Entry Regulation and Intersectoral Reallocation

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Abstract

We study how restrictions on firm entry affect intersectoral factor reallocation when open economies experience global economic shocks. In our theoretical framework, countries trade freely in a range of differentiated sectors that are subject to country-specific and global shocks. Entry restrictions are modeled as an upper bound on the introduction of new differentiated goods following shocks. Prices and quantities adjust to clear international goods markets, and wages adjust to clear national labor markets. We show that in general equilibrium, countries with tighter entry restrictions see less factor reallocation compared to the frictionless benchmark. In our empirical work, we compare sectoral employment reallocation across countries in the 1980s and 1990s with proxies for frictionless benchmark reallocation. Our results indicate that the gap between actual and frictionless reallocation is greater in countries where it takes longer to start a firm.

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1 Introduction

In some countries it takes more than half a year to incorporate quite standard businesses (e.g. Djankov *et al.*, 2002). Additional administrative requirements to register land, build and operate factories, purchase equipment, and obtain sector-specific licenses can lead to it often taking several years to obtain the permits necessary to start production (e.g. De Soto, 1989; World Bank, 2007). We study how such entry delays affect intersectoral factor reallocation in open economies that experience global economic shocks. Our theoretical framework is a multi-sector world equilibrium model where countries restrict entry of new product varieties to different degrees. We show that in general equilibrium, tighter entry restrictions reduce factor reallocation compared to the frictionless benchmark. In our empirical work, we compare sectoral employment reallocation across countries in the 1980s and 1990s with proxies for frictionless benchmark reallocation in response to global shocks and find larger gaps in countries where it takes longer to start a firm.

In our theoretical model, consumers value variety and production is subject to increasing returns. Countries trade freely in many differentiated sectors that are subject to country-specific and global shocks. Entry restrictions are modeled as an upper bound on the introduction of new differentiated goods (varieties) following economic shocks. Prices and quantities adjust to clear international markets for each variety, and wages adjust to clear national labor markets. We find that in equilibrium, economies with looser entry restrictions respond to economic shocks with employment contractions in more sectors; moreover, employment cuts in contracting sectors are also deeper. To put it differently, economies with tighter entry restrictions experience contractions that are more limited in sectoral breadth and also shallower. This is because entry restrictions lead to sectors expanding by increasing the supply of existing varieties (at the intensive margin). When consumers value variety, demand is less elastic at the intensive than the extensive margin. Countries restricting entry will therefore experience a relative fall in factor prices in general equilibrium. It is this fall in the cost of production factors that ends up limiting the sectoral breadth and the magnitude of employment contractions compared to the frictionless benchmark.

A testable model implication is that, in response to global shocks, economies with tighter entry restrictions should see less employment reallocation relative to the frictionless benchmark. Conceptually, the frictionless benchmark is given by sectoral factor reallocation in economies with no entry restrictions that are subject to global shocks only. Our measure of entry restrictions is the Djankov *et al.* (2002) index of the time needed to start a firm.

The implicit assumption is that in countries where it takes longer to start a business, fewer new varieties will get the necessary production permits during the period following economic shocks. When we compare actual sectoral employment reallocation with proxies for frictionless reallocation in response to the global shocks of the 1980s and the 1990s, we find greater gaps in countries with longer administrative entry delays. This continues to be the case when we take into account that firm entry, and hence employment growth, may also be affected by financial development and labor market regulation.[1] Our empirical evidence therefore supports the view that entry restrictions reduce efficient factor reallocation in response to economic shocks.

Existing theoretical work shows that administrative start-up costs reduce income by blocking technology adoption (e.g. Parente and Prescott, 1994, 2000); slowing down technological renovation (e.g. Hopenhayn, 1992); reducing product variety (e.g. Dixit and Stiglitz, 1977); disincentivating entrepreneurship and reducing employment rates (e.g. Fonseca, Lopez-Garcia, and Pissarides, 2001); and sustaining market power (e.g. Stigler, 1971). We argue that entry restrictions can also reduce income by delaying resource reallocation in changing economic environments. Our focus is therefore on the interaction between entry restrictions and economic shocks. This focus also distinguishes our empirical work from cross-country and cross-region studies analyzing the effects of entry regulation on income and other indicators of economic performance (for surveys see Geroski, 1995, and Schiantarelli, 2005; for recent cross-country contributions see Alesina *et al.*, 2005; Conway *et al.*, 2005; Djankov, McLiesh, and Ramalho, 2006; and Ardagna and Lusardi, 2008; Kaplan *et al.* 2006; Bruhn, 2007; and Yakovlev and Zhuravskaya, 2007, present recent cross-region evidence[2]). Our work is also related to Krueger and Pischke (1998), Blanchard (2000), and Blanchard and Wolfers (2000) who stress the interplay between economic shocks and (labor and product) market institutions as an explanation of cross-country differences in unemployment.

The remainder of the paper is structured as follows. In Section 2, we build a world equilibrium model that links entry restrictions and sectoral reallocation in response to (partly global) economic shocks. Section 3 presents our econometric framework, discusses the data, and presents our empirical results. Section 4 concludes.

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[1]The empirical link between financial development, labor market regulation, or entry restriction and growth in the number of establishments is discussed in, for example, Rajan and Zingales (1998); Fisman and Sarria-Allende, (2004); Desai, Gompers, and Lerner (2003); Klapper, Laeven, and Rajan (2006); Aghion, Fally, and Scarpetta (2007); and Ciccone and Papaioannou (2007). See Hopenhayn and Rogerson (1993) and Alvarez and Veracierto (2001) on the theoretical link between labor market regulation and firm entry in general equilibrium, and King and Levine (1993) on the theory linking financial development and entry.

[2]For parallel cross-region work on labor regulation see Holmes (1998) and Besley and Burgess (2004); Aghion *et al.* (2008) examine interaction effects between labor and entry regulation.

2   Model

We study how entry restrictions affect intersectoral factor reallocation when open economies experience sectoral shocks. Our starting point is a multi-sector world equilibrium model where consumers love variety and production is subject to increasing returns. We then ask how sectoral factor allocation adjusts when countries differ in the extent they restrict entry following economic shocks. Our focus is therefore on the interaction between entry restrictions and global economic shocks in open economies. We consider both the case where countries restrict entry of new varieties in each sector and the case where restrictions only affect total entry in each economy.

2.1   Model Setup

The world we consider contains a continuum of countries and sectors, each with mass 1. In each sector there is a continuum of freely tradable differentiated goods (varieties). The range of available varieties is endogenous.

All countries admit a representative consumer with utility function $\int_0^1 \ln Q_i di$ where Q_i is an index of consumption of sector-i varieties. Varieties are differentiated by country of origin. Let V_{ni} be the measure of sector-i varieties produced by country n. The measure of varieties available in the world is the union of the varieties supplied by each country $\int V_{ni} dG_i = V_i$ where G_i describes the distribution of V_i across countries. The sector-i consumption index takes the constant elasticity of substitution form $Q_i = \int_0^{V_i} q_{vi}^{(\varepsilon-1)/\varepsilon} dv$ where $\varepsilon > 1$ is the elasticity of substitution across varieties.

Production of a quantity q of a variety requires $z = q/A$ production workers plus one overhead labor. The efficiency of production A differs across countries and sectors, as well as across varieties in each country-sector. We assume that there is a continuum of firms in each country, each of which can produce exactly one variety. If country n produces a measure V_{ni} of goods in sector i, the efficiency of production in the marginal variety (the variety with the lowest production efficiency in the country-sector) is

$$(1) \qquad\qquad A_{Vni} = A_{ni} V_{ni}^{-\gamma} \quad \text{with} \quad 0 < \gamma(\varepsilon - 1) < 1.$$

The smaller γ, the less technological heterogeneity within country-sectors ($\gamma = 0$ is the

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limiting case without heterogeneity).[3] When $0 < \gamma(\varepsilon - 1) < 1$, technological heterogeneity within country-sectors ensures that each country produces at least a few varieties in each sector.[4] The equilibrium range of varieties produced will increase with A_{ni}, which is a summary measure of the overall efficiency of production in the country-sector.

The inverse demand function for each variety takes the constant-elasticity-of-substitution form,

$$(2) \qquad \frac{p_{vi}}{P_i} = q_{vi}^{-\frac{1}{\varepsilon}} \left(\frac{Y}{P_i}\right)^{\frac{1}{\varepsilon}}$$

where $P_i = \left(\int_0^{V_i} p_{vi}^{1-\varepsilon} dv\right)^{1/(1-\varepsilon)}$ is the (ideal) price index corresponding to the sector-i consumption index and Y is world income. Hence, the price p_{vi} of a particular variety decreases with the quantity sold q_{vi} and increases with prices charged by the competition P_i and world income Y.

The optimal pricing formula for firms in this environment is to charge a constant markup $\varepsilon/(\varepsilon - 1)$ over marginal production costs, $p_{vni} = (\varepsilon/(\varepsilon - 1))(w_n/A_{vni})$. Varieties which can be produced less efficiently (with low A) are therefore sold more expensively in equilibrium. From now on we will order varieties in a country-sector from highest to lowest efficiency. Combining (1) and (2) then yields that the demand for production workers z_{Vni} from the marginal variety V_{ni} in each country-sector is

$$(3) \qquad z_{Vni} = \delta_z w_n^{-\varepsilon} V_{ni}^{-(\varepsilon-1)\gamma} (A_{ni}P_i)^{\varepsilon-1} Y,$$

where δ_z is an unimportant constant. Demand for production workers is therefore decreasing in wages, and increasing in world income, the efficiency of the country-sector, and prices charged by the competition. Production worker demand is higher for intramarginal (high-efficiency) varieties $u < V$, $z_{uni} = z_{Vni} (V/u)^{\gamma(\varepsilon-1)}$. Summing labor demand (production and overhead workers) for all varieties $u \leq V$ yields aggregate labor demand at the country-sector level,

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[3]We assume throughout that heterogeneity is in technology, but it would be straightforward to have heterogeneity in demand.

[4]If $\gamma = 0$, countries fully specialize in one sector as long as A_{ni} differs across sectors. If $\gamma \geq 1/(\varepsilon - 1)$, there is no equilibrium as countries want to specialize in the highest-productivity variety, which in the continuum model has infinite productivity ($A_{Vni} \to \infty$ as $V_{ni} \to 0$). Intuitively, this is because consumers are very responsive to low prices within an industry and prices drop quickly as countries specialize within country-sectors. In a model with a countable number of varieties, countries would fully specialize in the highest-productivity variety.

$$(4) \qquad L_{ni} = \left(1 + \frac{z_{Vni}}{1 - \gamma(\varepsilon - 1)}\right) V_{ni}.$$

Labor markets are competitive in all countries, and labor supply in each country is inelastic and normalized to 1. As a result, wages in each country will adjust to clear the labor market, $\int_0^1 L_{ni} di = 1$.

