Social competition and firms' location choices

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Abstract

The paper evaluates the empirical effects of labor market institutions (LMI) on foreign direct investment (FDI) decisions using an individual dataset describing French firms' expansion strategies abroad over 1992-2002. We provide evidence that labor market rigidity significantly reduces the country's attractiveness for foreign investors. In line with the literature, we notably find that stringent employment protection law (EPL) has a dampening effect on the location probability. Yet, our results tend to downplay the role of EPL, whose marginal impact on the probability to settle in is estimated weak in quantitative terms. Our results rather suggest that, among the various dimensions of LMI under study, the more influential in location choices are related to the wage bargaining process and the unemployment benefit system.

JEL Classification: F16, F21, J32
Keywords: Labor Market Institutions, Foreign Direct Investment determinants, Firm-level data

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1 Introduction

One of the most notable changes OECD countries have experienced over the last decades is the increasing liberalization in international goods and financial markets. It has notably induced a globalization of firms' production process, which is now taken on a worldwide basis in a large number of sectors. In industrialized countries, recurrent debates have emerged on the "good" way to deal with the risk of unemployment that the reorganization of firms on a worldwide basis may induce. Globalization therefore forces policy-makers to re-think the design of labor market policies. The other way round, national labor market institutions *per se* are likely to affect location decisions of firms across alternative countries. If so, this link has to be taken into consideration in the design of labor market policies, so as to assess all their expected effects on the national economy.

The paper takes part to the debate empirically. It focuses on the way labor market institutions (LMI hereafter) affect foreign direct investments (FDI), using a database describing French firms' foreign investments over the 1992-2002 period. The paper is inscribed in the New Economy Geography (NEG) tradition (Krugman, 1991) that studies the determinants of production patterns and firms' location decisions in an international setting. The empirical literature identifies two main determinants of location choices: relative production costs in all possible locations and aggregate demands, referred to as "real market potentials" (Head and Mayer, 2004*a*). On top of this, other dimensions have been shown to affect FDI decisions. Amiti and Javorcik (2008) put into evidence the proximity to suppliers (or "supply access") as a key element underlying FDI flows. Head and Mayer (2004*b*) point out the importance of mimetic behaviors, as investors have a propensity to agglomerate in countries where other firms in the same sector have already settled. The literature also investigates the role of national economic policies, notably the role of corporate taxation (Devereux and Griffith, 1998) or the quality of governance (Wei, 2000). Our paper contributes to the literature by focusing on the role of labor market regulations.

This follows a growing interest in the literature for the role of labor market institutions as a determinant of firms' location decisions. In the theoretical field, some recent contributions suggest that labor market rigidities may reduce the incentive to locate in a country. Haaland et al. (2002) thus show that employment protection deters FDI inflows in a framework with investment uncertainty. Leahy and Montagna (2000) and Haaland and Wooton (2007) obtain contrasted results regarding the role of the wage-setting centralization degree. In Haaland and Wooton (2007), a more centralized wage bargaining process raises labor costs, thus reducing the country's attractiveness for FDI. Leahy and Montagna (2000) however show that the result is sensitive to interactions between goods and labor markets.[1] Munch (2003) and Picard and Toulemonde (2006) study the role of trade unions. Both papers show that powerful trade unions, by raising the negotiated wage, have a negative impact on the country's attractiveness for foreign investments. However, the direct negative effect may be mitigated by the impact of wage bargaining on aggregate demand. Finally,

[1] In Leahy and Montagna (2000), when competition is sufficiently keener on the goods market side, the multinational firm may benefit from a more centralized bargaining process on the labor market: a higher negotiated wage indeed disfavors the local competitors that are assumed to be less productive than the multinational.

Méjean and Patureau (2010) and Pflüger (2004) obtain similar effects when studying the impact of minimum wages and social policies such as unemployment benefits.

In the empirical field, the question is usually investigated using aggregate or sectoral data (see Golub et al., 2003, Dewit et al., 2003, or Görg, 2005). Our paper differentiates from this literature by using a firm-level dataset describing French firms' expansion strategies in OECD countries. With these data, we are able to study the impact of various dimensions of labor market regulation on FDI decisions at the individual level. This strategy uses the heterogeneity of investment decisions across firms and countries to identify the potential impact of labor market institutions. Instead, aggregate empirical analysis can solely rely on the time variability, that is arguably low for labor market institutions. As a related consequence, the use of individual data allows controlling for all compositional effects that may affect aggregate FDI flows. In that respect, our paper is closely related to Javorcik and Spatareanu (2005) and Gross and Ryan (2008) that also use individual data. Likewise, we study how non-wage labor costs embodied in labor market regulations affect location choices among otherwise roughly similar countries.

Our contribution differs from these papers in two dimensions though. First, we focus on estimating the determinants of the probability that a country has to be chosen as location, in direct parallel to the theoretical insights of the New Economic Geography literature.[2] In this exercise, we pay particular attention to the way other determinants of FDI choices put into evidence in the related literature are controlled for (see Head and Mayer, 2004*a*).[3] Second, the paper differentiates from the literature by the scope of labor market institutions it considers. While most related empirical studies (Javorcik and Spatareanu, 2005, Gross and Ryan, 2008, Golub et al., 2003, among others) focus on the single role of employment protection in FDI flows, we enlarge the analysis to other dimensions of labor market regulations that affect non-wage labor costs. Beside employment protection, we thus study the role of minimum wage and unemployment benefits policies, as well as the degree of centralization of wage bargaining procedures.

Following Head and Mayer (2004*b*), the determinants of French firms' FDI decisions are estimated using a discrete choice model on all possible foreign locations. This allows explaining the probability for a French firm to invest in a given country by a set of country- and sector-specific variables.[4] The set of potential determinants used in the regressions is explicitly derived from a

[2]Javorcik and Spatareanu (2005) study the determinants of both the location probability and of the volume of FDI invested abroad, while Gross and Ryan (2008) rather focus on the employment consequences of foreign investments. Our focus on the location probability is also dictated by our database, which does not provide any information about the volume invested abroad or the induced employment effects. This drives us to restrict the analysis to the role of LMI on discrete location choices, and neglect the potential for labor rigidities to affect the volume of investment and the employment consequences.

[3]In particular, unlike Gross and Ryan (2008) and Javorcik and Spatareanu (2005), we include a "supply access" variable that captures the role of a good access to intermediate suppliers as an agglomeration force, whose key role on FDI decisions is clearly demonstrated in the literature as well as in our results. Besides, we rely on a structural measure of real market potential, based on the methodology developed by Redding and Venables (2004).

[4]Our empirical exercise thus takes as granted that the firm invests abroad. This is dictated by our data that only describes French firms' foreign investments. Our analysis is thus mute on the determinants of the decision by the firm to invest rather than exporting from France, which may also be affected by labor market considerations. The trade-off between FDI and export is studied in an empirical setting by Brainard (1997) and Head and Ries (2003), among others.

model inscribed in the New Economy Geography literature. Furthermore, our theoretical framework includes features borrowed from the labor market literature, so as to relate labor market institutions and location decisions. As in Belot and Van Ours (2004), the country-specific wage entering the marginal cost of producing in a given location results from a bargaining process between firms and employees. As a consequence, it can be expressed as a combination of various dimensions of the host country's labor market regulations. The theoretical setting delivers useful insights on the causal link between labor market institutions and FDI decisions. We test the model's predictions using firm-level data covering French firms' FDI in 27 OECD countries over the 1992-2002 period.

Our contribution to the literature is twofold. First, our results indicate that the design of labor market institutions does affect the attractiveness of a country from the firm's viewpoint. Labor market rigidity is found to exert a negative impact on the country's attractiveness for (French) foreign investors. The effect is significant when considering a synthetic index of labor market rigidity as well as with specific indicators of labor market regulations. This result is consistent with the literature that underlines the negative effect of stringent employment protection regulations on FDI inflows (Golub et al., 2003, Javorcik and Spatareanu, 2005, Gross and Ryan, 2008, among others). Yet, our results indicate that the role of labor market institutions, if significant, remains modest in comparison with the role of market potential and supplier access, which role in driving FDI inflows is reaffirmed.

