country-specific part,

$$A_{int} = A_{it} A_{nt} \quad \text{and} \quad B_{int} = B_{it} B_{nt}. \tag{2}$$

Demand. Households take prices as given and maximize utility subject to their budget constraints, $\int_0^N \int_0^I P_{int} C_{int}\, di dn \leq y$, where y is household income and $P_{int} = (\int_0^{V_{int}} p_{invt}^{1-\varepsilon} dv)^{1/(1-\varepsilon)}$ is the cost of purchasing one unit of the industry-i composite of country n. The resulting aggregate demand function for country industry n, i is

$$C_{int} = \frac{B_{int}^{\sigma} Y_t}{P_{it}} \left(\frac{P_{int}}{P_{it}} \right)^{-\sigma}, \tag{3}$$

where Y_t is world income and $P_{it} = (\int_0^N B_{int}^{1/\sigma} P_{int}^{1-\sigma} dn)^{1/(1-\sigma)}$ is the cost of purchasing one unit of the industry-i composite.

Symmetric equilibrium with free entry. Each variety is produced by a single firm that maximizes profits, taking prices of all other firms and the price of labor, w_{nt}, as given. Firms observe technology and preference parameters before they make their employment decisions (see Ciccone and Papaioannou (2007) for the case with unanticipated demand and technology shifts). Because firms face constant-elasticity demand functions, their profit-maximizing price consists of a constant markup over their marginal cost of production, $p_{invt} = (\varepsilon/(\varepsilon-1))(w_{nt}/A_{int})$.

A necessary and sufficient condition for all countries to produce in all industries is that demand for the typical variety is increasing in the price of the domestic competition in the same industry, which requires that $\varepsilon > \sigma$. In this case, the free-entry measures of varieties V_{int}^* and of free-entry employment L_{int}^* in each country industry satisfy

$$\varepsilon f_{in} V_{int}^* = L_{int}^* = \theta \left(\frac{A_{it}^{\sigma-1} B_{it}^{\sigma}}{P_{it}^{1-\sigma} f_i} \right)^{\frac{\varepsilon-1}{\varepsilon-\sigma}} \left(\frac{A_{nt}^{\sigma-1} B_{nt}^{\sigma} Y_t}{w_{nt}^{\sigma} f_n} \right)^{\frac{\varepsilon-1}{\varepsilon-\sigma}}, \tag{4}$$

where θ is an unimportant positive constant. Hence, free-entry equilibrium variety and employment growth depend on global industry-level technology and demand shifts (changes in A_{it} and B_{it}), global industry price movements (changes in P_{it}), as well as the country-level and global factors collected in the second square bracket (domestic wages, country-level demand and supply shocks, and global demand).

Time-consuming procedures and delayed entry. Consider economies that differ in the time needed to comply with government entry procedures ($TimePcd_n$) when they are faced with technology and demand shifts. A simple way of capturing the link between actual variety growth $\Delta \ln V_{in} = \ln V_{int} - \ln V_{int-1}$ and free-entry growth in these economies is

$$\Delta \ln V_{in} = (1 - \lambda TimePcd_n)\Delta \ln V_{in}^{*}, \qquad (5)$$

where asterisks ($*$) denote free-entry values. When $\lambda > 0$ time-consuming procedures slow down variety growth relative to the free-entry benchmark. When $\lambda = 0$, entry is unaffected by $TimePcd_n$.

Entry and global reallocation. In a free-entry equilibrium, variety growth equals employment growth, $\Delta \ln V_{in}^{*} = \Delta \ln L_{in}^{*} = \ln L_{int}^{*} - \ln L_{int-1}^{*}$ (see equation [4]). Because industry-employment growth has a global component (captured by the first term after θ in [4]), we can write country-industry variety growth in (5) as a function of global industry employment shifts $\Delta \ln L_i^{*}$,

$$\Delta \ln V_{in} = \delta_n + \delta_i - \lambda(TimePcd_n \Delta \ln L_i^{*}), \qquad (6)$$

where δ_n, δ_i capture country and industry effects. The parameter we are interested in estimating is λ, the effect of time-consuming procedures on the entry in globally expanding industries.

It is interesting to note that in our model it is administrative delay that matters for entry in expanding industries. Regulations that increase the overhead cost of production, for example, but do not cause delay, affect the free-entry measure of varieties but not entry in response to technology and demand shifts.