In a 0-profit equilibrium, the marginal variety in each country-sector just breaks even. Its operating profits $\pi_{Vni} = p_{Vni} q_{Vni} - w_n z_{Vni}$ therefore equal to the overhead cost of production w_n. Using the optimal pricing formula, $p_{vni} = (\varepsilon/(\varepsilon - 1))(w_n/A_{vni})$, this implies that the number of production workers employed by the marginal variety in a 0-profit equilibrium is

$$(5) \qquad z^o_{Vni} = \varepsilon - 1,$$

and output equals $q^o_{Vni} = (\varepsilon - 1)A_{Vni}$. Combining (5) with (3) yields that the 0-profit equilibrium range of varieties in each country-sector is

$$(6) \qquad V_{ni} = \delta_V \left(A_{ni} P_i\right)^{\frac{1}{\gamma}} w_n^{-\frac{\varepsilon}{(\varepsilon-1)\gamma}} Y^{\frac{1}{(\varepsilon-1)\gamma}},$$

where δ_V is an unimportant constant. Hence, the range of varieties produced in a country-sector is decreasing in the country's wage rate w_n and increasing in the efficiency parameter A_{ni}, the price of the competition P_i, and world income Y.

When efficiency grows at the same rate in all country-sectors, $\Delta \ln A_{ni} = a$, our world equilibrium model admits a steady-state where wages in each country and world income grow at the same rate as efficiency, and the range of varieties in each country-sector is constant. In this steady-state there is no intersectoral labor reallocation and value added grows at the same rate in all country-sectors.

2.2   Adjustment to Sectoral Shocks

How does the sectoral allocation of labor change when there are sectoral shocks and countries differ in the extent they restrict entry? To address this question we consider sectoral shocks $\Delta \ln A_{ni}$ that are the sum of a country-level shock, a global sector-level shock, and an i.i.d. country-sector shock u_{ni} with mean zero, $\Delta \ln A_{ni} = \rho_n + \mu_i + u_{ni}$. The key variable for sectoral

adjustment in our analysis turns out to be the shock plus the response of the sectoral price index, $s_{ni} = \Delta \ln A_{ni} + \Delta \ln P_i$, which we can write as

$$s_{ni} = \rho_n + \omega_{ni} = \rho_n + \sigma_i + u_{ni}. \tag{7}$$

2.2.1 Frictionless Sectoral Adjustment

Consider first a country without any restrictions on entry. In this case the range of varieties immediately adjusts to the new 0-profit level, and sectoral employment reallocation is entirely at the extensive margin. It follows directly from (4), (6), and (7) that employment adjustment in a sector with allocation shock $\omega_i = \sigma_i + u_i$ is $\Delta \ln L_i^f = (\rho + \omega_i)/\gamma + (\Delta \ln Y)/\gamma(\varepsilon - 1) - \varepsilon(\Delta \ln w)/\gamma(\varepsilon - 1)$, where the first term captures the impact of the shock and the second and third term the effect of (general equilibrium) changes in world income and the wage level in the country (not surprisingly, sectoral employment growth depends positively on the shock $(\rho + \omega_i)$ and world income growth, and negatively on wage growth in the country). Labor market clearing implies that sectoral employment growth rates satisfy $\int_{-\infty}^{+\infty} \Delta \ln L_i^f dF_L(\omega) = 0$ where F_L is the employment share of sectors with allocation shocks below ω. This yields

$$\Delta \ln L_i^f = \frac{\omega_i - \omega}{\gamma}, \tag{8}$$

where $\omega = \int_{-\infty}^{+\infty} \omega_i dF$ can be interpreted as the average sectoral shock in the country; sectors with shocks above average therefore experience employment growth, while sectors with shocks below average contract. As u_{ni} is i.i.d. with mean zero, expected employment growth across sectors is linked to the global shock by

$$E(\Delta \ln L_i^f | \sigma_i) = \frac{\sigma_i - \omega}{\gamma}. \tag{9}$$

2.2.2 Sectoral Reallocation with Entry Frictions

How does the sectoral allocation of labor change in countries that restrict entry of new varieties? To address this question we think of countries as requiring each variety to have a production permit and limiting the growth of production permits to be smaller than $\psi - \delta_n$.

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In this formulation, greater values of δ_n correspond to tighter restrictions on entry (we assume that all countries allow for some entry, $\delta_n < \psi$). We first analyze the case where restrictions on new production permits are sector specific but permits can be traded freely within sectors (which yields an efficient equilibrium allocation of permits within sectors). Our second scenario assumes that production permits can also be traded across sectors (so that the allocation of permits is efficient within and across sectors).

Sector Specific Entry Restrictions Sectoral employment growth in countries with frictions depends on whether the allocation shock $\omega_i = \sigma_i + u_{in}$ is below or above a country-specific threshold $\widetilde{\omega}_n$. Sectors with $\omega_{ni} \leq \widetilde{\omega}_n$ will be unrestricted as their 0-profit adjustment implies a growth rate of varieties smaller than $\psi - \delta_n$ (the maximum rate of entry). Hence, all employment adjustment in these sectors is at the extensive margin. The entry restriction is binding for sectors with $\omega_{ni} > \widetilde{\omega}_{ni}$, and these sectors therefore also adjust at the intensive margin (increase output per variety). The threshold is the value of the allocation shock such that 0-profit entry exactly equals the maximum. That is, using (6) and (7),

$$
(10) \qquad
\begin{aligned}
\Delta \ln V_n(\widetilde{\omega}_n) &= \psi - \delta_n \\
&= \frac{1}{\gamma}\widetilde{\omega}_n + \frac{1}{\gamma}\rho_n + \frac{1}{(\varepsilon - 1)\gamma}\Delta \ln Y - \frac{\varepsilon}{(\varepsilon - 1)\gamma}\Delta \ln w_n.
\end{aligned}
$$

Employment adjustment in unrestricted sectors equals the adjustment of varieties, $\Delta \ln L_{ni} = \Delta \ln V_{ni}$. Using (6) and (10),

$$
(11) \qquad \Delta \ln L_{ni} = \psi - \delta_n + \frac{1}{\gamma}(\omega_{ni} - \widetilde{\omega}_n) \quad \text{for} \quad \omega_{ni} \leq \widetilde{\omega}_n.
$$

Hence, employment growth equals the maximum rate of entry $\psi - \delta_n$ in the threshold sector ($\omega_{ni} = \widetilde{\omega}_n$). Also, the marginal impact of allocation shocks ω_{ni} on employment growth ($1/\gamma$) in unrestricted sectors is the same as in frictionless economies (see (8)).

In restricted sectors ($\omega_{ni} > \widetilde{\omega}_{ni}$), the growth rate of varieties equals the maximum rate of entry $\psi - \delta_n$. Employment grows faster than varieties because firms expand at the intensive margin. Linearizing (3) around (4) and (5) using $\Delta \ln V_n = \psi - \delta_n$ and (5) yields

$$
(12) \qquad \Delta \ln L_{ni} = \psi - \delta_n + \frac{(\varepsilon - 1)^2}{\varepsilon - \gamma(\varepsilon - 1)}(\omega_{ni} - \widetilde{\omega}_n) \quad \text{for} \quad \omega_{ni} > \widetilde{\omega}_n.
$$

The condition in (1) implies $(\varepsilon - 1)^2 / (\varepsilon - \gamma(\varepsilon - 1)) < 1/\gamma$ and hence that the marginal impact of allocation shocks ω_{ni} on employment growth is smaller in restricted than unrestricted

sectors. This is because the limitations on entry in restricted sectors do not allow them to provide the variety consumers value.

Labor market clearing requires $\int_{-\infty}^{+\infty} \Delta \ln L_{in} dF_L = 0$, or making use of (11) and (12),

$$(13) \qquad 0 = \psi - \delta_n + \frac{1}{\gamma} \int_{-\infty}^{\widetilde{\omega}_n} (\omega_{ni} - \widetilde{\omega}_n) \, dF_L + \frac{(\varepsilon - 1)^2}{\varepsilon - \gamma(\varepsilon - 1)} \int_{\widetilde{\omega}_n}^{+\infty} (\omega_{ni} - \widetilde{\omega}_n) \, dF_L.$$

Implicit differentiation yields the marginal effect of tighter entry restrictions (increasing δ_n) on the $\widetilde{\omega}_n$ threshold,

$$(14) \qquad \frac{\partial \widetilde{\omega}_n}{\partial \delta_n} = g'(\delta_n) = -\frac{\gamma}{F(\widetilde{\omega}_n) + \frac{\gamma(\varepsilon-1)^2}{\varepsilon-\gamma(\varepsilon-1)} (1 - F(\widetilde{\omega}_n))} < -\gamma,$$

where the last inequality makes use of $\gamma(\varepsilon - 1)^2 < \varepsilon - \gamma(\varepsilon - 1)$. Using (14), it can now be shown that economies restricting entry less have employment contract in a wider range of sectors, and that employment cuts in these sectors will also be deeper. To see this, note that contracting sectors are those with shocks smaller than ω_n^* defined by $\Delta \ln V_n(\omega_n^*) = 0 = \omega_n^*/\gamma + \rho_n/\gamma + \Delta \ln Y/(\varepsilon - 1)\gamma - \varepsilon \Delta \ln w_n/(\varepsilon - 1)\gamma$. Making use of (10) yields the simpler expression $\omega_n^* = \widetilde{\omega}_n + \gamma \delta_n$, which can be combined with (14) to obtain $\partial \omega_n^*/\partial \delta_n < 0$. Hence, the range of contracting industries is larger in economies with less restricted entry (lower δ_n). To see that these economies also see deeper employment cuts in contracting sectors note that (11) and (14) yield $\partial(\Delta \ln L_{ni})/\partial \delta_n = -1 - (\partial \widetilde{\omega}_n/\partial \delta_n)/\gamma > 0$.