Second, whereas the related literature restricts the analysis to the single role of employment protection, our paper goes deeper into this result. We indeed show that other dimensions of labor market institutions do matter as well. Precisely, stringent employment protection laws, but also a generous unemployment benefits system, strong minimum wage constraints and a highly-centralized wage bargaining process significantly reduce the propensity for firms to locate in a country. Not all LMI dimensions are found to be of same importance though. Our simulation results thus indicate that minimum wage changes have a minor effect on the probability to settle in, in comparison with other LMI dimensions. Besides, our results tend to downplay the role of EPL in FDI decisions. If significant, its marginal impact on the probability to settle in is estimated low. On the contrary, our results indicate an influential role of the organization of the wage bargaining process and the unemployment benefits system.

The rest of the paper is organized as follows. Section 2 derives the equation at the root of the estimation using tools of the new trade and the labor market literatures. Section 3 presents our dataset and the variables used to proxy the determinants of location choices underlined in Section 2. Section 4 presents estimation results. Last, Section 5 concludes.

2 The estimated equation

2.1 Main assumptions

As exposed in Devereux (2007), engaging in international activities may be described as a four-step process. First, the firm chooses whether to produce in the home economy and export to the

destination market or whether to open a subsidiary abroad. Second, if the firm plans to set a production unit abroad, it has to choose a settlement location. Third, the size of the new unit will depend on the amount invested. Last, the firm decides whether the profits should be reinvested in the foreign plant or be repatriated in the home country. Our database provides us with information on the location of French firms' new affiliates abroad. Our analysis thus focuses on the second step just described, *i.e.* the choice of the particular destination country for foreign investments.

Following Head and Mayer (2004*b*) and Amiti and Javorcik (2008), we derive the equation explaining the determinants of FDI decisions using a partial-equilibrium model inscribed in the New Economic Geography framework *à la* Krugman (1991). Conditional on investing abroad, each French firm k decides the country where to settle its affiliate among multiple location alternatives. In that decision process, the only relevant information is the ordering of profits between the various countries of the choiceset. The trade-off between alternative countries of settlement is thus explained by the relative attributes of each location.[5] Following the related literature, we assume that the fixed cost of investing abroad is not destination-specific. The firm consequently chooses location i that offers the highest operating profit among all possible locations. Calling $\pi_i^{op}(k)$ the operating profit, the probability for firm k to choose country i as location is:

$$P(\pi_i^{op}(k) > \pi_j^{op}(k)) \quad \forall j \neq i \tag{1}$$

Anticipating on our theoretical modeling (detailed below), we can write (the log of) the operating profit function in country i as:

$$\ln \pi_i^{op}(k) = a + b \ln MC_i(k) + c \ln RMP_i + \varepsilon_i(k) \tag{2}$$

where a, b and c are coefficients to be estimated. $MC_i(k)$ is the marginal cost of production in country i. Higher marginal costs negatively affect the firm's operating profit, hence the probability for country i to be chosen as location. We accordingly expect a negative sign for b. Operating profits are also positively influenced by country i's "real market potential", denoted RMP_i in Equation (2). In the NEG literature, this variable summarizes the potential demand addressed to the firm that decides to locate in country i. It sums national real demands over all countries attainable from i, weighted by accessibility from country i. In accordance with the NEG framework, we expect a positive sign for c. Last, $\varepsilon_i(k)$ in Equation (2) is a random term capturing the effect of unobserved components of operating profits.

In the following, Equation (1) is estimated using a discrete choice model with an univariate extreme value marginal distribution of the $\varepsilon_i(k)$ errors. Investment decisions are assumed to be independent from one another in this setting. This allows us using the conditional logit model to derive the probability for each potential location to receive the French firm's investment.[6] The estimation strategy therefore assumes a structure of errors correlation that is specific to each investment

[5] In what follows, we do not distinguish firms that decide to build an entirely new plant abroad and those that buy an existing one, as our dataset does not allow to make the distinction between greenfield and brownfield investments.

[6] The focus of the paper fully conditions our choice of a conditional logit model, rather than the multinomial logit model. While the multinomial logit puts emphasis on the role of individuals' characteristics in being in certain categories of a dependent variable, the conditional logit model evaluates how the characteristics of the categories affect individuals' likelihood of being in them. In that respect, it is better suited to our purpose.

and identifies coefficients using the cross-country variability. Since multiple investment decisions made by the same French firm k may induce the residuals to be heteroscedastic, we run regressions with clustered errors by firm (k). That way, we account for correlations across investments within a single firm while assuming independence between firms.

The representation of firms' location choices based on Equation (2) is commonly used in the literature that estimates the determinants of FDI decisions using individual data (Head and Mayer, 2004*b*, among others). The originality of the paper lies in the introduction of a subset of explicative variables related to the labor market functioning. In what follows, we accordingly focus on that aspect. This requires a detailed modeling of the determinants of marginal costs.

2.2 Determinants of marginal costs

The modeling of production costs is guided by several concerns. First, as notably underlined by Dickens et al. (1999), minimum wages are an important feature of a large number of national labor markets. Further, Picard and Toulemonde (2006) and Méjean and Patureau (2010) obtain contrasted theoretical results when they investigate location decisions in a new economic geography framework with minimum wages. These elements lead us to investigate their role empirically. To that aim, production in country i is assumed to use workers paid at the minimum wage level $\underline{w}_i$ (say, unskilled workers). Second, we want to enlarge the set of labor market institutions beyond minimum wages. Based on the insights of the labor market literature (Cahuc and Zylberberg, 2004, Belot and Van Ours, 2004, among others), we assume that production also requires another type of labor (say, skilled labor). The skilled equilibrium wage w_i^q results from a negotiation between firms and unions. As such, it is notably affected by the set of labor market institutions in place.[7] Third, previous empirical papers have put forward other cost determinants susceptible to influence firms' location choices, notably the price of intermediate goods incorporated in the production process (Amiti and Javorcik, 2008) and various transaction costs (Head and Mayer, 2004*a*). Such elements are taken into account by including a third production factor, whose price z_i is proxied by several indicators detailed in Section 3.

Once settled in country i, firm k is assumed to produce using a Cobb-Douglas technology combining both types of labor and the third production factor, according to:

$$y_i(k) = A(k)A_i k_i(k)^{\gamma} l_i(k)^{\chi} h_i(k)^{\alpha}, \quad \alpha + \gamma + \chi = 1 \tag{3}$$

with $y_i(k)$ the quantity produced, $l_i(k)$ and $h_i(k)$ the use of unskilled and skilled labor, $k_i(k)$ the consumption of the third production factor, A_i the total factor productivity in country i and $A(k)$ the firm's individual productivity, assumed transferrable to its foreign affiliate.

Firms in monopolistic competition in the production of differentiated varieties, are distributed over the continuum $[0;1]$ within country i. We denote by $p_i(k)$ the price chosen by the firm for its sales in country i. With iceberg transportation costs τ_{ij} and mill-pricing, the price in other

[7] Pflüger (2004) adopts a similar modeling strategy in a New Economic Geography framework.

countries is $p_i(k)\tau_{ij}$. The program of the representative firm consists in the maximization of the following profit function:

$$\max_{p_i(k),y_i(k)} \pi_i^{op}(k) = p_i(k)y_i(k) - (1+\rho f_i)\left[\underline{w}_i l_i(k) + w_i^q h_i(k)\right] + z_i k_i(k) \tag{4}$$

under the technological constraint (3) and the demand function:

$$y_i(k) \geq p_i(k)^{-\sigma} RMP_i \tag{5}$$

with RMP_i the real market potential of country i, whose expression is given by:

$$RMP_i = \sum_j I_j P_j^{\sigma-1} \phi_{ij}$$

where I_j is the nominal expenditure in country j, P_j the price level and $\phi_{ij} \equiv \tau_{ij}^{1-\sigma}$ a measure of the "freeness" of trade between i and j, that increases from 0 to 1 when trade becomes easier.

