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ABSTRACT

European nations substitute between employment protection regulations and labor market expenditures (e.g., unemployment insurance benefits) for providing worker insurance. Employment regulations more directly tax firms making frequent labor adjustments than other labor insurance mechanisms. Venture capital and private equity investors are especially sensitive to these labor adjustment costs. Nations favoring labor expenditures as the mechanism for providing worker insurance developed stronger private equity markets in high volatility sectors over 1990-2004. These patterns are further evident in US investments into Europe. In this context, policy mechanisms are more important than the overall insurance level provided.

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1 Introduction

We examine how differences in labor regulations across European countries influence the development of private equity (PE) markets, comprised of venture capital and buy-out investors. Recent theoretical models predict that countries with stricter labor policies will specialize in less innovative activities due to the higher worker turnover frequently associated with rapidly changing sectors (e.g., Saint-Paul 1997, 2002a; Samaniego 2006). We provide the first empirical evidence for this prediction at the industry level in the entrepreneurial finance literature. In the process, we also make a methodological contribution by demonstrating how jointly modelling the different policies for providing worker insurance delivers more consistent results than their individual relationships. Our techniques may find application in other settings, too.

We first observe that European countries empirically substitute between employment protection regulations (EPRs) and labor market expenditures (LMEs) in the provision of worker insurance. Figure 1 shows the cross-sectional relationship for 1998. The vertical axis documents the average LMEs per capita taken from the OECD Social Expenditures database. LMEs include both active and passive policies designed to facilitate job creation and transitions, with the majority of expenditures being unemployment insurance benefits. The horizontal axis provides an EPR index developed by the OECD. Higher EPR scores indicate more heavily regulated labor markets, factoring in a wide variety of legislation concerning the individual and collective dismissals of both temporary and regular workers.

This plot illustrates two important features. First, Anglo-Saxon countries provide lower worker insurance on both dimensions than Continental Europe. These differences in absolute *levels* of worker insurance provided by nations have been a frequent political-economy topic since at least de Tocqueville (e.g., Alesina et al. 2001, Kerr 2007). Second, the trend line, which is calculated only for Continental European nations, indicates that economies with higher LMEs per capita have weaker EPRs. These differences in the *mechanisms* used to provision worker insurance among Continental European nations has received less attention. Denmark provides the highest LMEs per capita but has the second-lowest employment protection in Continental Europe. This reflects the well-publicized Danish 'flexicurity' approach that emphasizes high job mobility facilitated by generous out-of-work benefits and active labor market programs to promote worker re-entry. Portugal, on the other hand, provides strong security to the employed but weaker benefits to the unemployed.

While employment protection and transition/re-entry assistance are perhaps substitutes for providing worker security, they have different implications for the costs firms face. Labor rigidities have a stronger impact on the adjustment margins of firms, especially those undertaking substantial restructurings. Even if general corporate or payroll taxation is higher to support

LMEs, the direct incidence on the labor adjustments that firms wish to make is weaker in regimes favoring LMEs than in strict employment protection regimes. These taxes on labor adjustments are particularly pertinent for PE investments, which thrive in dynamic industries that require frequent labor adjustments. This PE focus on high-growth opportunities and rapid restructuring is necessary for achieving sufficient returns when portfolio companies offer the potential for exceptional investment returns but also carry a high risk of failure.

Combining these observations, nations emphasizing LMEs over employment protection should be more attractive for the development of PE financing, even after conditioning on the level of worker insurance provided. While labor market regulations do not specifically target the portfolio companies of PE investors, these investors are seeking opportunities that are generally more sensitive to these taxes on labor adjustment. We investigate this hypothesis using PE surveys provided by the European Private Equity and Venture Capital Association and Venture Economics. Figures 2 and 3 show that policy choices are correlated with PE placement (trend lines are still for Continental Europe). European countries with stricter employment protection have lower PE investments per capita, while those favoring LMEs are more attractive to these financial forms.