Figure 1 summarizes employment growth across sectors in two economies that differ in the extent they restrict entry. Depending on the shock, sectors fall into three broad ranges (marked by A, B, and C). Sectors experiencing the strongest positive shocks (in the *A zone*) see employment growth in the economy with less restricted entry and, to a lesser extent, in the economy with more restricted entry. The intuition for slower growth in economies with more restricted entry comes in two parts. Entry restrictions force these sectors to expand at the intensive margin, where demand is less elastic than at the extensive margin because consumers value variety. Moreover, this negative effect of entry restriction is only partly offset by falling wages in general equilibrium. Sectors experiencing intermediate shocks (in the *B zone*) still see employment growth in the economy with less restricted entry, but actually grow faster in the economy with tighter entry restrictions. This is because economies restricting entry see a relative fall in factor prices in equilibrium. Other things equal, this increases labor demand in all sectors. For sectors in the B zone this effect is strong enough

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for employment to grow faster in the economy with more restricted entry. Finally, sectors experiencing the lowest shocks (in the *C zone*) contract in the economy restricting entry less. Falling wages in the economy with more restricted entry, imply that these sectors either contract by less or grow.[5]

What are the implications of entry restrictions for sectoral reallocation in response to global shocks (σ_i)? Expected sectoral adjustment conditional on σ_i and δ_n is readily obtained using (11) and (12),

$$(15) \qquad E(\Delta \ln L_{ni}|\sigma_i; \delta_n) = \psi - \delta_n + \frac{1}{\gamma} \int_{-\infty}^{g(\delta_n)-\sigma_i} (\sigma_i + u_{ni} - g(\delta_n))\, dH$$

$$+ \frac{(\varepsilon - 1)^2}{\varepsilon - \gamma(\varepsilon - 1)} \int_{g(\delta_n)-\sigma_i}^{+\infty} (\sigma_i + u_{ni} - g(\delta_n))\, dH$$

where we have substituted $\widetilde{\omega}_n = g(\delta_n)$ (as implicitly defined by (13)) and H denotes the distribution function of u. The interpretation of (15) becomes clearest by taking a second-order Taylor approximation of $E(\Delta \ln L_{ni}|\sigma_i; \delta_n)$ around σ, δ. This yields

$$(16) \qquad E(\Delta \ln L_{ni}|\sigma_i; \delta_n) = \mu_n + \mu_i - \frac{\mu}{\gamma}\sigma_i\delta_n$$

where μ_n collects all country-specific terms and μ_i all sector-specific terms, and

$$(17) \qquad \mu = \frac{(1 - \gamma(\varepsilon - 1))\,\varepsilon}{\varepsilon - \gamma(\varepsilon - 1)}\phi > 0.$$

where $\phi = H'(g(\delta) - \sigma)g'(\delta) > 0$. The key implication of (16) and (17) is that expected sectoral employment growth responds more to global shocks in countries with less restricted entry, $\partial^2 E(\Delta \ln L_{ni}|\sigma_i; \delta_n)/\partial\sigma_i\partial\delta_n < 0$. That is, in countries with less restricted entry, high-σ sectors tend to grow more rapidly relative to low-σ sectors. To put it differently, there is more factor reallocation towards the high-σ sectors in countries with less restricted entry. The magnitude of this reallocation differential falls as the elasticity of substitution among varieties ε increases. This is intuitive because, when different varieties are close substitutes, restrictions on new varieties become less relevant. Making use of $\sigma_i/\gamma = E(\Delta \ln L_i^f|\sigma_i) + \sigma/\gamma$ in (9), we can rewrite (16) in terms of the expected frictionless employment adjustment

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[5]Using (14) it can be shown that wage and income per capita growth are lower the tighter entry restrictions, while profit growth increases with entry restrictions.

(18)
$$E(\Delta \ln L_{ni}|\sigma_i; \delta_n) = \varphi_n + \mu_i - \mu E(\Delta \ln L_i^f|\sigma_i)\delta_n.$$

Restrictions on Total Entry Only We now show that (16), (17), and (18) continue to hold when production permits are not sector specific. In this case, sectors fall into three groups. Those with shocks below some threshold $(\underline{\omega}_n)$ see exit of varieties and adjust employment at the extensive margin only. Sectors experiencing intermediate shocks (between $\underline{\omega}_n$ and $\overline{\omega}_n$) see no change in varieties and adjust employment at the intensive margin only. This is because the increase in profits is insufficient for production permits to be allocated to these sectors. All production permits are allocated to sectors experiencing shocks above some threshold $(\overline{\omega}_n)$, which adjust employment both at the extensive and the intensive margin. The distribution of permits across these sectors equalizes profits of the marginal entrant. Following the same steps as in the case of sector-specific production permits, it can be shown that $\Delta \ln V_{in} = (\omega_{in} - \underline{\omega}_n)/\gamma$ for $\omega_{in} \leq \underline{\omega}_n$; $\Delta \ln V_{in} = 0$ for $\underline{\omega}_n \leq \omega \leq \overline{\omega}_n$; and $\Delta \ln V_{in} = (\omega_{in} - \overline{\omega}_n)/\gamma$ for $\overline{\omega}_n \leq \omega_{in}$. Hence, the marginal effect of the allocation shock on entry and exit $(1/\gamma)$ is the same as in the frictionless case for low and high allocation shocks. The lower threshold is equal to the allocation shock that implies no 0-profit adjustment of varieties, $\underline{\omega}_n/\gamma + \rho_n/\gamma + \Delta \ln Y/\gamma(\varepsilon - 1) - \varepsilon\Delta \ln w_n/\gamma(\varepsilon - 1) = 0$. The upper threshold is such that aggregate growth of varieties equals the aggregate entry restriction, $\int_{\overline{\omega}_n}^{\infty} \Delta \ln V_{in} dF_V(\omega) = \psi - \delta_n$ where F_V is the fraction of varieties in sectors with allocation shocks below ω.

Employment growth for sectors in the three groups can be determined analogously to the case where production permits are sector specific. When allocation shocks are below the threshold $\underline{\omega}_n$, all employment adjustment is at the extensive margin, which implies $\Delta \ln L_{in} = (\omega_{in} - \underline{\omega}_n)/\gamma$ for $\omega_{in} \leq \underline{\omega}_n$. For intermediate allocation shocks, adjustment is at the intensive margin only, $\Delta \ln L_{in} = (\varepsilon - 1)^2 (\omega_{in} - \underline{\omega}_n)/(\varepsilon - \gamma(\varepsilon - 1))$ for $\underline{\omega}_n \leq \omega \leq \overline{\omega}_n$. The marginal effect of shocks on employment growth $((\varepsilon - 1)^2/(\varepsilon - \gamma(\varepsilon - 1)))$ in this range is exactly equal to the case of sector-specific production permits. Finally, for sectors with allocation shocks above the threshold $\overline{\omega}_n$, adjustment is partly at the intensive and partly at the extensive margin, $\Delta \ln L_{in} = (\varepsilon - 1)^2 (\overline{\omega}_n - \underline{\omega}_n)/(\varepsilon - \gamma(\varepsilon - 1)) + (\omega_{in} - \overline{\omega}_n)/\gamma$ for $\overline{\omega}_n \leq \omega_{in}$.

Expected employment growth conditional on the global industry shock and entry frictions, $E(\Delta \ln L_{ni}|\sigma_i; \delta_n)$, can now be determined analogously to (15). And the second-order approximation of expected employment growth yields (16), (17), and (18), with the only dif-

ference that the parameter $\phi > 0$ is different from the sector-specific permit case.[6] Hence, we continue to obtain that there should be more factor reallocation towards the high-σ sectors in countries with less restricted entry.

3 Empirical Evidence

Before presenting the empirical evidence, we summarize the testable implications of the model and discuss the data.

3.1 Estimating Equation

Our estimating equation is based on (16) and (18). For estimation purposes, it is useful to rewrite these equations as

$$(19) \qquad EMPGR_{ni} = \varphi_n + \alpha_i + \beta_i ED_n + \Pi X_{ni} + \upsilon_{ni}$$

where $EMPGR_{ni}$ denotes employment growth in country n and sector i; φ_n and α_i are country and industry fixed effects; ED_n measures entry restrictions; and υ_{ni} is a mean-zero residual. ΠX_{ni} summarizes the sectoral employment growth effects of other variables we want to account for in our empirical work. The theoretical framework also implies that the marginal effect of entry restrictions on employment growth of sector i, β_i, is proportional to frictionless sectoral employment growth in response to global shocks,[7]

$$(20) \qquad \beta_i = -\theta EMPGR_i^f.$$

Combining the two previous expressions we get,

$$(21) \qquad EMPGR_{ni} = \varphi_n + \alpha_i - \theta \left(EMPGR_i^f * ED_n \right) + \Pi X_{ni} + \upsilon_{ni}.$$

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[6] Now $\phi = H'(d(\overline{\lambda}) - \overline{\sigma}) d'(\overline{\lambda}) - H'(f(\overline{\lambda}) - \overline{\sigma}) f'(\overline{\lambda})$, where $\overline{\omega}_n = f(\lambda_n)$ and $\underline{\omega}_n = d(\lambda_n)$ are implicitly defined by labor market clearing, $\underline{\omega}_n/\gamma + \rho_n/\gamma + \Delta \ln Y/\gamma(\varepsilon - 1) - \varepsilon \Delta \ln w_n/\gamma(\varepsilon - 1) = 0$, and $\int_{\underline{\omega}_n}^{\infty} \Delta \ln V_{in} dF_V(\omega) = \lambda_n$.

[7] The model does *not* imply that entry restrictions slow down growth in all industries. For example, globally contracting industries will grow faster in countries with tighter entry restrictions.

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Evaluation of these model implications requires country-industry employment growth data as well as proxy measures of entry restrictions and frictionless sectoral employment growth in response to global shocks.

3.2 Data and Measurement

Country-sector employment growth   Country-sector employment data come from the Industrial Statistics of the United Nations Industrial Development Organization (UNIDO). The data covers a maximum of 28 manufacturing industries at the 3-digit International Standard Industrial Classification (ISIC) level for a large number of countries. We drop countries with data for less than 10 industries and also require at least five years of data in each decade. Our sample excludes the US because it is used for sector benchmarking. We then obtain annual logarithmic growth rates for employment ($EMPGR$) at the country-sector level for the 1980s and the 1990s. After merging the employment growth data with the country-level measure of entry delays, we are left with 1428 observations in 55 countries for the 1980s and 1054 observations in 43 countries for the 1990s. (Supplementary Appendix Table 1 reports sample details by country.)

Administrative entry restrictions   We proxy the tightness of entry restrictions in our model by the Djankov *et al.* (2002) index of the log time needed to comply with the necessary administrative procedures to start up a business.[8] The implicit assumption is that in countries where it takes longer to start a business, fewer new varieties will get the necessary production permits during the period following economic shocks.[9] There is significant variation in administrative entry delays across countries. For example, in Spain and Portugal an entrepreneur needs almost three months to meet the various bureaucratic requirements

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[8]Djankov *et al.* (2002) focus on a "standardized" firm with the following characteristics: 1) The firm performs general industrial or commercial activities; 2) it operates in the largest city; 3) it is exempt from industry-specific requirements; 4) it does not participate in foreign trade and does not trade in goods subject to excise taxes; 5) it is a domestically owned limited liability company; 6) its capital is subscribed in cash; 7) it does not own land and business premises; 8) it has between 5 and 50 employees one month after the commencement of operations all of whom are nationals; 9) it has a turnover of up to 10 times its start-up capital; 10) it does not qualify for investment incentives.