The profit equation (4) introduces employment protection through firing costs f_i. As in Haaland and Wooton (2007), firms are assumed to face a catastrophic shock with probability ρ that results in the plant's closure and all workers being fired. Should the firm be forced to close down its factory, it has to pay compensation to each worker f_i proportional to the wage rate.

Solving this program yields the optimal price:

$$p_i(k) = \frac{\sigma}{\sigma-1} MC_i(k) \tag{6}$$

with the optimal marginal cost $MC_i(k)$ given by:[8]

$$MC_i(k) = \frac{1}{\alpha^\alpha \chi^\chi \gamma^\gamma} \frac{1}{A_i A(k)} \left[w_i^q\right]^\alpha \left[\underline{w}_i\right]^\chi \left[1+\rho f_i\right]^{\alpha+\chi} \left[z_i\right]^\gamma \tag{7}$$

In Equation (7), w_i^q is the skilled-labor wage. Following Belot and Van Ours's (2004) right-to-manage model, w_i^q is assumed to result from a Nash-bargaining process between unions and firms, the employment level then being determined by the firms' labor demand. When negotiations are fully centralized (when Nash-bargaining takes place at the national level), the equilibrium negotiated wage of skilled workers can be expressed as:

$$w_i^q = \left[1 + \frac{\mu\beta_i}{1-\mu}\right] \frac{b_i}{1+\rho f_i} \tag{8}$$

Equation (8) delivers an expression of the equilibrium skilled-labor wage as a function of the labor market institutions in place in country i. b_i denotes unemployment benefits, that intervene in the

[8]Strictly speaking, the cost function in Equation (7) implies that there is always a binding minimum wage for unskilled labor. This is however not the case in all countries of our choiceset in which French firms may invest. Our estimation strategy deals with this problem as follows. In presence of a minimum wage legislation in the host country i, we assume that it is binding for unskilled workers, therefore affecting the marginal cost of producing in i. In the absence of a minimum wage legislation in i, we would ideally use the relative wages of unskilled workers to stick to Equation (7). However, obtaining detailed information on relative wages in the data turns out to be very difficult. In this case, we simply abstract from this problem by assuming that both skilled and unskilled workers are paid at the same average wage rate.

worker's outside option and β_i the union's bargaining power ($0 < \beta_i < 1$). $\mu = 1 - \alpha\frac{\sigma-1}{\sigma}$ is interpreted by Belot and Van Ours (2004) as the effective degree of firms' monopoly power.

According to Equation (8), an increase in the union's bargaining power (β_i) or unemployment benefits (b_i) raises the negotiated wage, while an increase in firing costs (f_i) reduces it. All three elements thus affect labor costs paid by the affiliate in country i and are likely to enter the French firm's investment decision. While high values of b_i and β_i always increase marginal costs, the effect of firing costs f_i is ambiguous. On the one hand, high firing costs reduce the negotiated net wage w_i^q (Equation (8)). On the other hand, by raising the labor cost for any given wage level, they exert an upward pressure on the skilled labor cost (Equation (7)). The final effect on marginal costs, and location decisions, is thus uncertain.

Equation (8) is obtained in the special case of a fully centralized bargaining process. When allowing for a less-than-fully centralized procedure, Belot and Van Ours (2004) obtain the prediction that the more centralized the wage bargaining process is, the lower the negotiated wage. When wage bargaining is decentralized at the firm level, trade unions can indeed extract a higher rent, leading to a higher negotiated wage in the symmetric equilibrium. Transposing this result in our framework would yield the prediction that more decentralized bargaining procedures deter the country's attractiveness for FDI. We do not take this prediction as granted though. The effect of the centralization of wage bargaining on wages is indeed a controversial issue in the labor market literature, both in the empirical and theoretical fields (see Cahuc and Zylberberg, 2004, Chapter 12, for a survey). Its impact on location decisions is not clear either. By exerting an upward pressure on labor costs, bargaining procedures reduce the country's attractiveness in Haaland and Wooton (2007) model. However, Leahy and Montagna (2000) show that the result is sensitive to the extent of competition between local firms and multinationals. Our paper contributes to clarify the topic using an empirical approach.

2.3 The conditional logit estimation method

The next step of our conditional logit strategy consists in generating the set of alternatives each decision maker (*i.e.* each French firm k) faces. Each observation is thus duplicated over the whole set of countries. We then build an indicator variable $fdi_{ij}(k)$ equal to one if firm k invests in the corresponding country i among the set of potential locations j, and zero otherwise:

$$fdi_{ij}(k) = \begin{cases} 1 & \text{if } j = i \\ 0 & \text{if } j \neq i \end{cases}$$

The conditional logit model estimates the probability that $fdi_{ij}(k) = 1$, that is:

$$\begin{aligned} &Pr(fdi_{ij}(k) = 1) = Pr\left[\ln \pi_i^{op}(k) > \ln \pi_j^{op}(k)\right] \quad \forall j \neq i \\ &= Pr\left[\varepsilon_i(k) - \varepsilon_j(k) > -b\left[\ln MC_i(k) - \ln MC_j(k)\right] - c\left[\ln RMP_i - \ln RMP_j\right]\right] \end{aligned} \tag{9}$$

Incorporating the log-linearized version of Equations (7) and (8) leaves us with a model explaining firms' location choices by *i)* the real market potential, *ii)* the cost of immobile factors and *iii)*

various aspects of the labor market functioning in each location. The next section describes the way these determinants are measured empirically.

3 Data description

3.1 French firms' FDI decisions

The dataset describing French firms' foreign expansion strategies is based on *"LIFI"* conducted by the French official statistics institute (INSEE). The survey provides information on the creation of foreign affiliates by French firms, including the location of the new production unit and the year of investment over the 1992-2002 period. We restrict the analysis to firms that operate in the manufacturing sector and invest in OECD countries. While the geographical restriction is meant to homogenize the country sample, this is not too limitative since more than 70% of investments covered by the survey are indeed located in OECD countries. This leaves us with 2,776 investment decisions in 27 OECD foreign countries.

Figure 1 illustrates the spatial distribution of investments. Over the 1992-2002 period, a vast majority of French firms invests in West Europe. This is related to the European integration process that makes the mobility of factors within the European Union easier. Besides EU investments, French firms tend to invest in Eastern and Central Europe as well as in North America. The share of investments flying to Asian, South American and Oceanic countries is much smaller, notably because few OECD countries are located in these regions. The distribution of FDI across countries within West Europe is reported Figure 2. Most French firms invest in the "core" European countries (Germany, Belgium, Great-Britain, Italy and Spain).

[Insert Figure 1]

[Insert Figure 2]

As explained in Section 2, our identification strategy implicitly assumes foreign investments to be the outcome of decisions that are independent from each other. To evaluate the pertinence of the assumption, Figure 3 (black bars) illustrates the number of investments taken by each single firm in our sample.

[Insert Figure 3]

More than one fifth of the investments are taken by a firm that will not invest a second time during the period of observation. Those investments can indeed be considered as independent from each other since they are the outcome of decision processes taken within totally different entities. However, a large number of firms do invest several times. On average, these are the largest firms in

the sample as illustrated by the increasing relationship between the number of investments realized by a single firm and its mean size (measured by average employment, grey bars in Figure 3). Those investments occurring within the same firm may not be independent from each other. For instance, a firm might decide to open several affiliates in the same country in order to locate its whole productive process in the same area. On the contrary, a firm trying to diversify its foreign markets may choose to open one affiliate in one part of the world, then another one in a different continent. We account for such potential within-firm interactions between investment decisions using firm-level clusters to correct estimated standard deviations from the correlation of residuals.[9]

3.2 The set of explanatory variables

We evaluate the determinants of opening a subsidiary in country i, relying on the theoretical FDI motives included in Equation (2). Strictly speaking, firms' location decision should be related to a cross-country comparison of expected profits. Nevertheless, the determinants of FDI decisions are considered the year of investment. This assumption is usually retained in the literature, as it prevents the econometrician from putting more constraints on the formation of firms' expectations. Since the identification of parameters uses the cross-country variability, it is sufficient to assume that determinants observed the year of investment are correlated with the variables entering the expectation function.