While these correlations are suggestive, many other factors vary across countries besides labor market policies, and it is quite likely that omitted factors correlated with labor policies are important for PE formation. Labor market policies tend to evolve slowly in most countries, limiting the scope of panel estimation techniques at the country level for disentangling these effects. We thus test these predictions using a differences-in-differences approach similar to Rajan and Zingales (1998) that employs country-sector variation in PE market size over the 1990-2004 period. We specifically model whether countries that favor LMEs over employment protection for providing worker insurance develop relatively stronger PE markets in more volatile sectors. We calculate the volatility of sectors using US establishment-level data from the Census Bureau, which we take to be the unconstrained case.

Regression estimates find that the interaction of sector volatility and employment protection has a negative effect on PE formation, while the opposite is true for LMEs. While suggestive of labor regulations having an important bite, the coefficients are sometimes of borderline economic and statistical importance. As a methodological contribution, we show that the coefficients on the base policies are less informative than their joint effect. Studies that evaluate the impact of labor rigidities modelling one policy only will typically understate the impact of worker insurance policy choices for economic outcomes like PE investments.

This concept relates back to the policy decisions illustrated in Figure 1. The individual policies are simultaneously capturing both the level of labor market insurance provided and the

mechanism used to provision the insurance. An empirical evaluation of an increase in employment protection will encompass both increases in insurance levels (e.g., Anglo-Saxon versus Continental Europe) and changes in policy mechanisms (e.g., Denmark versus Portugal). These two objects are distinct from a policy perspective, however, and it is important to distinguish their individual effects as much as possible. Indeed, the simple trend lines in Figures 1-3 can look quite different when the Anglo-Saxon economies are included in the calculation. Throughout this study, we assess the impact of adjusting worker insurance policies while keeping the overall level of insurance provided by a country constant. Substantial changes in insurance levels provided by countries are quite rare, but policy makers frequently contemplate moving towards or away from flexible labor markets with concomitant adjustments in other insurance programs (e.g., the recent interest in the Danish model).

We show two techniques to isolate the mechanism of worker insurance provision from the overall insurance level. One approach is particularly simple, just taking the linear difference of two policy coefficients after a multivariate regression. A second approach transforms the base policies into more intuitive indices. Both approaches find that policy mechanisms are robustly important for PE investment patterns, while the overall level of labor insurance provided is of much weaker importance. This is true on both the extensive margin (i.e., whether PE investments form at all in a country-sector) and the intensive margin (i.e., the volume of deals in the country-sector). The effects are particularly strong for US-sourced venture capital investments, and we show the sector-level patterns are generally robust to other policy characteristics and traits of countries.

The findings of this project are important for policy makers, PE investment managers, and entrepreneurs seeking high-growth opportunities. Policy choices regarding the optimal levels and mechanisms of labor market insurance are complex and should consider many economic and non-economic factors. While it is well beyond this paper's scope to determine how labor market insurance should be provisioned, we highlight one factor that should influence this decision given the desire of many European leaders to promote entrepreneurial financing (e.g., OECD 2004a). Many policy makers look to active policies like public venturing as a means of seeding or expanding their entrepreneurial communities (e.g., Lerner 2009). This work instead highlights how influential passive policies like general labor regulations are.

More broadly, this study is part of a growing body of academic and policy research examining how labor market regulations influence entrepreneurship and productivity growth. Many observers, both within and outside of academia, believe strict European labor policies hinder economic restructuring and subsequent productivity growth. The PE funds studied here support firm creation and restructuring. As such, the findings of this project provide a complementary measure to studies considering entrepreneurship rates or reallocation measures directly.

Moreover, our results suggest strong caution in the interpretation of previous work that finds stronger employment protection leads to higher self-employment rates. Some take this correlation to suggest that employment protection increases entrepreneurship generally. This study finds the opposite relationship, however, with respect to VC investments and the high-growth entrepreneurship associated with them. This difference is evident even in the simple correlations of Figures 2 and 3. Southern European countries rank very high on self-employment scales but have smaller PE markets; the opposite is true for Scandinavian countries. There is substantial heterogeneity in the types of firms founded and therefore in the various metrics of entrepreneurship (e.g., Glaeser and Kerr 2009). Understanding these variations is particularly important in evaluating how labor regulations influence entrepreneurship.