3. Data and Empirical Results

Data. Our cross-country industry data come from the UNIDO 3-IndStat database. The data cover 45 countries in a maximum of 28 manufacturing industries. We proxy variety growth ($\Delta \ln V_{in}$ in [6]) by annual log growth of establishments over the 1981–1990 period in industry i of country n ($ENTRY_{in}$). Our measures for administrative entry delay ($TimePcd_n$ in [6]) come from Djankov et al. (2002). They construct cross-country indicators for the time and the number of administrative procedures required to start up a new business. Our first proxy for global free-entry industry employment growth ($\Delta \ln L_i^*$ in [6]) is annual employment growth in the US during the 1980s, which we take from the NBER Manufacturing Industry Database. In addition, we use UNIDO cross-country industry employment data to estimate free-entry industry employment growth in a (hypothetical) country facing world-average demand and technology shifts. We explain subsequently how this estimate is obtained and how it can be used to avoid the biases when using only US industry data to proxy for global demand and technology shifts. Table 1 gives detailed variable definitions and sources. The Supplementary Appendix reports the industry-level and country-level values of all the variables.[2]

Benchmark estimates. Table 2 reports least squares effects of the log time to register new businesses ($TIME_n$) on entry using US industry employment growth ($EMPGR_i$) as a proxy for global industry employment shifts. In all models we control for country and industry effects. Moreover, we account for the initial industry composition by controlling for 1981 log employment and log number of establishments of industries, both of which are highly significant in all specifications[3] (the literature sometimes uses size and sometimes number of establishments, see Rajan and Zingales (1998) and Perotti and Volpin (2004) respectively; we show in supplementary appendix Table 3 that results are robust to dropping these controls).

The results in column (1) show a highly significant negative effect of the $TIME_n \times EMPGR_i$ interaction on country-industry establishment growth. Hence, countries where it takes longer to register new businesses see slower entry in expanding industries. The least squares coefficient (−0.167) implies an annual growth differential of approximately 0.385–0.40% between an industry with $EMPGR_i$ around the 75th percentile and an industry around the 25th percentile if they operate in Italy (62 days to incorporate a new business; close to the 75th percentile of *TIME*), rather than Finland (24 days to incorporate a new business; the country at 25th percentile of *TIME*). To put this into perspective, median annual establishment growth in our sample is 1.05%.

Is this result driven by the time to register new businesses standing in for other types of regulation, such as labor market regulation? We address this issue in column (2) where we augment the specification in (1) by an interaction between $EMPGR_i$ and an employment protection index from Botero et al. (2004) (LMR_n; see Table 1 for details). It can be seen that the time to register new businesses

2. Available at www.crei.cat/people/ciccone/papers.htm and at www.mitpressjournals.org.

3. The initial number of establishments enters negatively whereas initial employment enters positively. Hence, entry is larger when industries start out with large establishments. The negative effect of the initial number of establishments may capture that measurement error in the 1981 establishment statistics is greater than in 1990.

TABLE 1. Variable definitions and sources.

Variable	Definition
	Panel A: Country-Industry Level
Entry [$ENTRY_{in}$]	Average annual change of log number of establishments in industry i in country n over the 1981–1990 period. We use all countries with data on entry regulation, but we exclude countries with less than 10 industry observations and country-industries with less than 5 observations. *Source: United Nations Industrial Development Organization (UNIDO) Statistics (2005).*
Establishments [$ESTABL_{in}$]	Log number of establishments in industry i in country n in the initial year (1981). *Source: United Nations Industrial Development Organization (UNIDO) Statistics (2005).*
Employment Size [$SIZE_{in}$]	Log employment in industry i in country n in the starting year (1981). *Source: United Nations Industrial Development Organization (UNIDO) Statistics (2005).*
	Panel B: Industry Level
Employment Reallocation [$EMPGR_i$]	Annual change of log employment in industry i in the US over the 1980–1989 period. *Original source: NBER Manufacturing Database (Bartelsman and Gray 1996).*
Estimated World-Average Industry Employment Shifts [$G\text{-}EMPGR_i$]	Estimated industry employment shifts at the US level of entry regulation. These estimates are obtained in two steps: – Step 1: Regress industry-country employment growth for all countries except the US on country dummies, industry dummies, and industry dummies interacted with country-level entry regulation. – Step 2: Obtain $G\text{-}EMPGR_i$ as predicted industry employment growth for a country with the US level of entry regulation. See the main text for details. *Source: United Nations Industrial Development Organization (UNIDO) Statistics (2005) and Djankov et al. (2002).*
External-Finance Dependence [$EXTFIN_i$]	Industry dependence on external finance. The median of the ratio of capital expenditure minus cash flow to capital expenditure for US firms averaged over the 1980–1989 period. *Source: Klingebiel, Kroszner, and Laeven (forthcoming). Original source: COMPUSTAT.*
Sales Growth [$SALESGR_i$]	Annual change of log shipments in industry i in the US over the 1980–1989 period. *Original Source: NBER Manufacturing Database (Bartelsman and Gray 1996).*
	Panel C: Country Level
Time-Consuming Government Entry Procedures [$TimePcd_n$]	1. *TIME*: Natural logarithm of the number of days required to obtain legal status to operate a firm in 1999. 2. *PROCED*: Natural logarithm of the number of different procedures that a start-up business has to comply with to obtain a legal status in 1999.