3.2.1 Labor costs

In our theoretical framework, labor market institutions play a role through three different channels, the minimum wage $\underline{w}_i$ remunerating low-skilled workers in country i, the negotiated wage w_i^q paid to skilled workers and firing costs f_i. Moreover, the equilibrium wage resulting from the Nash-bargaining process (w_i^q) depends on the union's bargaining power β_i, unemployment benefits b_i, the firing cost f_i and the degree of centralization of the wage-bargaining process. These various dimensions of labor market regulations thereby affect the operating profit expected from country i, hence location decisions.

The corresponding labor market indicators are captured using information contained in two alternative databases. We first use the *Economic Freedom of the World* database (EF) constructed by the Fraser Institute (Gwartney and Lawson, 2006). The different indicators contained in the database are obtained from an annual survey covering a broad array of issues, including the size of the government, legal structures and the security of property rights, the access to sound money, the freedom to trade internationally, and the regulation of credit, labor, and business. In particular, labor market indicators are derived from answers to the *Global Competitiveness Report* of the World Economic Forum. As such, the information contained in these indicators is mostly subjective. As an alternative source of labor market data, we use the OECD's *Labor statistics* database that

[9]To ensure the robustness of our results on that point, we also ran regressions on the database restricted to the sub-sample of firms that invested no more than once over the period, at the cost of a substantial reduction in the number of observations (587 FDI in 26 OECD countries). We obtain roughly similar results, which are not reported here for space saving but are available upon request to the authors.

compiles legal information obtained from national sources. We view the use of the two datasets as complementary. The EF databse contains an indicator of the overall degree of labor market rigidity, which encompasses the wide range of LMI variables that intervene in the marginal cost expression (7). Using this synthetic variable is precious as it allows to estimate the effect of the overall labor market rigidity on location choices (Section 4.2). When decomposing the effect of the overall index in its various sub-components, we can rely on both EF and OECD sources (Section 4.3). The obtention of effects going in the same direction thus delivers a valuable robustness check. In the opposite case, the obtention of divergent results calls for caution in the interpretation of results.

Whatever the source, LMI variables are provided on a yearly basis. From an econometric point of view, the use of explanatory variables in place the same year location decisions took place may arguably give rise to simultaneity issues. We do not view this as a serious concern here. As we consider individual binary choices of investment from a single country (France), there is little chance that endogeneity emerges between labor market institutions, which are long-run and low time-variant indicators, and location decisions occurring at the firm level.

We now come into the details of the LMI variables. As just discussed, the *Economic Freedom* database provides us with a synthetic index of the overall degree of rigidity of the labor market (denoted "Synthetic LMI Index, EF" in the tables). This variable sums up the following dimensions of the labor market functioning: *1)* the hiring and firing practices, *2)* the degree of centralization of wage bargaining, *3)* the unemployment benefit system, *4)* the minimum wage legislation, and *5)* the use of conscripts to obtain military personnel. Except for the last dimension, these are precisely the labor market institutions we are interested in. The index takes values between 0 and 100, increasing with the degree of labor market rigidity.

When investigating the role of each particular dimension of labor market institutions which is encompassed in the synthetic index, we rely on the following labor market variables:

- **Firing costs** (f_i) are approximated by the Hiring and Firing Practices index of *Economic Freedom*. The variable, denoted "Hir. & Fir. Index, EF" in the tables, is increasing with the difficulty of hiring and firing workers. As an alternative, we use the OECD's Employment Protection Legislation index for all workers ("EPL, OECD"). It is defined over the [0;100] interval increasing with the strictness of employment protection.

- **The degree of centralization of bargaining procedures** is measured by the variable called "Centralization Index, EF". It is related to the share of the labor force whose wages are set by a centralized collective bargaining. The variable increases with the degree of centralization of wage bargaining. In OECD data, the variable is proxied by the "Degree of centralization of wage bargaining". In the regressions, it is introduced through binary variables denoted "Centralization $=i$, OECD" with $i = 1, 2, 3, 4$ and 5 increasing in the degree of centralization. The reference dummy corresponds to the most decentralized case ($i = 1$).

- **The generosity of the unemployment benefit system** is captured by the "Unemployment Benefits" variable in *Economic Freedom*. It measures the extent to which the unemployment

benefit system affects the incentive to work. As such, it does not strictly match the unemployment benefit level (b_i). Yet, a high value of the indicator (scaled over [0;100]) can be interpreted as capturing a generous unemployment benefit system. By raising the worker's outside option in the Nash-bargaining, this exerts an upward pressure on the negotiated wage. The alternative OECD variable is the gross benefit replacement rate. It is expressed in percentage points and denoted "Ben. Repl. ratio (%), OECD" in the tables.

- **The minimum wage legislation** proxying $\underline{w}_i$ is captured by the "Minimum wage impact" variable in *Economic Freedom*. The variable (denoted "Min. Wage Impact, EF") is increasing with the strictness of the minimum wage legislation (precisely with the magnitude of its impact and the strength of enforcement, as so defined). As an alternative, we use the ratio of minimum over median wage, constructed from OECD and ILO data. Beyond minimum wage *per se*, it can be considered as measuring the degree of constraint that the minimum wage legislation introduces. It is denoted "Min. wage ratio (%), OECD".[10]

As discussed in Section (2), and given the construction of our LMI variables, we expect a negative sign associated with most of them in the regressions, as more rigid labor market institutions are found to increase the marginal cost (Equation (7)) hence reduce the propensity to settle in (Equation (9)). The only exception is the firing costs variable, whose effect on the marginal cost is indeterminate in the model.

Table 1 displays some descriptive statistics of the distribution of the LMI variables. We notably report the number of countries covered and the mean value of the LMI variable (averaged over the period and the country sample). Detailed country coverage is reported in Table 7 of Appendix A.1. Table 1 also reports moments calculated in the cross-country dimension (the "between-country" statistics), using the mean value over the period for each country, and in the time dimension (the "within-country" statistics), considering the mean value over the country sample for each year. Since our identification strategy is mostly cross-sectional, we have to check that the between-country variability is sufficient in our data. As indicated in Table 1, labor market institutions exhibit a substantial degree of cross-country heterogeneity. As expected, the variability is way larger between countries than in the time dimension.

[Insert Table 1]

3.2.2 Other control variables

Real market potential: Several market potential indicators can be found in the empirical literature. We retain the structural measure proposed by Redding and Venables (2004). As detailed in Appendix A.2, it is built based on a gravity-type equation estimated annually between 1992 and 2002. In the conditional logit, the variable is taken in logarithm and denoted "ln real market

[10] See Appendix A.1 for details.

potential". Since the variable is generated from a first-stage estimation, its inclusion in Equation (2) makes the OLS standard errors invalid. We thus employ bootstrap techniques to obtain correct standard errors and fix the number of replications to 100. In relation with the theoretical model, we expect a positive sign associated with the real market potential variable.

Supply access: The inclusion of intermediate goods in the production function creates an incentive for firms to locate where they are the cheapest, *i.e.* near intermediate good suppliers. Following Amiti and Javorcik (2008), we build a "supply access" variable that measures the access to intermediate suppliers in each potential location. As in Amiti and Javorcik (2008), we build the corresponding country- and sector-specific variable annually using information about the actual matrix of inter-industry linkages (*i.e.*, the French Input/Output tables). To avoid simultaneity issues, regressions use the lag value of the variable (taken in log and denoted "ln (supply access -1)"). We expect a positive sign associated with it, since a better access to intermediate suppliers is supposed to reduce the price of inputs for the subsidiary, thereby reducing marginal cost in Equation (7).