[9]Djankov *et al.* (2002) also quantify entry restrictions using the log number of procedures required for starting up a business. This index is very closely related to the log time index and yields almost identical results (not reported). The third proxy of Djankov *et al.* (2002) accounts for the official cost of procedures relative to GDP per capita. Official costs are estimated based on identifiable official expenses like fees, costs of procedures and forms, photocopies, fiscal stamps, and legal and notary charges. This cost index is unrelated to the way we think of entry restrictions in our theoretical framework. Using it yields similar results to the time and procedure indices in the 1990s but insignificant results in the 1980s (not reported), see also Fisman and Sarria-Allende (2004).

to incorporate a standard start-up, and in Indonesia and Venezuela it takes more than 5 months. In Australia and Canada, on the other hand, business incorporation takes less than a week. The Djankov *et al.* measure of entry delays is almost certainly an underestimate of delays to start production as it does not reflect the administrative permits to register land, build and operate factories and warehouses, purchase equipment, and obtain sector-specific licenses. Moreover, it reflects the official time needed for starting up a business, and in practice there are likely to be considerable additional delays. In fact, available estimates of the bureaucratic delays to start production usually exceed the Djankov *et al.* time index by a wide margin. De Soto (1989) and the World Bank (2007) document a range from a few months to several years. The advantage of the Djankov *et al.* index of entry delays is that the underlying data has been collected using a consistent criterion for a wide sample of countries at the same time (the late 1990s).

Our country-level controls for labor market regulation, financial market frictions, and economic underdevelopment also come from standard sources, see the Data Appendix. (Supplementary Appendix Table 1 and 2 report the values and summary statistics for all country-level variables.) In our regression analysis, country-level variables are scaled so that (i) zero corresponds to the in-sample value of the unscaled indicator that a priori should lead to most sectoral factor reallocation (shortest entry delay, lowest index of labor regulation, highest level of financial development, and highest level of development); (ii) positive values correspond to stronger frictions.

Proxies for frictionless employment growth in response to global shocks In our empirical work we use two proxies for frictionless sectoral employment growth in response to global industry shocks ($EMPGR_i^f$). The first proxy is sectoral employment growth in the US ($US\text{-}EMPGR_i$). This approach follows the influential study of Rajan and Zingales (1998) and subsequent work, which proposes using data from a flexible market economy to proxy for latent global industry characteristics. As US product, labor, and capital markets are less regulated than in most other countries, actual employment growth should closely reflect the sectoral shocks the US is subject to. If these shocks were partly global, US employment growth could be taken as a proxy for $EMPGR_i^f$.

Sectoral employment growth in the US also reflects idiosyncratic shocks however. These shocks could be large and in this case US sectoral employment growth would not be a useful proxy for frictionless sectoral employment reallocation in response to global shocks.[10] This

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[10]If US idiosyncrasies are independent of the idiosyncrasies affecting all other countries in the sample,

makes it important to have an alternative proxy that does not reflect the idiosyncrasies of a particular country (if only to see whether US sectoral employment growth does reflect global shocks over a particular time period). Such a proxy can be obtained from (19). In this equation, α_i captures sectoral employment growth in the absence of entry restrictions. We use least squares estimates of α_i, which we denote by $G\text{-}EMPGR_i$, as a second proxy for frictionless sectoral reallocation in response to global shocks.

If US sectoral employment growth reflects global shocks, the two proxies for $EMPGR_i^f$ should be positively correlated. Figures 2A and 2B plot US sectoral employment growth on the vertical axis ($US\text{-}EMPGR_i$) against estimated global employment growth in the absence of entry frictions ($G\text{-}EMPGR_i$). The positive correlation is evident for the 1980s as well as the 1990s; and the R-squared is quite high, 0.45 in the 1980s and 0.41 in the 1990s. The slope of the regression line indicates that a one percentage point increase in frictionless industry employment growth is associated with roughly a half percentage point increase in US employment growth.

3.3   Results

We first examine whether entry restrictions reduce employment growth relatively more in sectors that would have expanded faster in a frictionless scenario. Then we estimate the strength of the effect using three different approaches.

Preliminary evidence   Our theoretical framework implies that the marginal effect of entry delays should be smaller in sectors with faster growth in a frictionless scenario. That is, the marginal effect of entry delays across sectors, β_i, should be negatively correlated with frictionless growth, $EMPGR_i^f$ (see (20)). This implication is readily checked by obtaining the least squares estimates of the sector-specific slope parameters β_i in (19) and plotting them against our proxies for frictionless employment growth (for now we are estimating (19) without any additional control variables).

The results are in Figure 3 for the 1980s and Figure 4 for the 1990s. The marginal effect of administrative entry delays is on the vertical axis and frictionless growth on the horizontal axis.[11] There is a clear negative relationship for the 1980s, whether we use $US\text{-}EMPGR_i$ in

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estimates using the US-based proxy will be attenuated (classical measurement error bias). If US idiosyncrasies are more similar to the idiosyncratic shocks affecting countries with similar entry restrictions, measurement error bias can be non-classical (Ciccone and Papaioannou, 2006).

[11]Supplementary Appendix Table 3 reports the marginal effects of entry delays on industry growth for the

Figure 3A or $G\text{-}EMPGR_i$ in Figure 3B as a proxy for frictionless growth. The R-squared of the regression is 32% for the US-based proxy and 76% for the global proxy. Figures 4A and 4B repeat the analysis for the 1990s. The relationship between our estimates of β_i and frictionless growth continues to be negative and significant, and the R-squared of the regression continues to be higher with $G\text{-}EMPGR_i$ (when we use $US\text{-}EMPGR_i$ we lose two sectors because of gaps in the UNIDO data). Figures 3 and 4 are therefore supportive of administrative entry barriers slowing down employment growth more in sectors that would have expanded most in a frictionless scenario.

Estimates with US benchmarking There are several ways of approaching the estimation of θ in (21). One approach is to use US sectoral employment growth as a proxy for frictionless growth. Table 1 reports the resulting least squares estimates of θ. Standard errors adjusted for general heteroskedasticity and corresponding p-values are reported in parenthesis and italics respectively below the coefficients. Models (1)-(3) report estimates for the 1980s and models (4)-(6) report results in the 1990s. Note that the sample drops considerably in the 1990s. All models include country fixed effects, industry fixed effects, and controls for the initial log employment of the sector.[12]

The coefficient on the entry delay interaction $(ED_n * US\text{-}EMPGR_i)$ in model (1) is negative and statistically significant at the 99% confidence level. This indicates a larger gap between actual sectoral reallocation and the frictionless benchmark in countries with longer administrative entry delays. The estimate (-0.17) implies an annual employment growth differential of approximately 0.4% between an industry with frictionless employment growth at the 75th percentile and an industry at the 25th percentile if they operate in Finland rather than Italy (in Italy it takes almost 3 times longer to comply with basic entry procedures). To put this into perspective, average annual employment growth in our sample is 0.4%. The estimate is similar in magnitude and highly significant in the analogous model in the 1990s (in column (4)).

Firm entry may also be affected by the level of financial development (e.g. King and Levine, 1993; Rajan and Zingales, 1998) and labor market regulation (e.g. Hopenhayn and Rogerson, 1993; Alvarez and Veracierto, 2001). The (negative) effect of the entry de-

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1980s and the 1990s, as well as US employment growth and global frictionless growth.

[12]We control for the initial size of sectors following the finance and industry growth literature (e.g. Rajan and Zingales, 1998; Fisman and Love, 2007), which finds a negative effect of initial size on subsequent growth. All our regressions yield that the initial log employment level enters with a negative and highly significant effect. One explanation is that there is more measurement error in the employment data as one goes back in time. In any case, our results are not sensitive to these controls.

lay interaction in our baseline model could therefore be capturing financial development or the stringency of labor market regulation.[13] To check on this, we augment our baseline specification with an interaction between the US-based proxy for frictionless employment reallocation and an index that is increasing in the degree of labor market regulation. The index (LMR_n) is from Botero *et al.* (2004) and is based on the existence of alternative employment contracts, the cost of increasing hours, the cost of firing, and the formality of dismissal procedures. The results in columns (2) and (4) show that the entry delay interaction continues to enter negatively and significantly, while the labor market regulation interaction is statistically insignificant. This continues to be the case when we use subcomponents of the labor market regulation index (results not reported).[14] In models (3) and (6), we add an interaction between the US-based proxy for frictionless employment reallocation and financial underdevelopment ($FIN\text{-}UND_n$). The effect of the entry delay interaction changes little; the financial underdevelopment interaction enters negatively and significantly at the 95% confidence level, which indicates that financial underdevelopment reduces sectoral employment reallocation.

Table 2 investigates the robustness of our results to the differential industry growth effects of financial development documented in the literature. In columns (1) and (5) we augment the baseline specification with the Rajan and Zingales (1998) interaction of industry reliance on external finance ($EXTFIN_i$) with financial underdevelopment. In columns (2) and (6) we control for the Fisman and Love (2007) interaction between financial underdevelopment and industry sales growth in the US ($SALESGR_i$), which Fisman and Love use to proxy for growth opportunities. In line with previous work, the $FIN\text{-}UND_n * EXTFIN_i$ interaction is significant and negative, indicating that more finance dependent industries grow more slowly in financially underdeveloped countries. The coefficient on $FIN\text{-}UND_n * SALESGR_i$ is also negative, which points to slower growth of industries with good growth opportunities in less financially developed countries, but only significant in the 1990s. Both finance interactions have little impact on the entry delay interaction, which continues to be negative and significant at the 99% confidence level. We explore the role of financial underdevelopment further in columns (3), (4), (7), and (8), where we add the interaction between financial

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[13]The theoretical (general equilibrium) employment effects of labor market regulation depend on exactly which markets exist and how they work. For example, Hopenhayn and Rogerson (1993) find that a firing tax reduces employment; Alvarez and Veracierto (2001) find the contrary in a model of costly search and rigid wage contracts. Helpman and Itskhoki (2007) analyze the general equilibrim effects of firing costs in a two country trade model with search.