(*Continued*)

TABLE 1. CONTINUED

Variable	Definition
	3. *STEPS*: Natural logarithm of the number of different steps that a start-up has to comply with in order to obtain a registration certificate that is not associated with safety and health issues, the environment, taxes, or labor in 1999. *Source: Djankov et al. (2002).*
Entry Cost [$EntCost_n$]	1. *COST*: Direct cost of obtaining legal status to operate a firm as a share of GDP p.c. in 1999. 2. *TIMECOST*: Direct cost plus the monetized value of entrepreneur's time of obtaining legal status to operate a firm as a share of GDP p.c. in 1999. *Source: Djankov et al. (2002).*
Labor Market Regulation [LMR_n]	Employment protection index based on the existence of alternative employment contracts, the cost of increasing hours, the cost of firing, and the formality of dismissal procedures. *Source: Botero et al.(2004).*
Financial Development [FD_n]	Log of average domestic credit to the private sector relative to GDP in the 1980s. *Source: World Bank World Development Indicator's Database (2005).*
Income/GDP [Y_n]	Log of real per capita GDP in 1980. *Source: Penn World Tables 5.6 Edition.*
Law Ineffectiveness [$LAWINEF_n$]	Legal system ineffectiveness index, based on the number of calendar days to resolve a payment dispute through courts (unpaid debt worth 50% of the GDP per capita). *Source: Djankov, McLiesh, and Shleifer (forthcoming).*
Legal Origin [$LEGOR_n$]	A set of dummy variables that identifies the legal origin of the Commercial Code. *Source: La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999).*

Note: Table 1 reports variable definitions and sources. The first column reports the variable name and the abbreviation; the second column reports definition and sources. Supplementary Appendix Table 1 reports the values of the industry-level variables for each of the 28 manufacturing industries. Supplementary Appendix Table 2 reports the values of the country-level variables for each of the 45 countries.

remains highly significant, whereas LMR does not appear to play a role for establishment growth.

Maybe the time to register new businesses affects entry in industries with the potential to expand because inter-industry reallocation is slower in countries with poor property rights enforcement? To check on this, we augment the specification in (1) by an interaction between $EMPGR_i$ and an index of the ineffectiveness of property rights enforcement by courts from Djankov et al. (forthcoming) ($LAWINEF_n$, which measures the time it takes to resolve a payment dispute in court; see Table 1 for details). The results in column (3) show that the time to register new businesses remains a negative and significant determinant of entry, while property rights enforcement does not appear to matter for entry in industries with the potential to expand.

Does administrative entry delay matter simply because it captures the level of economic development? The specification in column (4) addresses this point by