Other controls: As standard in the related literature, we control for transaction costs linked to various determinants of the "easiness" for investing in a specific country. These control variables are meant to capture the role of total factor productivity in Equation (7). First, we control for information and communication costs using the distance between France and the host country (taken in log and denoted "ln distance").

Second, we consider that the affiliate's productivity level may be affected by positive spillovers due to past investment decisions taken by French firms in the same industry. Head and Mayer (2004*a*) indeed point out the importance of mimetic behaviors of investors as a determinant of location decisions. We capture these spillovers using a variable measuring the cumulated number of French subsidiaries of the same industry that have settled in the past in country i (in log, denoted "ln(# of same ind. firms -1)"). Note that the variable may also capture some country-specific characteristics that have been influencing location decisions in the past and nowadays, beyond "pure" spillover effects. In any case, we expect a positive sign of the coefficients associated with the variable in the regressions.

Third, we control for country i's current GDP per capita (taken in log). This variable is commonly used in the empirical literature on FDI determinants. As underlined by Javorcik and Spatareanu (2005) or Bénassy-Quéré et al. (2007), GDP per capita is notably correlated with high labor costs in the host country. Beyond wages, GDP per capita also captures the overall remuneration of production factors and is used as such by Redding and Venables (2004). As a result, we expect a negative sign associated with it, as a higher GDP per capita raises marginal costs (Equation (7)) thus reducing the propensity to settle in.

Details on the construction of these control variables are provided in Appendix A.2.

4 Estimation

This section estimates the role of labor market institutions on French firms' FDI decisions. We proceed as follows. In a first step, we estimate a baseline specification that assesses the impact of a standard set of explanatory variables found in the related literature. This allows us to check the consistency of our data with usual findings. In a second step, we study the role of labor market institutions by including them in the baseline specification. We start with the synthetic index of labor market rigidity, before studying the particular impact of different institutions.

4.1 Baseline specification

Results of the conditional logit model are reported in Table 2. Consider first column (A) that displays estimation results for the baseline regression excluding labor market institutions.

[Insert Table 2]

As expected, the market potential variable enters with a positive sign in the regression. With the variable in log, the estimated coefficient can be interpreted as the elasticity of the mean probability of a country to be chosen as location (Train, 2003): increasing a country's real market potential by 10% inflates its probability to be chosen as location by about 4% on average. The impact of market potential is thus sizeable, in line with usual findings in the literature.

With regards to variables capturing production costs, results are also consistent with the literature. The incentive to invest in a given country is negatively correlated with its GDP per capita, with an elasticity around 0.35. Moreover, vertically-linked agglomeration forces are found to have a significant impact on firms' location choices. The positive sign associated with the supply access variable means that firms are more likely to move close to suppliers, as it reduces transportation costs on intermediate inputs.

Distance enters the estimated equation with a positive sign: The farther the host country, the higher the tendency for French firms to invest. This result is consistent with the literature on horizontal FDI, notably Helpman et al. (2004), which shows how the incentive to invest in a foreign country increases with the difficulty to serve it directly through exports, approximated by the distance from France in Table 2.

Finally, the benchmark specification displays a positive coefficient associated with the spillover variable ("ln (# of same ind. firms -1)"). This suggests the presence of externalities among French investors, such as better market knowledge, easier administrative procedures and more broadly, production externalities that make them aggregate in the same foreign location. We do not wish to push the interpretation of the coefficient too much however, since its impact can also capture unobserved amenities of the host country that do not vary over time. These amenities may affect French firms' location choices throughout the period, thus explaining the agglomeration process we estimate. As such, we view the status of this variable as a control for unobserved determinants of FDI that may possibly be correlated with the labor market institutions we are more particularly interested in.

4.2 FDI decisions and overall labor market rigidity

Having checked that our data confirm the usual findings in the related literature, both quantitatively and qualitatively, we now consider the specific impact of labor market institutions on location choices. Namely, Column (B) in Table 2 augments the estimated equation with the synthetic LMI variable provided by *Economic Freedom*. The regressor is increasing in the overall rigidity of the host country's labor market. Results displayed in Column (B) thus indicate that more rigid labor markets significantly deter firms from investing in a given country, everything else equal. Moreover, the inclusion of the LMI index significantly improves the data fit.[11]

If significant, one may wonder whether the effect is quantitatively important. To investigate that point, we first run the following experiment. Suppose that a labor market reform raises the rigidity of the labor market from the lowest to the highest level observed in our dataset (that is, from 26 (the US) to 68 (Germany)). According to our results, this reduces the probability to be chosen as location by a factor of two.[12] As such, the quantitative impact of labor market policies is not negligible.

Second, we evaluate its role in comparison with that of other FDI determinants. Namely, we run simulations to infer the marginal effect on the probability to be chosen as host country of a marginal change in each explanatory variable. Table 3 thus displays the percentage change in the probability to be chosen as location attributable to a one standard deviation increase in the host country's real market potential (column (A)), its spillover variable (column (B)), its supply access (column (C), its GDP per capita (D) and its synthetic LMI index (column (E)). Since the probability adjustment depends on the country's initial characteristics, we report the simulations results for the mean and median countries of the sample as well as for each individual country.

Results reported in Table 3 call for two main comments. First, although they confirm that the role of labor market institutions is not negligible, they also show that the effect is modest in comparison with those of market potential and supply access. Providing a large access to final demand and suppliers thus appears as a key determinant of location choices. This result stands in accordance with the FDI literature (Combes et al., 2008, Chapter 12). In comparison, the effect of labor market institutions is much more modest, and of similar magnitude as the spillover variable. A one standard deviation increase in the real market potential raises the probability to be chosen by 2.8 percentage points on average, while the same change in the LMI index reduces the probability by 0.7 percentage point. GDP per capita, which captures the overall cost of factors, has a slightly larger effect on the location probability, even though far below the role of market potential and

[11] This is confirmed by a likelihood ratio test of model (B) versus model (A), which rejects the null assumption with a $\chi^2(1) = 263.43$ and an associated $p-$value of 0.00.

[12] As detailed by Train (2003), with a variable introduced in level, the estimated coefficient can be interpreted as a semi-elasticity of the mean probability for a country to be chosen as location. For two potential locations j and k sharing the exact same characteristics but the level of their synthetic LMI index ($LMI_j \neq LMI_k$), we have:

$$\frac{P_j}{P_k} = exp[\hat{\beta}(LMI_j - LMI_k)]$$

where P_j/P_k is the relative probability for j to be chosen as location and $\hat{\beta}$ the estimated coefficient on the LMI variable.

supply access.

Second, Table 3 indicates that the marginal impact of labor market institutions sensibly differs among potential host countries. French firms are more reactive to changes in labor market conditions in the "core" Western European countries, US and Japan. This suggests that the sensitivity to labor market conditions is correlated with the probability to invest. This is confirmed by Figure 4, according to which the marginal impact of the LMI index is increasing in the number of FDI received by each country in the sample.[13]

[Insert Table 3]

[Insert Figure 4]

Before going forward, we test the robustness of the LMI effect to additional control variables that have been shown to affect location choices in previous empirical studies.[14] Since the extent of rigidities in the labor market might be correlated with other institutional variables, one may be concerned that the impact of LMI found in Table 2, Column (B) reflects other things but the effect of rigidities on the level of labor costs paid by the affiliate. In Table 2, column (C), we thus control for governance, using the indicator provided by Kaufmann et al. (2005) and notably used in Javorcik and Spatareanu (2005). Bénassy-Quéré et al. (2007) and Wei (2000), among others, indeed show how bad governance can make firms reluctant to invest in a given country. As expected, we also find that better governance positively affects the probability to settle in. Yet, the coefficient is weakly significant, which is not surprising in a sample of OECD countries where the level of governance is already high. Further, even once governance is controlled for, the impact of labor market rigidities remains significant and its magnitude is unchanged.