[14]For a discussion of the literature on labor market institution and employment, see Nickel and Layard (1999) and Freeman (2005). For an analysis of job security and employment protection provisions on sectoral employment see Caballero *et al.* (2006) and Micco and Pages (2006).

underdevelopment and US employment growth that was significant in Table 1. The $FIN\text{-}UND_n * US\text{-}EMPGR_i$ interaction is now insignificant when we control for the Rajan and Zingales interaction in models (3) and (7), while the $FIN\text{-}UND_n * EXTFIN_i$ interaction is significant and negative. This shows that financial underdevelopment affects industry growth is through external finance dependence. The main interaction of interest to us, $ED_n * US\text{-}EMPGR_i$, remains negative and statistically significant at the 99% confidence level. When we control for both $FIN\text{-}UND_n * US\text{-}EMPGR_i$ and the Fisman and Love interaction in models (4) and (8), we do not obtain clear cut results on their relative importance. This is not too surprising as both sectoral employment growth and sales growth are closely related. Entry delays continue to affect sectoral employment growth in the way predicted by our theoretical framework.

Using estimated global frictionless employment growth Proxying global frictionless employment growth with $US\text{-}EMPGR_i$ gives rise to measurement error bias when US employment growth partly reflects US idiosyncrasies. This makes it important to use an alternative proxy that does not reflect the idiosyncrasies of the US or any other country. Our estimates of global frictionless employment growth ($G\text{-}EMPGR_i$) satisfy this criterion as they are obtained by estimating α_i in (19) with data on all countries in the sample except the US (see Section 3.2 and the Data Appendix). In this case the interaction of interest in (21) becomes $ED_n * G\text{-}EMPGR_i$, which is a generated regressor. Applying least squares yields consistent estimates of θ as long as $G\text{-}EMPGR_i$ is consistent (e.g. Wooldridge, 2002; pp. 115-116). Least squares standard errors are in general inconsistent however; the exception is the case where the null hypothesis is $\theta = 0$.

Models (1) and (3) in Table 3 show that proxying global frictionless employment growth with $G\text{-}EMPGR_i$ yields a negative and highly significant estimate of θ. This continues to be the case in models (2) and (4), which control for labor market regulation by adding the $LMR_n * G\text{-}EMPGR_i$ interaction, and models (3) and (6), which control for financial underdevelopment by adding the $FIN\text{-}UND_n * G\text{-}EMPGR_i$ interaction (in both cases we account for the additional country-level control when estimating $G\text{-}EMPGR_i$).

It turns out to be straightforward to combine our two proxies for global frictionless employment growth to obtain a consistent estimate and standard error of θ. We can use US sectoral employment growth as a proxy for $EMPGR_i^f$ in (21) and instrument the $ED_n * US\text{-}EMPGR_i$ interaction with $ED_n * G\text{-}EMPGR_i$. This amounts to an instrumental variables approach with a generated instrument, which yields consistent estimates and standard errors

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for θ as long as $G\text{-}EMPGR_i$ is consistent (e.g. Wooldridge, 2002, pp. 116-117).[15]

The first stage regression corresponding to this approach yields a good fit in both decades. The F-score when regressing $US\text{-}EMPGR_i$ on $G\text{-}EMPGR_i$ is 21.16 in the 1980s and 11.28 in the 1990s (see Figures 2A and 2B). Table 4 reports instrumental variables estimates of θ. The effect remains negative and highly significant and is stronger than in previous tables for all specifications. The point estimates indicate an annual employment growth differential of approximately $0.8 - 1.2\%$ between an industry with frictionless employment growth at the 75th percentile and an industry at the 25th percentile if they operate in Finland rather than Italy.

Controlling for Underdevelopment   Our final set of results allows the amount of sectoral employment reallocation in response to global shocks to vary with income per capita. These specifications have to be interpreted with caution because economic underdevelopment is a summary measure of many different market frictions, including various kinds of effective entry restrictions (not just official entry delays). Table 5 reports the results of the three previous approaches when we add an interaction between economic underdevelopment ($EC\text{-}UND_n$) and frictionless employment reallocation to the specification. In columns (1) and (4) we report least squares estimates using US employment growth as the frictionless benchmark. The entry delay interaction continues to enter with a negative and significant coefficient in the 1980s and the 1990s. In models (2) and (5) we report least squares estimates using the global proxy for frictionless employment reallocation (economic underdevelopment is also accounted for when estimating α_i in (19)). The entry delay interaction continues to enter negatively and significantly in both decades. The finding persists when we use frictionless global employment growth as an instrument for actual US employment growth in models (3) and (6).

4   Conclusion

Many countries have been cutting red tape in product markets and removing time-consuming entry procedures to make their economies more flexible (e.g. World Bank, 2007). Our goal here has been to develop a better understanding of how entry restrictions affect adjustment to economic shocks.

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[15]In fact, in this case, the $\sqrt{N}$-asymptotic distribution of $\widehat{\theta}$ is the same whether one uses $\widehat{\alpha}_i$ ($G\text{-}EMPGR_i$) or α_i in constructing the instrument (Wooldridge, 2002, p.117).

In our theoretical analysis, we present a multi-sector world equilibrium model where countries differ in the degree they restrict entry of new product varieties. We show that following industry shocks, economies with tighter entry restrictions experience contractions in fewer sectors, and that employment cuts in these sectors are also shallower. This is because entry restrictions lead sectors to expand by increasing the supply of existing goods (at the intensive margin) rather than by introducing new varieties (at the extensive margin). When consumers value variety, demand is less elastic at the intensive than the extensive margin. Entry restrictions therefore result in a fall of factor prices in general equilibrium. This fall in factor prices buffers contractions in sectors experiencing contractionary global shocks and reduces sectoral factor reallocation in general equilibrium.

In our empirical work, we test for the interaction between global industry shocks, administrative entry delays, and employment reallocation using data for a large cross-section of countries and industries in the 1980s and 1990s. We show using two proxies for frictionless reallocation, that the gap between actual and frictionless reallocation is greater in countries with longer administrative entry delays.

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Variable	Definition

Panel A: Country-Industry Level

Employment Growth [$EMPGR_{in}$]
Annual change of log employment in industry i in country n over the period 1980-1989 or the period 1990-1999. We exclude countries with less than 10 industry observations and country-industries with less than 5 observations in the respective decade.
Source: United Nations Industrial Development Organization (UNIDO) Statistics, 2005.

Employment Size [EMP_{in}]
Log employment in industry i and country n in the starting year (1980 or 1990).
Source: United Nations Industrial Development Organization (UNIDO) Statistics, 2005.

Panel B: Industry Level

US Employment Reallocation [$US\text{-}EMPGR_i$]
Annual change of log employment in industry i in the US over the period 1980-1989 or the period 1990-1999. Due to data unavailability in 1990-1999 we lose two industries, namely "Printing and Publishing" and "Miscellaneous Petroleum and Coal Products."
Source: United Nations Industrial Development Organization (UNIDO) Statistics, 2005.

Global Frictionless Employment Growth [$G\text{-}EMPGR_i$]
Global industry employment growth at the absence of entry delays. These estimates are obtained in two steps:
Step 1: Regress industry-country employment growth for all countries except the U.S. on country dummies, industry dummies, and industry dummies interacted with country-level entry regulation (and, if relevant, additional controls).
Step 2: Obtain $G\text{-}EMPGR_i$ as predicted industry employment growth at the lowest level of entry delays. See Section 3 for details.
Source: United Nations Industrial Development Organization (UNIDO) Statistics, 2005

External-Finance Dependence [$EXTFIN_i$]
Median ratio of capital expenditure minus cash flow to capital expenditure for U.S. firms averaged over the 1980s.
Source: Rajan and Zingales (1998) and COMPUSTAT.

Sales Growth [$SALESGR_i$]
Annual change of log shipment growth in industry i in the US over the period 1980-1989 or the period 1990-1996. This is Fisman and Love's (2007) measure of industry growth opportunities.
Source: NBER Manufacturing Database (Bartelsman and Gray, 1996).

Panel C: Country Level

Entry Delays [ED_n]
Log number of days required to obtain legal status to operate a firm in 1999. In the regression analysis the index is rescaled so that zero indicates the minimum in-sample value.
Source: Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002).

Labor Market Regulation [LMR_n]
Labor market regulation index based on the existence of alternative employment contracts, the cost of increasing hours, the cost of firing, and the formality of dismissal procedures. The variable ranges from zero to a hundred where higher values indicate a greater labor market regulation. In the regression analysis the index is rescaled so that