TABLE 2. Time-consuming procedures, employment reallocation, and entry; OLS estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TimePcd × Employment Reallocation	−0.1679	−0.1859	−0.1406	−0.1491	−0.1507	−0.1344	−0.3138
[*TIME* × *EMPGR*]	(*3.93*)	(*3.75*)	(*3.20*)	(*2.75*)	(*3.40*)	(*3.09*)	(*3.09*)
LMR × Employment Reallocation		0.3417					
[*LMR* × *EMPGR*]		(*0.88*)					
Legal Inefficiency × Employment Reallocation			−0.0845				
[*WINEF* × *EMPGR*]			(*1.42*)				
Income/GDP × Employment Reallocation				0.0438			
[*Y* × *EMPGR*]				(*0.54*)			
Financial Development × External Finance Dependence					0.0153		
[*FD* × *EXTFIN*]					(*3.12*)		
Legal Inefficiency × External Finance Dependence						−0.0133	
[*LAWINEF* × *EXTFIN*]						(*2.71*)	
TimePcd × Sales Growth							0.1564
[*TIME* × *SALESGR*]							(*1.60*)
Initial Log Number of Establishments	−0.0356	−0.0357	−0.0356	−0.0356	−0.0361	−0.0356	−0.0360
[*ESTABL*]	(*5.94*)	(*5.95*)	(*5.94*)	(*5.94*)	(*5.79*)	(*5.95*)	(*5.99*)
Initial Log Employment	0.0223	0.0224	0.0222	0.0222	0.0212	0.0219	0.0225
[*SIZE*]	(*5.20*)	(*5.22*)	(*5.17*)	(*5.16*)	(*4.81*)	(*5.09*)	(*5.26*)
adjusted R-squared	0.569	0.569	0.569	0.569	0.574	0.571	0.570
Observations	1162	1162	1162	1162	1162	1162	1162
Countries	45	45	45	45	43	45	45
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the annual log change in the number of establishments at the industry-country level for the period 1981–1990 (*ENTRY*). Table 1 gives detailed variable definitions and data sources. Absolute values of t-statistics based on robust standard errors are reported in parenthesis below the coefficients.

interacting $EMPGR_i$ with both $TIME_n$ and log GDP per capita (Y_n). The time-to-register-new-businesses interaction is again negative and significant, while there is no evidence that more developed countries see faster establishment growth in industries facing expansionary demand and technology shifts.

Rajan and Zingales (1998) show that industries with greater external-finance dependence ($EXTFIN_i$; see Table 1) see lower rates of entry in financially underdeveloped countries. To take this into account we extend the specification in (1) by an interaction between industry external-finance dependence and country-level financial development (FD_n, which measures private credit relative to GDP; see Table 1 for details). Column (5) shows that adding financial development to the specification changes the coefficient and significance level of the time-to-register-new-businesses interaction by little. It can also be seen that financial development raises entry in external-finance dependent industries.

Perotti and Volpin (2004) find that external-finance-dependent industries see slower entry in countries with bad property rights enforcement. In column (6), we therefore augment the specification in (1) by a $LAWINEF_n \times EXTFIN_i$ interaction. The time-to-register-new-businesses interaction continues to enter negatively and significantly. The results also show that bad property rights enforcement lowers entry in external-finance dependent industries.

Fisman and Sarria-Allende (2004) argue that product market regulation lowers entry in industries with growth opportunities, which they proxy by US sales growth. In column (7), we include an interaction of the time to register new businesses with both $EMPGR_i$ and sales growth ($SALESGR_i$; see Table 1) and find that the employment-growth interaction dominates the sales-growth interaction. One explanation for this finding is that employment growth is a better measure of the industry shifts that trigger the entry of new varieties than sales growth. This would be the case if prices adjust more quickly than employment and firms are sometimes faced with unexpected, short-lived productivity and demand shocks.

Sensitivity. In supplementary appendix Table 4, we show that results are similar when we use estimation approaches that are less sensitive to so-called influential observations ("outliers") than ordinary least squares (the results in the supplementary appendix are obtained using robust regressions, which assign lower weight to influential observations; least absolute deviation estimation yields the same findings).[4]

We also find similar results when we measure $TimePcd_n$ as the log number of different procedures a new firm has to comply with to obtain legal status

4. The UNIDO establishment growth data contain some implausible values. Other country-industry studies therefore cut off observations in the tails of the distribution.

($PROCED_n$) or by the log number of procedures with the exception of regulations related to safety, health and environmental issues, taxes, or labor affairs ($STEPS_n$). Moreover, expressing these variables in levels rather than in logs yields equivalent results. Results are sensitive to the exact specification when we use the cost—instead of the time delay—to obtain legal status as a share of per capita GDP (also available from Djankov et al. 2002). The cost share yields insignificant estimates, but expressing the variable in logs yields results similar to Table 1.