Table 2, column (D) then controls for the level of corporate taxation in the potential host country. The link between tax policy and international capital flows has indeed been largely studied in the literature, as surveyed by Devereux (2007). As expected, the effect of higher corporate taxes is (slightly) negative. However, controlling for the variable does not have much of an impact on the LMI effect. This continues to hold true when both the governance and the corporate tax variables are introduced together in the estimation (Table 2, column (E)).

Finally, column (F) tests the robustness of our effect to the way average labor costs in the host country are measured. Until now, we have followed the literature that uses GDP per capita as a proxy for wages and other country-specific features affecting the level of production costs the firm can expect from settling in the country. Column (F) instead uses the mean compensation per employee in the manufacturing sector provided by the OECD's *Main Economic Indicators* database.

[13]Note that this is not specific to the LMI dimension though, as the percentage point change in the probability to be chosen is also the highest for these countries following a marginal change in real market potential, supply access and technological spillover.

[14]See Appendix A.2 for details on these variables' definitions and sources.

Results confirm our priors: higher wages reduce the likelihood for a country to be chosen as location and the impact of labor markets being more rigid remains significantly negative.

As a whole, results reported in Tables 2 and 3 emphasize the significant and robust negative impact of labor market rigidities on location choices. This stands in line with the related empirical literature that obtains a negative effect of stringent employment protection on FDI inflows (Javorcik and Spatareanu, 2005 and Gross and Ryan, 2008, among others).

4.3 The role of the specific LMI dimensions

This section goes deeper into the result that labor market institutions matter in FDI decisions. As previously mentioned, the synthetic LMI index encompasses many dimensions of labor market regulations, which do not necessarily have the same importance on FDI decisions. In this section, we study the specific role of each dimension. This detailed analysis differentiates us from the rest of the literature that generally captures the effect of labor market regulations on FDI decisions through the single dimension of employment protection laws. Yet, investigating the role of various dimensions of labor market institutions is important for at least two reasons. First, this is informative about the potential role of other dimensions of labor market regulations in affecting FDI choices. Second, it allows us to assess whether the result commonly found in the literature, that stringent employment protection discourages FDI inflows, is robust to the inclusion of other LMI dimensions.

Table 4 reports estimation results when the strictness of employment protection (measured by the "Hiring & Firing index"), the degree of centralization of wage bargaining, the generosity of the unemployment benefit system and the strictness of minimum wage policy are included as regressors. We first include each LMI variable separately (columns (A) to (D)) before including them simultaneously (column (E)) to discuss the relative importance of each of these measures for firms' location choices. In Table 4, these variables are those of the *Economic Freedom* database. We then test the robustness of the results using the LMI variables measured by OECD (Table 5).

[Insert Table 4]

[Insert Table 5]

Consistent with estimates based on the synthetic LMI index (Table 2), all LMI variables are significant and negatively signed when included separately in the baseline regression. This result holds either when LMI variables come from *Economic Freedom* (Table 4) or OECD (Table 5). We ensure the robustness of the results by testing the overall significance of the specifications including LMI variables against the baseline model of Table 4, column (A). The χ^2-statistics and p-values associated to likelihood ratios tests displayed in Tables 4 and 5 indicate that each LMI indicator is jointly significant with the control variables, and that its inclusion in the baseline regression significantly improves the model's fit.

Results in column (A) of Tables 4 and 5 show that stringent employment protection laws reduce the propensity of firms to settle in the country. Referring to our theoretical framework, the estimated negative impact suggests that the direct upward effect of firing costs on the marginal cost of producing dominates its indirect effect on the negotiated wage, thereby detering FDI. To evaluate the quantitative effect of the variable, we run a similar experiment as before. Suppose a labor market reform that raises employment protection from the lowest to the highest mean level observed in our sample of countries. When using the Hirings and Firing Index (EF sources, Table 4), such a reform is found to reduce the probability to be chosen as location by 36% everything else unchanged.[15] When considering the OECD EPL index (Table 5), the quantitative impact is even stronger (54%), notably because the dispersion of EPL indices is larger in OECD data. The quantitative impact of employment protection regulations on FDI choices is thus sizeable. This result is consistent with the related empirical literature, as Dewit et al. (2009), Gross and Ryan (2008) or Javorcik and Spatareanu (2005).

Column (B) in Table 4 reports a negative effect of the centralization of wage bargaining on the probability to settle in. The effect is confirmed in Table 5, column (B), that uses the OECD data on centralization. Increasing the EF's centralization index from 20.6 (USA) to 64.5 (Germany) reduces the probability for the country to be chosen as location by 48%. The effect is more pronounced (74%) when the country switches from the lowest level of centralization defined by the OECD (the reference dummy Centralization = 1) to the highest level (Centralization = 5).[16] The impact of centralization on location choices may be rationalized as follows. Highly centralized bargaining implies that each individual firm does not have much control on the wage level in place in the country. This may be particularly costly for foreign firms that settle in, as their weight in the bargaining process is likely to be overwhelmed by that of national firms. The lack of control on the local workforce's wages may thus explain the aversion of French firms for highly-centralized bargaining procedures. This relation can be formally obtained in a model with firm-specific risks of failure and a fixed cost of exiting the market, as in Haaland and Wooton (2007).

The model in Section 2 indicates that higher unemployment benefits raise the negotiated wage, hence reduce the incentive for FDI. Results reported in Tables 4 and 5, column (C), are consistent with the prediction. Namely, they indicate that the probability to be chosen as location is decreasing in the generosity of the unemployment benefit system. In quantitative terms, increasing unemployment benefits from the lowest to the highest level observed in the sample reduces the location probability by 46% with EF data and 51% with the OECD data.

[15] That is, for a change in the Hirings and Firings Index from 24.7 (Denmark) to 75.1 (Italy), we get :

$$\frac{Pr(\text{high EPL})}{Pr(\text{low EPL})} = \exp(-0.009 \times (75.1 - 24.7)) = 0.64$$

[16] As a discrete variable, the degree of centralization (OECD sources) is converted into as many dummies as the number of categories of the indicator. In this case, estimated coefficients can be interpreted in relative terms. For instance, calling $\hat{\beta}_2$ and $\hat{\beta}_5$ the coefficients associated to the dummies "Centralization= 5" and "Centralization= 2" respectively, the ratio $\exp(\hat{\beta}_5)/\exp(\hat{\beta}_2)$ measures the relative probability that a representative country with a high level of bargaining centralization is chosen as location, in comparison with the same country with a low level of centralization.

Finally, columns (D) in Tables 4 and 5 display a negative impact of minimum wage laws on the probability to settle in, again consistent with the predictions of the model. Yet, the quantitative impact is somewhat smaller than what is obtained with the other labor market institutions: Raising the minimum wage from its lowest to its highest level in the sample thus reduces the location probability by only 12% in the EF data, and 56% in the regression using OECD LMI variables.

To deepen the analysis of the quantitative effects of the various labor market institutions under focus, we run simulations based on the previous estimations. Namely, we sequentially simulate a one standard-deviation increase in each labor market variable *ceteris paribus* and derive the change in the location probability for each country in the sample. Table 6 reports the simulations results for LMI variables provided by *Economic Freedom*. Simulation results for OECD LMI variables are reported in Appendix B.2, Table 9. For sake of comparison, Tables 6 and 9 also report the simulated impact of a one standard-deviation increase in real market potential.

[Insert Table 6]

These simulations display some cross-country heterogeneity in the quantitative impact of the various LMI reforms on the location probability. The marginal effect is much larger in the core industrialized countries (Western European countries, US and Japan) where the *ex-ante* probability to locate is the highest. Moreover, the effect remains of modest magnitude in comparison with the impact of a change in the country's real market potential. These results are in line with those obtained considering the overall LMI rigidity index (Table 3).

Besides, this exercise allows comparing the marginal impact on the location probability of alternative labor market reforms. Namely, our simulation results suggest that reforming employment protection, while not neutral, is not necessarily the dimension of labor market regulations that matters the most for the country's attractiveness. The marginal impact on the location probability is found larger for reforms of the unemployment benefit system and the degree of centralization of wage bargaining procedures. For some countries, like Spain or Belgium, the differential can be sizeable. These results stands in accordance with our previous experiment's findings and are robust to the source of LMI dataset (Tables 6 and 9, Appendix B.2).