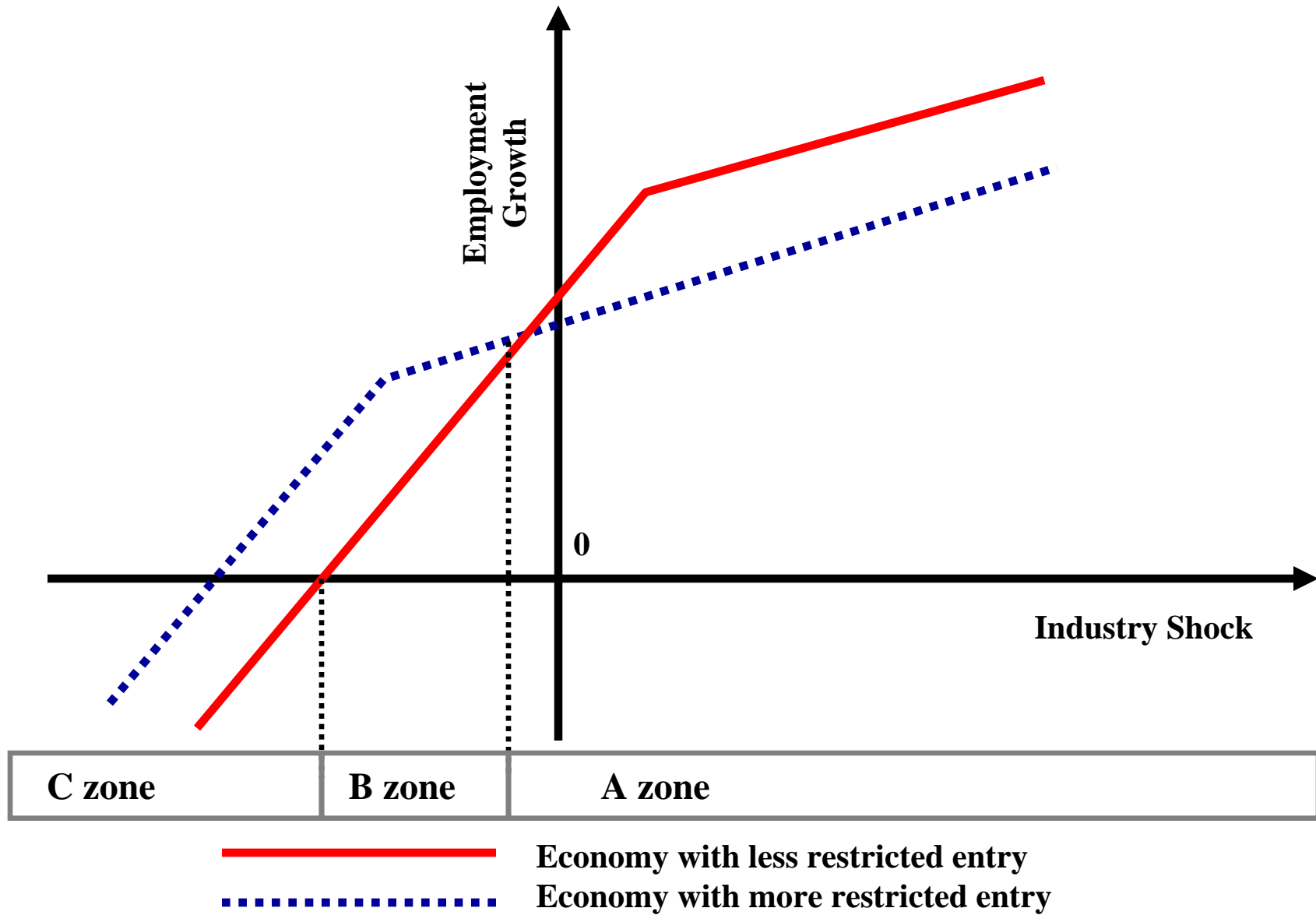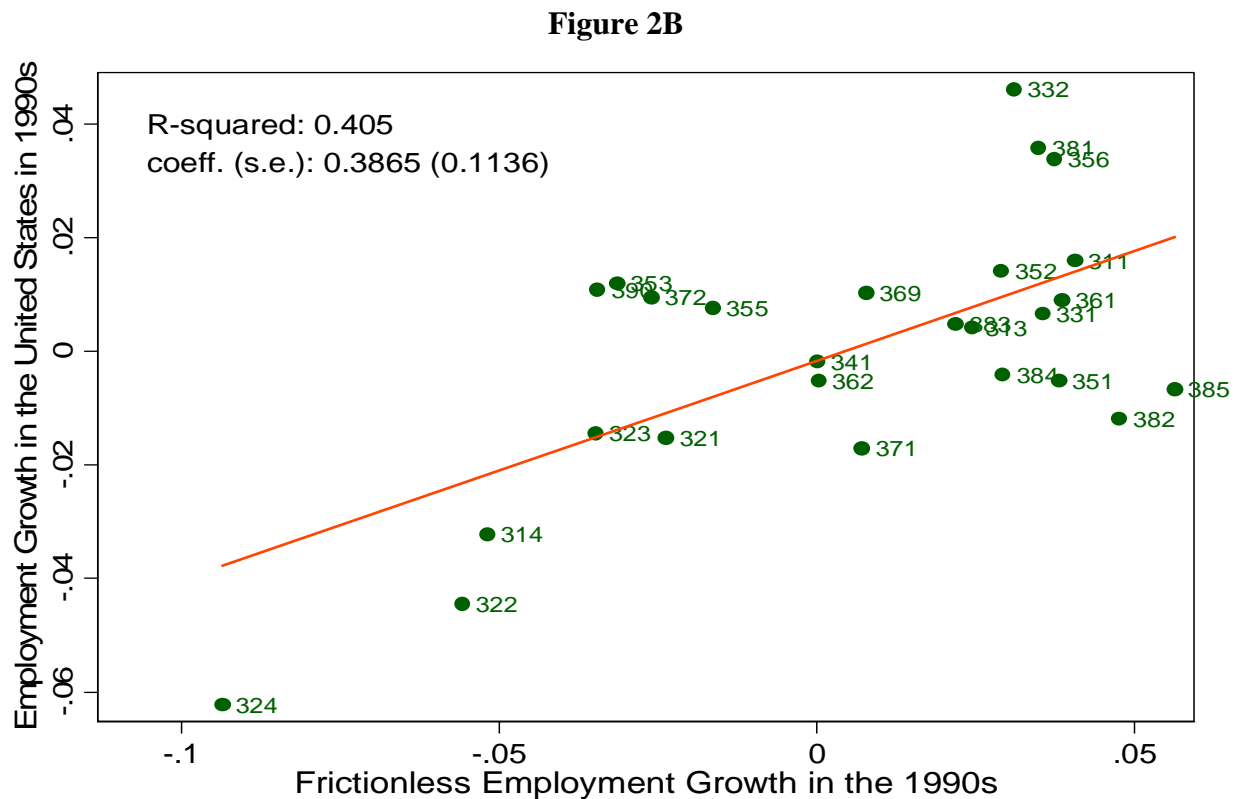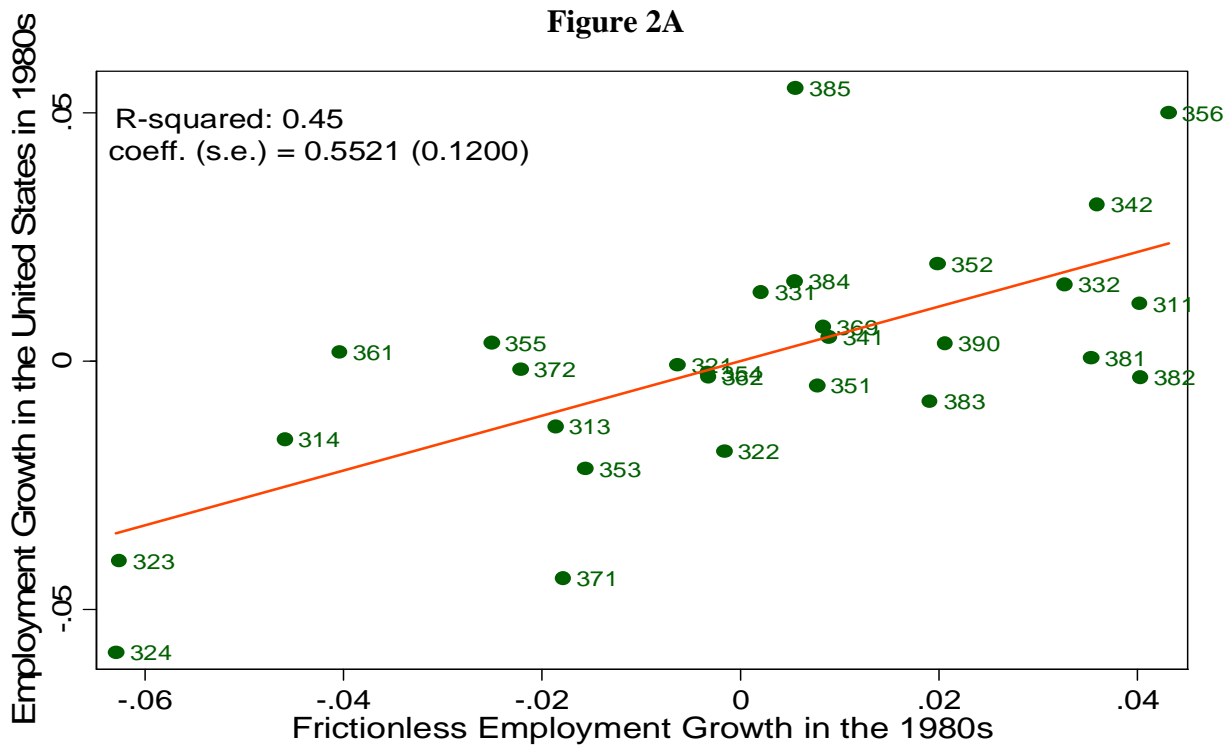|	
	zero indicates the minimum in-sample value. *Source: Botero, Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2004).*
Financial Underdevelopment [*FIN-UND_n*]	Log of average domestic credit to the private sector relative to GDP in the respective decade (denoted as *FD* in the Supplementary Appendix Tables). In the regression analysis the index is rescaled so that zero indicates the largest in-sample value, and higher values lower financial development (so that, as in the case of *ED* and *LMR*, higher values corresponds to greater frictions). *Source: World Bank World Development Indicators Database (2005).*
Economic Underdevelopment [*EC-UND_n*]	Log of real per capita GDP in the beginning of each decade (denoted as *Y* in the Supplementary Appendix Tables). In the regression analysis the index is standardized so that zero indicates the maximum in sample value and higher values denote lower income levels. *Source: Penn World Tables 5.6.*

The Data Appendix Table reports variable definitions and sources for all variables employed in the empirical analysis. The first column reports the variable name and the abbreviation; the second column reports definition and sources.

Figure 1

Figure 2A

Figure 2B

Figures 2A and 2B plot (demeaned) US industry-level employment growth (US-EMPGR; on the vertical axis) against (demeaned) estimated global frictionless employment growth (G-EMPGR) in the 1980s and the 1990s respectively. For the estimation of G-EMPGR we use data on all countries except the US. For details on the estimated global frictionless employment growth proxy, see Section 3. (The industries corresponding to the codes in the figures can be found in Supplementary Appendix Table 3.)
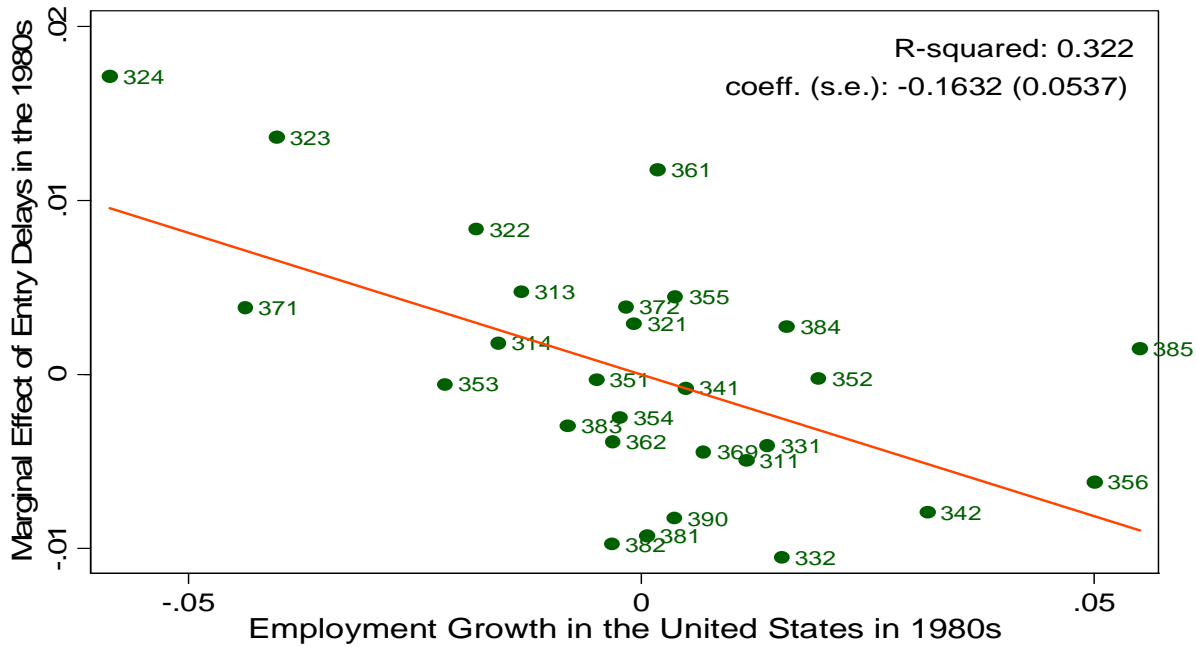
Figure 3A