Accounting for measurement error due to US technology and demand shifts. So far we have ignored that US industry employment growth reflects global as well as US technology and demand shifts. Taking this into account is important because it results in US employment growth reflecting global industry demand and productivity shifts with error. Such measurement error may lead to biased estimates of the effect of administrative delay on entry in industries that faced expansionary global demand and technology shifts (Ciccone and Papaioannou 2007). The bias will be downward if measurement error mostly reflects demand and technology shifts that are idiosyncratic to the US. But in principle the bias could also be upward. Consider the case where demand and technology shifts are more similar between countries with short administrative entry delays (like the US) than countries with long delays. In this case, US industry employment growth will be more closely related to industry entry patterns in countries with short delays, even if administrative delay is actually irrelevant for entry. Hence, proxying global industry demand and technology shifts by US employment growth may lead us to mistakenly conclude that administrative delay matters for entry.

Consistent estimation of the effect of administrative delay on entry in industries with the potential to expand requires a measure of industry demand and technology shifts that does not reflect US trends or trends specific to countries with a certain level of administrative entry delay. One such measure is free-entry industry employment growth in a (hypothetical) country facing world-average demand and technology shifts. Ciccone and Papaioannou (2007) show that these industry employment growth rates can be estimated in two steps. First, obtain the least squares prediction for annual country-industry employment growth for the 1980s ($P\text{-}EMPGR_{in}$) based on industry effects and country-level growth determinants as $P\text{-}EMPGR_{in} = \hat{\gamma}_n + \hat{\gamma}_i + \hat{\delta}_i TIME_n + \hat{\beta} \ln EMP_{in1980}$, where $\hat{\gamma}_n$ is the estimated country effect; $\hat{\gamma}_i$ the estimated industry effect; $\hat{\delta}_i$ the estimated marginal effect of the time to register new businesses on employment growth in industry i; and $\hat{\beta} \ln EMP_{in}$ controls for the effect of the initial industry composition (dropping this term does not affect results). No US data are used in estimation to ensure that these predictions do not reflect US industry trends. Second, predict industry employment growth rates for US values of $TIME_n$ as $G\text{-}EMPGR_i = P\text{-}EMPGR_{iUS} = \hat{\gamma}_i + \hat{\delta}_i TIME_{US} + \hat{\beta} \ln EMP_{iUS1980}$.

As no US data are used in the estimation of $\hat{\gamma}_i$ and $\hat{\delta}_i$, $G\text{-}EMPGR_i$ reflects free-entry employment growth in a (hypothetical) country experiencing the world-average non-US demand and technology shifts. One can therefore estimate the effect of entry delay on entry in industries facing expansionary global demand and technology shifts by using a two-stage least squares approach with $G\text{-}EMPGR_i$ as an instrument for $EMPGR_i$.[5] (This two-stage approach is preferable to measuring global industry shifts using only $G\text{-}EMPGR_i$ as these estimates contain sampling error.)

Table 3, column (1) reports our (two-stage least squares) estimate of the effect of the time to register new businesses on entry in expanding industries when using $TIME_n \times G\text{-}EMPGR_i$ as an instrument for $TIME_n \times EMPGR_i$. The coefficient is negative and significant and larger in absolute value than the estimate in column (1) of Table 1. Hence, this approach yields even stronger evidence that the time to register new businesses has a negative effect on entry in industries facing expansionary global demand and technology shifts.

In columns (2) to (4), we reestimate the specification in column (1) using the other entry regulation indicators of Djankov et al. (2002) instead of $TIME_n$. In column (2) we show that the results are robust to using the log of the number of different procedures (rather than the days required) that a new firm has to comply with to obtain a legal status ($PROCED_n$). In column (3) we show that results are very similar to column (2) when we use the log number of procedures with the exception of those procedures that are associated with safety, health and environmental issues, taxes, or labor affairs ($STEPS_n$). In columns (4) and (5), we find similar results when proxying entry regulation by the cost of obtaining legal status as a share of per capita GDP ($COST_n$ and $TIMECOST_n$; see Table 1).