So far, our results indicate that the various dimensions of labor market institutions significantly affect FDI decisions when individually considered. We finish the analysis by studying their relative role in affecting FDI decisions. To that aim, we introduce the four LMI dimensions simultaneously in the regressions. The results are displayed in column (E) of Tables 4 and 5. These results have to be interpreted carefully though, since the correlation between several LMI variables is high, as reported in Table 8 in Appendix B.1. Two main results emerge.

First, statistics associated with the likelihood ratio tests comparing these regressions and the baseline estimation (Column (A) in Table 2) show that the four LMI indicators are jointly significant with the control variables. Moreover, their inclusion in the baseline regression significantly increases the quality of the model's fit.

Second, these regressions contribute to refine the analysis of the role of each LMI dimension in affecting FDI decisions. With EF variables (Table 4), the employment protection index is estimated non-significant when the other dimensions of labor market regulations are also considered. However, it remains significant with OECD data (Table 5). We interpret these conflicting results as suggestive of the limited role of EPL in FDI choices, once the other dimensions of labor market regulations are taken into account. This result stands in contrast with related studies, which typically put strong emphasis on the role of EPL in FDI decisions (Dewit et al., 2009, or Javorcik and Spatareanu, 2005).

By contrast, the generosity of unemployment benefits and the degree of centralization of wage bargaining remain significant, whatever the way they are measured. The magnitude of the centralization effect is however reduced with OECD data. In accordance with simulations reported in Tables 6 and B.3, these results shed light on the sizeable effect of the organization of the wage bargaining process and the unemployment benefit system on the country's attractiveness for foreign investors.

Last, the impact of minimum wages is estimated positive, suggesting that a more generous minimum wage policy raises the incentive for FDI. This is surprising and in contradiction with our theoretical predictions, as well as our previous results. Yet, given the potential colinearity problems associated with the simultaneous inclusion of all LMI variables, we tend to downplay these results to favor the interpretation that minimum wage policy plays a minor role in firms' FDI decisions, consistently with our simulation results.

5 Conclusion

This paper evaluates the empirical effects of labor market institutions on FDI decisions, using a dataset describing French firms' expansion strategies abroad over 1992-2002. We estimate the determinants of FDI decisions using a discrete choice model on all possible foreign locations. We explicitly derive the set of potential determinants from a theoretical model, that combines elements of the new economic geography and the labor market literatures. Besides controlling for standard FDI determinants (such as market potential and supplier access), our originality is to evaluate the role of labor market regulations in affecting the probability to settle in.

Our overall results show that labor market institutions do matter in FDI decisions. Labor market rigidities exert a negative impact on the country's attractiveness for (French) foreign investors. While the effect is significant, its magnitude is small in comparison with FDI determinants related to the country's market potential or supplier access.

Our empirical analysis goes beyond this result and examine the relative contribution of various labor market policies to FDI decisions. Namely, we show that the degree of employment protection, the organization of wage bargaining, the unemployment benefit system and, to less extent, minimum wage policies do affect FDI location choices. These results add to the empirical literature that usually focuses solely on the impact of employment protection laws.

Our overall results deliver an interesting message with regards to the design of labor market pol-

icy. The globalization process at work over the last decades has weakened welfare-state institutions in industrialized countries. The raising competition from low-wage emerging countries strengthens criticisms towards highly-regulated labor markets, in particular in European countries. Our results tend to moderate this view. They suggest that reforming labor markets to reduce rigidities would indeed increase the country's attractiveness for foreign investments. However, the marginal effect is likely to be small given the predominant role of the country's market potential in firms' location decisions.

A Data appendix: definitions and sources

A.1 Labor Market Institutions

***Economic Freedom* database:** The database is provided by the Fraser Institute, available online, `http://www.freetheworld.com`. We use the 2005 edition of the *Economic Freedom of the World* annual report. Original data take values over the range $[0, 10]$ but have been rescaled over $[0, 100]$ before introducing this variable in level in the conditional logit. This allows interpreting coefficients as the probability change attributable to a one percentage point increase in the indicator. LMI indicators are defined as follows:

The **Synthetic LMI Index** sums up various sub-indices that are related to different dimensions of the labor market functioning: *1)* the "minimum wage impact", *2)* the "unemployment benefits" variable, *3)* the "Hiring and firing practices" index, *3)* the "Centralization" index, and *4)* an indicator of the use of conscripts to obtain military personnel.

The **Minimum wage impact** variable is based on two survey responses obtained from the *Global Competitiveness Report*, asking about *1)* the overall "impact of the minimum wage", and *2)* the strength of enforcement of the minimum wage law. Countries receive lower ratings if the survey respondents indicate the minimum wage has a large impact and / or is strongly enforced. Countries with no minimum wage are given a rating of 100.

The **Unemployment Benefits** variable indicates whether the unemployment benefits system preserves the incentive to work, with low values meaning that the unemployment benefit system has pernicious effects.

The **Hiring and Firing Practices** variable indicates whether hiring and firing practices of companies are determined by private contract, with low values meaning that firing and hiring laws are more constraining.

The **Centralization Index** measures the share of labor force whose wages are set by centralized collective bargaining.

As such, the EF variables are increasing with the degree of labor market flexibility. To homogenize the interpretation of coefficients with OECD LMI variables, we rebuild the variables from *Economic Freedom* for them to be increasing with the degree of labor market rigidity. Precisely,

we take 100 minus the original value. This preserves the cross-country distribution of the variables, while making them take values over the range $[0; 100]$ as OECD LMI variables.

We use raw data that are given for the years 1990, 1995, 2000, 2001 and 2002, and we rely on interpolation for missing years. The treatment for the "Minimum wage impact" variable slightly differs, as data are not available for 1990. Preliminary treatment relying on interpolation delivering some weird results on particular countries, we discard interpolation. Rather, we assume the 1995-value for the whole 1990-decade. Inspection of raw data comforts us in this choice, as the database reports no temporal variation between 2000 and 2002 for this variable.

***OECD* sources:** We collect data on various LMI for OECD countries over the period 1992-2002, using data provided by the OECD. The coverage varies between 20 and 27 countries (see Table 7). We focus on the following set of labor market institutions:

Employment Protection Laws : We consider the EPL indicator provided by the OECD, for all workers.[17] The original index takes values in the range [0;5], increasing with strictness of employment protection. We rescale it over [0;100] and introduce it in level in the regressions. Data are given for 1990, 1998 and 2003. They are interpolated over the period 1992-2002.

Centralization Degree of Bargaining is an index of bargaining centralization taken from OECD (2004). It ranges between 1 and 5 and is increasing in the degree of centralization: 1 = Company and plant level predominant, 2 = Combination of industry and company/plant level, with an important share of employees covered by company bargains, 3 = Industry level predominant, 4 = Predominantly industrial bargaining, but also recurrent central-level agreements, 5 = Central-level agreements of overriding importance. Information on this variable covers a 5-year period, on 1980-84, 1985-89, 1990-1994, 1995-2000. We conserve the most recent value for 2001 and 2002.

Benefit Replacement Ratio : We consider the gross replacement rates provided by the OECD's *Social and Welfare Statistics* database.[18] It is defined as the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment. Raw data have one observation every two years, starting in 1985. We rely on interpolation for missing years.

Minimum Wage Legislation : The ratio of minimum wage to median wage is taken from the OECD's *Labor Force Statistics* database. It corresponds to the minimum relative to median wages for full-time workers. It is available on a yearly frequency for 19 OECD countries. In this country sample, Ireland and United-Kingdom had no legal minimum wage policy before 2000 and 1999, respectively. For the previous years, their minimum wage is thus set to zero. We complete these pieces of information using data from ILO Bureau of Statistics (*LABORSTA* database). This database contains legal and negotiated minimum wages in national currency and international US$ in 2003. This information is used to reconstitute series of minimum wages for countries in which minimum wages are negotiated at the sector level, that are not included in OECD data (precisely,

[17] Data are available on `http://stats.oecd.org/`.