Figure 3B

Figures 3A and 3B plot the (demeaned) estimated industry-specific marginal effect of entry delays (on the vertical axis) on employment growth against the two proxy measures of industry frictionless employment growth (in the horizontal axis) in the 1980s. In Figure 3A the frictionless benchmark is actual US industry employment growth (US-EMPGR). In Figure 3B the frictionless benchmark is estimated global frictionless employment growth (G-EMPGR). For the estimation of G-EMPGR we use data on all countries except the US. For details on the estimated global frictionless employment growth proxy, see Sections 3. (The industries corresponding to the codes in the figures can be found in Supplementary Appendix Table 3.)
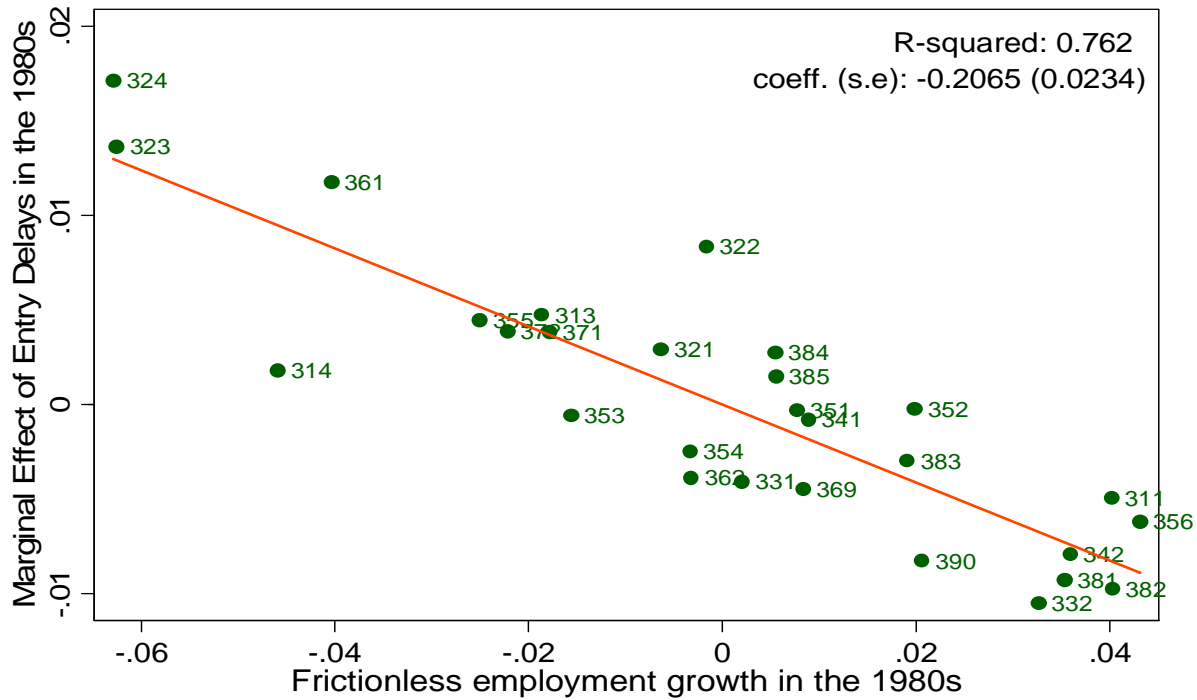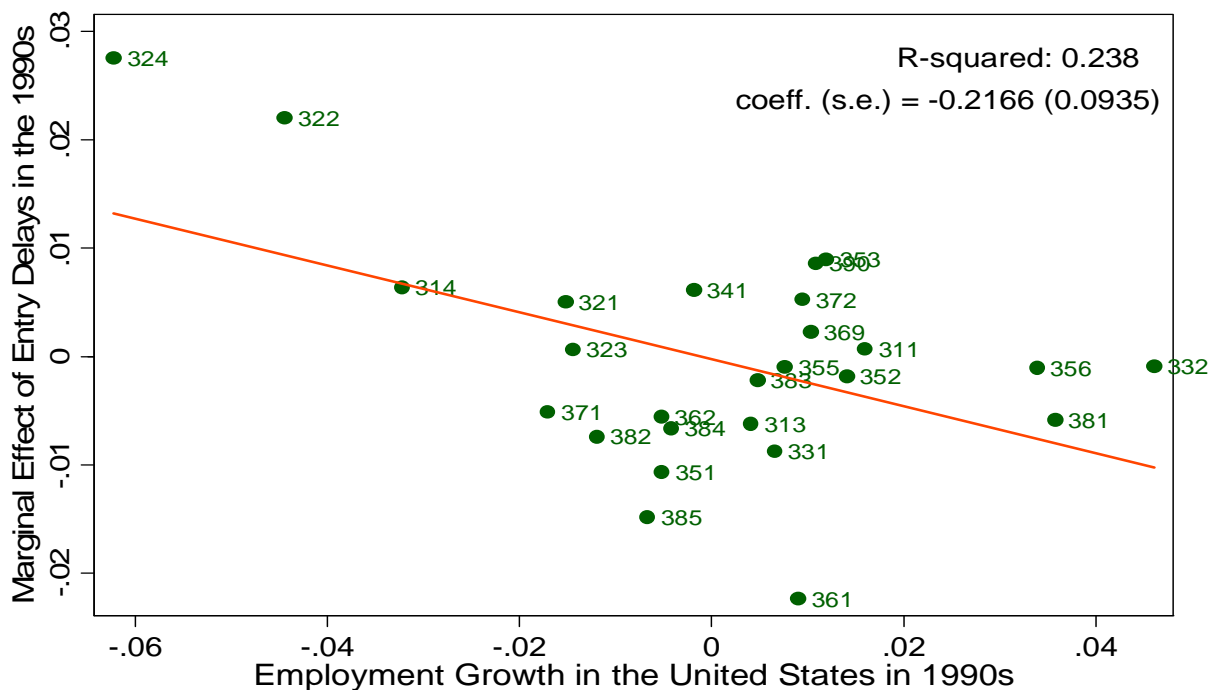
Figure 4A

Figure 4B

Figures 4A and 4B plot the (demeaned) estimated industry-specific marginal effect of entry delays (on the vertical axis) on employment growth against the two proxy measures of industry frictionless employment growth (in the horizontal axis) in the 1980s. In Figure 3A the frictionless benchmark is actual US industry employment growth (US-EMPGR). In Figure 3B the frictionless benchmark is estimated global frictionless employment growth (G-EMPGR). For the estimation of G-EMPGR we use data on all countries except the US. For details on the estimated global frictionless employment growth proxy, see Sections 3. (The industries corresponding to the codes in the figures can be found in Supplementary Appendix Table 3.)
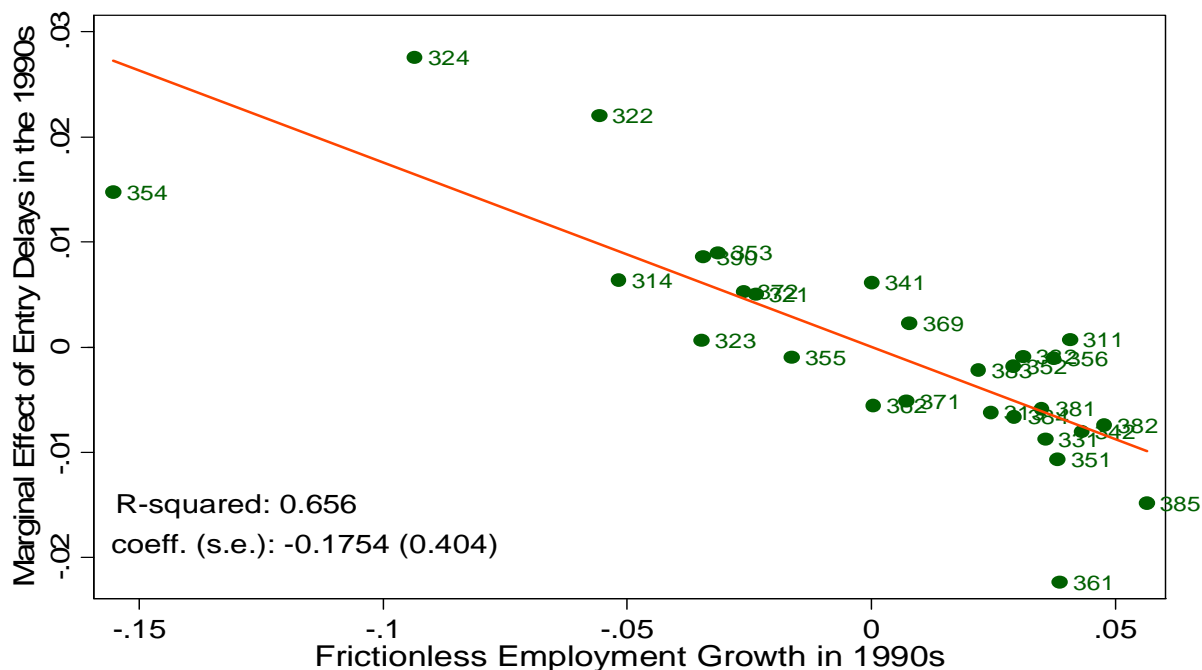
Table 1
Administrative Entry Delays and Employment Reallocation
US Benchmark Estimates

	Employment Growth 1980s			Employment Growth 1990s		
	(1)	(2)	(3)	(4)	(5)	(6)
Administrative Entry Delay X	-0.1623	-0.1781	-0.1660	-0.2206	-0.2291	-0.1863
Frictionless Employment Reallocation	(0.0380)	(0.0434)	(0.0346)	(0.0442)	(0.0506)	(0.0462)
[*ED X US-EMPGR*]	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Labor Market Regulation X		0.0040			0.0016	
Frictionless Employment Reallocation		(0.0027)			(0.0034)	
[*LMR X US-EMPGR*]		*0.13*			*0.64*	
Financial Underdevelopment X			-0.0036			-0.0032
Frictionless Employment Reallocation			(0.0015)			(0.0017)
[*FIN-UND X US-EMPGR*]			*0.02*			*0.05*
adjusted R-squared	0.376	0.384	0.395	0.388	0.387	0.394
Observations	1428	1386	1349	1001	981	975
Countries	55	53	52	43	42	42
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 1 reports OLS estimates. Heteroskedasticity - adjusted standard errors and corresponding p-values are reported in parentheses and italics respectively below the coefficients. The dependent variable is the annual growth rate of employment over the period 1980-1989 in columns (1)-(3) and over the period 1990-1999 in columns (4)-(6). The Entry Delays X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level administrative entry delays (ED). The Labor Market Regulation X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level labor market regulation (LMR). The Financial Underdevelopment X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level financial underdevelopment (FIN-UND).
All specifications include country fixed effects, industry fixed effects and the initial log level of employment at the country-industry level (coefficients not reported). The Data Appendix gives detailed variable definitions and data sources.