In principle it is possible that the time to register new businesses, or the other measures of entry regulation of Djankov et al. (2002), responds to industry-level technology and demand shifts. Possible instruments for administrative entry delay come from Djankov et al. (2002) and Shleifer (2005). They argue that the legal system of countries is a historically predetermined variable with long-lasting effects on regulation policies. For example, they show that countries with a common law system regulate entry less than countries influenced by the French Commercial Code (they classify legal systems as belonging to five legal families: English Common Law; French Commercial Code; German Commercial Code; Scandinavian Commercial Code; and socialist/communist laws). In column (6) we therefore instrument both parts of the interaction between the time to register new businesses and employment growth. In particular, we use interactions between $G\text{-}EMPGR_i$ and indicator variables for the five legal families as

5. $G\text{-}EMPGR_i$ turns out to have a strong positive effect on $EMPGR_i$, as one would expect if US interindustry employment reallocation partly reflects global demand and technology shifts. The least squares coefficient is 0.89 and has a t-statistic greater than 6.

TABLE 3. Time-consuming procedures, employment reallocation, and entry; Instrumental variable (IV) estimates.

	Industry-level IV					"Double" (country-level & industry-level) IV				
IV method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TimePcd × Employment Reallocation	−0.2399					−0.3560				
[*TIME* × *EMPGR*]	*(3.58)*					*(2.50)*				
TimePcd × Employment Reallocation		−0.5245					−0.5615			
[*PROCED* × *EMPGR*]		*(3.56)*					*(2.54)*			
TimePcd × Employment Reallocation			−0.5492					−0.5919		
[*STEPS* × *EMPGR*]			*(3.57)*					*(2.79)*		
EntCost × Employment Reallocation				−1.5774					−1.3840	
[*COST* × *EMPGR*]				*(3.16)*					*(2.52)*	
EntCost × Employment Reallocation						−0.9588				−1.2822
[*TIMECOST* × *EMPGR*]						*(3.42)*				*(3.18)*
Initial Log Number of Establishments	−0.0358	−0.0362	−0.0361	−0.0346	−0.0350	−0.0361	−0.0362	−0.0362	−0.0347	−0.0350
[*ESTABL*]	*(5.96)*	*(6.01)*	*(6.00)*	*(5.69)*	*(5.80)*	*(5.99)*	*(6.00)*	*(5.99)*	*(5.71)*	*(5.77)*
Initial Log Employment	0.0221	0.0219	0.0219	0.0205	0.0210	0.0218	0.0219	0.0218	0.0207	0.0204
[*SIZE*]	*(5.17)*	*(5.13)*	*(5.12)*	*(4.43)*	*(4.75)*	*(5.08)*	*(5.10)*	*(5.09)*	*(4.56)*	*(4.48)*
adjusted R-squared	0.596	0.596	0.597	0.482	0.549	0.593	0.596	0.596	0.507	0.516
Observations	1162	1162	1162	1162	1162	1162	1162	1162	1162	1162
Countries	45	45	45	45	45	45	45	45	45	45
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the annual log change in the number of establishments at the industry-country level for the period 1981–1990 (*ENTRY*). Table 1 gives detailed variable definitions and data sources. All models report instrumental variable coefficients. In columns (1)–(5) [Industry-level IV models] the TimePcd × EMPGR and the EntCost × EMPGR interactions are instrumented by, respectively, TimePcd × G-EMPGR and EntCost × G-EMPGR. In columns (6)–(10) [Double (country-level and industry-level) IV models] we instrument TimePcd × EMPGR and EntCost × EMPGR by interactions of legal origin dummy variables (LEGOR) with G-EMPGR. Absolute values of t-statistics based on robust standard errors are reported in parenthesis below the coefficients.

instruments for $TIME_n \times EMPGR_i$. Note that although the estimate is now larger in absolute value than in column (1), it is also noisier. Still, the interaction continues to be significantly negative at the 1% level. In columns (7) to (10), we find analogous results using the other measures of administrative time delay or entry cost of Djankov et al. (2002). In supplementary appendix Table 5, we show that reestimating columns (1) to (10) without the (highly significant) country-industry controls for size and number of establishments leads to weaker results.

4. Conclusion

How does entry respond to global industry demand and technology shifts when countries differ in the amount of red tape new businesses have to deal with? The multi-industry world-equilibrium model of Ciccone and Papaioannou (2007) predicts slower adjustment in countries with time-consuming entry procedures. Empirically, we find that countries where it takes more time to register new businesses saw slower establishment growth in industries that experienced expansionary global demand and technology shifts. Our estimates take into account that proxying global industry demand and technology shifts using data from only one country—or group of countries with similar entry regulations—will in general yield biased results.

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