[18] `www.oecd.org/els/social/workincentives`

Switzerland, Germany, Finland and Italy). For these countries, we build the series of minimum-to-median wage ratio as follows. First, as the ILO data have no time dimension, it has been assumed that negotiated minimum wages only adjust to inflation. Under this assumption, time series can be rebuilt using inflation series, calculated on consumption-price indices obtained from national sources. Second, we calculate the ratio of minimum to median wages using OECD *Earnings* data on gross median wages.

Table 7 displays the country coverage for the various LMI dimensions.

[Insert Table 7]

A.2 Other explanatory variables

Sources for the other variables included in our sample are described hereafter.

The real market potential variable is constructed as in Redding and Venables (2004), relying on importation data taken from the "*Dots*" database of the IMF and gravity variables taken from the "*Distance*" CEPII database. Our measure is based on the following definition of country i's real market potential:

$$RMP_i = \sum_j I_j P_j^{\sigma-1} \phi_{ij}$$

where I_j is the nominal income in country j, P_j the price level and ϕ_{ij} a measure of the various barriers limiting trade between countries i and j. Redding and Venables (2004) show how to build the variable using as proxy for the country-specific determinants of real market potential (the $I_j P_j^{\sigma-1}$ terms in the definition above) estimates of importer-specific fixed effects obtained from a gravity equation. The extent of trade barriers is then measured using various proxies.

The gravity equation that is first estimated has the following form:

$$\ln X_{ij} = \theta + \mu_i cty_i + \mu_j cty_j + \delta \Phi_{ij} + \varepsilon_{ij}$$

where X_{ij} is the value of the trade flow between country i and country j, cty_i and cty_j are exporter- and importer-specific fixed effects, and Φ_{ij} is a vector containing various measures of bilateral trade barriers (the distance between both countries and a set of binary variables, that indicate the existence of a common border, of past colonial links, the use of a common language and the countries' involvement into trade agreements and monetary unions).

From the estimation of the gravity equation, one can restore a measure of real market potentials (expressed in current US dollars) as in:

$$\hat{RMP}_i = \sum_j \left[\exp(cty_j)\right]^{\hat{\lambda}_j} \left[\exp(\Phi_{ij})\right]^{\hat{\delta}}$$

The variable is built annually between 1992 and 2002.

The GDP per capita is obtained by dividing current GDP series (converted at nominal exchange rate in US Dollars) by the population level of the country, based on the "*World Developments Indicators*", World Bank.

As an alternative to GDP per capita, we use a measure of sectoral wages based on the annual compensation per employee in the manufacturing sector, expressed in PPP US dollars. Data are provided by the OECD's *Main Economic Indicators* database. Series are available on a yearly basis over the period 1992-2002 for 25 countries of our sample (missing for Switzerland and Turkey).

Distance from France ("ln distance") comes from the CEPII's "*Distance*" database.

The supply access variable is built as in Mayer et al. (2010) using data from the French *Input/Output Tables* and the *Enquête Annuelle d'Entreprises* for employment data. The rationale behind the construction is the following. The incentive for a firm in sector s to locate in country i increases in (i) country i's supply of intermediate goods, relative to the rest of the world, and (ii) sector s's use of intermediate inputs. To capture the first element, we use information on input producers in country i which are affiliates of French firms. Namely, the share w_i^m of inputs m produced in country i is measured by the share of the overall employment by French affiliates in industry m that is located in country i. The use of intermediate inputs in the sector firm k belongs to is approximated using information from the French IO tables. This implicitly assumes that foreign affiliates of French firms have the same technological function as French firms in the same sector. The total share of intermediate goods in the production of the affiliate is thus approximated by the share recorded in the French I/O tables for sector s (called β_s hereafter). The same holds true for the technical coefficients a_s^m measuring the quantity of industry m's inputs needed to produce one unit of output in industry s.

Based on these data, it is possible to measure the availability of inputs within country i that are used by an affiliate operating in industry s as:

$$SA_i^s = \frac{\beta^s}{d_{ii}} \left[\sum_{m=1}^{S} a_s^m w_i^m \right]$$

The supply access variable thus measures the average share of world intermediate goods produced in country i. In the average, each industry is weighted by the technical coefficient measuring the reliance of sector s to this particular input (a_s^m): affiliates benefit more of the proximity to local suppliers producing intermediate goods they use intensively. The supply access variable is also higher if intermediate inputs are a large component of costs in industry s (as measured by β^s). Finally, the measure is divided by the internal distance of country i, d_{ii}, in order to account for the ease of access to suppliers inside i. Using IO tables for each year of the sample, we obtain time-series of sector-specific supply access. In the estimates, the explanatory variable is supply access in the year preceding the investment, in order to limit endogeneity and avoid double-counting the firm's own investment.

The governance indicator is built using the governance indicators defined and measured by Kaufmann et al. (2005). Data are available through the World Bank web site.[19] The indicators measure six dimensions of governance: (1) Voice and Accountability measures political, civil and

[19] `http://www.govindicators.org`

human rights; (2) Political Instability and Violence measures the likelihood of violent threats to, or changes in, government, including terrorism; (3) Government Effectiveness measures the competence of the bureaucracy and the quality of public service delivery; (4) Regulatory Burden measures the incidence of market-unfriendly policies; (5) Rule of Law measures the quality of contract enforcement, the police and the courts, as well as the likelihood of crime and violence; (6) Control of Corruption measures the exercise of public power for private gain, including both petty and grand corruption as well as state capture.

Data are available for the years 1996, 1998, 2000 and 2002. All countries in the sample are covered. For the years 1992-1995, we use the same value than in 1996. For the year 1997, 1999 and 2001, we take the average of the two yearly adjacent values. All variables are transformed so that they take values between 0 and 100, increasing with the quality of governance. The average indicator is built as a simple arithmetic mean of the 6 dimensions of governance. The larger the variable, the better the quality of governance.

The corporate tax rate series are taken from the OECD Tax database. Precisely, we use the "combined corporate income tax rate" (Table II.1) Series are yearly values, available over the period 1992-2002 period for 26 countries (Turkey is missing). Series are built as a percentage share, taking values within a $[0; 100]$ interval. The corporate tax rate variable is thus introduced in level in the regression. It is denoted "Corporate tax rate (%)".

B More on the role of Labor Market Institutions

B.1 Descriptive statistics on LMI

Figure 5 displays the mean value (over the period) of the overall rigidity index, for each OECD country in the sample. Unsurprisingly, at the lower extremity we find the Anglo-Saxon countries and Japan, while continental and scandinavian European countries feature the highest degrees of labor market rigidity.

[Insert Figure 5]

To detect potential collinearity problems when simultaneously including various LMI in the regression, we calculate the correlation coefficients between our LMIs. They are reported in Table 8. Precisely, we report here the "between-country" correlation coefficient, *i.e.* considering the mean value of the LMI over the sample period for each country.

[Insert Table 8]

The strong correlation between LMI variables coming from the *Economic Freedom* database suggests being cautious with the results obtained in Table 4, column (E). By contrast, we are much more confident of the absence of collinearity problems with regards to OECD labor market variables, given the reasonable or low correlation coefficient obtained between them.

B.2 Simulations results: the case of OECD LMI variables

Table 9 displays the individual marginal effects of the LMI variables provided by the OECD. As for EPL, unemployment benefits and minimum age policies, we derive the change in location probability following a 1 standard-deviation increase in each LMI variable. We proceed differently for the centralization degree of wage procedures, as this variable intervenes as dummy variables in the database. In that case, simulation are derived assuming a change in the degree of centralization from the more decentralized level to the more centralized case. As a result, the quantitative impact of this variable cannot be compared to the others. Results reported in Table 9 drive similar comments as those obtained using *Economic Freedom* LMI variables (Table 6).

[Insert Table 9]

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