Table 2
Administrative Entry Delays, Financial Underdevelopment, Factor Reallocation and Industry Growth

	Employment Growth 1980s				Employment Growth 1990s			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Administrative Entry Delay X Frictionless Employment Reallocation [*ED X US-EMPGR*]	-0.1679 (0.0346) *0.00*	-0.1790 (0.0348) *0.00*	-0.1685 (0.0347) *0.00*	-0.1662 (0.0346) *0.00*	-0.2046 (0.0450) *0.00*	-0.2000 (0.0438) *0.00*	-0.1887 (0.0466) *0.00*	-0.1869 (0.0462) *0.00*
Financial Underdevelopment X External Finance Dependence [*FIN-UND X EXTFIN*]	-0.0004 (0.0001) *0.00*		-0.0004 (0.0001) *0.00*		-0.0003 (0.0001) *0.00*		-0.0003 (0.0001) *0.01*	
Financial Underdevelopment X Sales Growth [*FIN-UND X SALESGR*]		-0.0009 (0.0014) *0.50*		0.0030 (0.0020) *0.15*		-0.0045 (0.0019) *0.02*		-0.0034 (0.0021) *0.11*
Financial Underdevelopment X Frictionless Employment Reallocation [*FIN-UND X US-EMPGR*]			0.0002 (0.0019) *0.91*	-0.0060 (0.0023) *0.01*			-0.0015 (0.0018) *0.39*	-0.0017 (0.0019) *0.39*
adjusted R-squared	0.400	0.400	0.400	0.396	0.398	0.394	0.398	0.394
Observations	1349	1349	1349	1349	975	975	975	975
Countries	52	52	52	52	42	42	42	42
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2 reports OLS estimates. Heteroskedasticity - adjusted standard errors and corresponding p-values are reported in parentheses and italics respectively below the coefficients. The dependent variable is the annual growth rate of employment over the period 1980-1989 in columns (1)-(4) and over the period 1990-1999 in columns (5)-(8). The Entry Delays X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level administrative entry delays (ED). The Financial Underdevelopment X External Finance Dependence interaction is the product of industry-reliance on external finance (EXTFIN) and country-level financial underdevelopment (FIN-UND).The Financial Underdevelopment X Sales Growth interaction is the product of industry-level sales growth in the US (SALESGR) in the respective decade and country-level financial underdevelopment (FIN-UND). The Financial Underdevelopment X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level financial underdevelopment (FIN-UND).

All specifications include country fixed effects, industry fixed effects and the initial log level of employment at the country-industry level (coefficients not reported). The Data Appendix gives detailed variable definitions and data sources.

Table 3
Administrative Entry Delays and Employment Reallocation
Global Frictionless Benchmark

	Employment Growth 1980s			Employment Growth 1990s		
	(1)	(2)	(3)	(4)	(5)	(6)
Administrative Entry Delay X	-0.2066	-0.1983	-0.1004	-0.2033	-0.2083	-0.1265
Frictionless Employment Reallocation	(0.0304)	(0.0390)	(0.0162)	(0.0502)	(0.0526)	(0.0298)
[*ED X G-EMPGR*]	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Labor Market Regulation X		0.0006			0.0008	
Frictionless Employment Reallocation		(0.0023)			(0.0024)	
[*LMR X G-EMPGR*]		*0.78*			*0.75*	
Financial Underdevelopment X			-0.0046			-0.0028
Frictionless Employment Reallocation			(0.0008)			(0.0008)
[*FIN-UND X G-EMPGR*]			*0.00*			*0.00*
adjusted R-squared	0.384	0.388	0.417	0.398	0.396	0.412
Observations	1428	1386	1349	1054	1034	1027
Countries	55	53	52	43	42	42
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 3 reports OLS estimates. Heteroskedasticity - adjusted standard errors and corresponding p-values are reported in parentheses and italics respectively below the coefficients. The dependent variable is the annual growth rate of employment over the period 1980-1989 in columns (1)-(3) and over the period 1990-1999 in columns (4)-(6). The Entry Delays X Frictionless Employment Growth interaction is the product of industry-level global frictionless employment growth (G-EMPGR) in the respective decade and country-level administrative entry delays (ED). The Labor Market Regulation X Frictionless Employment Growth interaction is the product of industry-level frictionless global employment growth (G-EMPGR) in the respective decade and country-level labor market regulation (LMR). The Financial Underdevelopment X Frictionless Employment Growth interaction is the product of industry-level global employment growth (G-EMPGR) in the respective decade and country-level financial underdevelopment (FIN-UND). G-EMPGR is estimated using equation (19) in the text. See Section 3 for details.

All specifications include country fixed effects, industry fixed effects and the initial log level of employment at the country-industry level (coefficients not reported). The Data Appendix gives detailed variable definitions and data sources.

Table 4
Administrative Entry Delays and Employment Reallocation
Instrumental Variable (IV) Estimates

	Employment Growth 1980s			Employment Growth 1990s		
	(1)	(2)	(3)	(4)	(5)	(6)
Administrative Entry Delay X	-0.3781	-0.3534	-0.3536	-0.5901	-0.5799	-0.4989
Frictionless Employment Reallocation	*(0.0623)*	(0.0720)	(0.0661)	(0.1019)	(0.1105)	(0.1204)
[*ED X US-EMPGR*]	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Labor Market Regulation X		0.0013			-0.0003	
Frictionless Employment Reallocation		(0.0040)			(0.0054)	
[*LMR X US-EMPGR*]		*0.76*			*0.96*	
Financial Underdevelopment X			-0.0156			-0.0149
Frictionless Employment Reallocation			(0.0034)			(0.0042)
[*FIN-UND X US-EMPGR*]			*0.00*			*0.00*
Observations	1428	1386	1349	1001	981	975
Countries	55	53	52	43	42	42
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 reports instrumental variable (IV) estimates. Heteroskedasticity - adjusted standard errors and corresponding p-values are reported in parentheses and italics respectively below the coefficients. The dependent variable is the annual growth rate of employment over the period 1980-1989 in columns (1)-(3) and over the period 1990-1999 in columns (4)-(6). The Entry Delays X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level administrative entry delays (ED). This interaction is instrumented by an interaction between industry-level frictionless global employment growth (G-EMPGR) in the respective decade and country-level administrative entry delays (ED).

The Labor Market Regulation X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level labor market regulation (LMR). This interaction is instrumented by an interaction between industry-level frictionless global employment growth (G-EMPGR) in the respective decade and country-level administrative entry delays (LMR). The Financial Underdevelopment X Frictionless Employment Growth interaction is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level financial underdevelopment (FIN-UND). This interaction is instrumented by an interaction between industry-level frictionless global employment growth (G-EMPGR) in the respective decade and country-level financial underdevelopment (FIN-UND).

G-EMPGR is estimated using equation (19) in the text. See Section 3 for details on the construction of this measure. All specifications include country fixed effects, industry fixed effects and the initial log level of employment at the country-industry level (coefficients not reported). The Data Appendix gives detailed variable definitions and data sources.

Table 5
Administrative Entry Delays, Economic Underdevelopment and Employment Reallocation

	Employment Growth 1980s			Employment Growth 1990s		
	OLS US	OLS GLOBAL	IV	OLS US	OLS GLOBAL	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Administrative Entry Delay X	-0.1135	-0.1222	-0.2376	-0.1048	-0.0919	-0.2916
Frictionless Employment Reallocation	(0.0471)	(0.0363)	(0.0747)	(0.0500)	(0.0498)	(0.0951)
[*ED X EMPGR*]	*0.02*	*0.00*	*0.00*	*0.04*	*0.07*	*0.00*
Economic Underdevelopment X	-0.1081	-0.1648	-0.3129	-0.2713	-0.1987	-0.5705
Frictionless Employment Reallocation	(0.0739)	(0.0578)	(0.1127)	(0.0676)	(0.0413)	(0.1140)
[*EC-UND X EMPGR*]	*0.14*	*0.00*	*0.01*	*0.00*	*0.00*	*0.00*
adjusted R-squared	0.377	0.389	__	0.410	0.421	__
Observations	1428	1428	1428	954	1005	954
Countries	55	55	55	41	41	41
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 reports OLS and II estimates. Heteroskedasticity - adjusted standard errors and corresponding p-values are reported in parentheses and italics respectively below the coefficients. The dependent variable is the annual growth rate of employment over the period 1980-1989 in columns (1)-(3) and over the period 1990-1999 in columns (4)-(6). The Entry Delays X Frictionless Employment Growth interaction in columns (1) and (4) is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level administrative entry delays (ED). The Entry Delays X Frictionless Employment Growth interaction in columns (2) and (5) is the product of industry-level global frictionless employment growth (G-EMPGR) in the respective decade and country-level administrative entry delays (ED). In columns (3) and (6) we instrument the interaction of Entry Delays with US industry employment with the interaction of Entry Delays with global frictionless employment growth (G-EMPGR). The Economic Underdevelopment X Frictionless Employment Growth interaction in columns (1) and (4) is the product of industry-level employment growth in the US (US-EMPGR) in the respective decade and country-level economic underdevelopment (EC-UND). The Economic Underdevelopment X Frictionless Employment Growth interaction in columns (2) and (5) is the product of industry-level global frictionless employment growth (G-EMPGR) in the respective decade and country-level economic underdevelopment (Y). In columns (3) and (6) we instrument the interaction of economic underdevelopment with US industry employment growth with the interaction of economic underdevelopment with global frictionless employment growth (G-EMPGR).

G-EMPGR is estimated using equation (19) in the text. See Section 3 for details on the construction of this measure and the IV method. All specifications include country fixed effects, industry fixed effects and the initial log level of employment at the country-industry level (coefficients not reported). The Data Appendix gives detailed variable definitions and data sources.