This study also has important implications for PE fund managers and the entrepreneurs they support. As background for this project, we undertook semi-structured interviews of PE professionals in ten European countries. Across respondent countries and fund types, investment managers generally believed labor regulations to be an important factor in the development of both VC and buy-out markets. Most respondents further rated local labor regulations as a first-order concern when evaluating investment candidates, although several noted that they were willing to enter heavily regulated markets if other advantages existed like high quality labor. One respondent even suggested that past concern over labor regulations may have hidden some high-quality opportunities in countries with heavily-regulated labor markets.[1]

Our analysis provides quantitative evidence of this general pattern. Moreover, the sector-level specialization that we document is very important for PE placement decisions. This includes the direct labor adjustment costs of these policies for portfolio firms, but it also extends much further. Many aspects of PE investment exhibit agglomeration or cluster economies, where larger numbers of similar firms that are spatially proximate increase the productivity of each firm. Some examples of these agglomeration economies include entrepreneurial awareness of PE investment models, legal and contractual support, clearly-defined exit opportunities, and strong local labor markets for specialized professionals. As many of these agglomeration economies are further specific to individual sectors, PE managers should factor in how these policy differences across nations influence local investment activity. These concerns will in turn influence location choices of entrepreneurs anticipating using PE funding to support firm creation and growth.

The next section reviews the relevant literature and theory, highlighting where our study fits in. Section 3 introduces our data. Section 4 provides our basic empirical results that model the two labor policies directly. Section 5 then outlines a transformation of the policies to separate the levels of insurance provided from the mechanisms employed. The last section concludes.

[1] Two sample interview quotes are: "We want our early stage investments to grow quickly to 50-100 employees, but they may also need to fall back to 25 workers. Strict employment regulations make it less attractive for starting these risky businesses." Also, "National differences in labor regulations are an important factor for where pan-European funds place their resources."

2 Literature Review

This section first reviews the economic effects of employment protection. We emphasize in particular how their impact on the labor adjustments of firms differs from LMEs, an alternative mechanism for providing worker insurance. We then describe the channels through which these hindered labor adjustments influence PE investors in particular.

2.1 Employment Protection Regulations

Theoretical models of EPRs share a common finding that EPRs should dampen labor fluctuations by firms. This unambiguous prediction contrasts with the models' different predictions regarding total employment levels and technical efficiency. The first and unambiguous prediction is the central building block for this study.

In the standard competitive model of the labor market, EPRs are economically equivalent to mandated employment benefits. Benefit mandates raise the cost of employing workers, leading to a decline in labor demand by firms for a given wage rate. Workers will increase their labor supply at a given wage rate to the extent that they value the mandate. If workers value the mandated benefit at its marginal cost of provision, then equilibrium employment levels are unchanged and wages fall to cover exactly the cost of the benefit. In this scenario, the mandate is efficient and the Coase theorem applies (e.g., Summers 1989, Lazear 1990).

EPRs can potentially improve efficiency when workers value the protections above their cost of provision. EPRs may be under-provided by the private market due to adverse selection (e.g., Aghion and Hermalin 1990, Levine 1991) and risk aversion (e.g., Bertola 2004). Agell (1999) discusses why eliminating EPRs may not be desirable when labor markets are subject to fairness considerations and market imperfections, while Wasmer (2006) and Macleod and Nakavachara (2007) focus on human-capital investment. In the Coasean model, these factors would lead to higher employment levels after the mandates are imposed. Many of the efficiency gains in these models operate through a longer attachment of a firm and worker.

Other common deviations, however, can yield efficiency costs when EPRs are introduced. First, workers may value the mandates at less than their marginal cost of provision, leading to a weaker growth in labor supply. Equivalently, some of the termination benefit may accrue to a third party, such as an attorney. Collective bargaining could also restrict the adjustments. In these cases, EPRs drive a wedge between the private and social cost of job separations and thereby create a deadweight loss. Because dismissal costs are only paid when workers and firms separate, EPRs result in labor adjustment costs to firms (i.e., a tax on separations).

Consequently, EPRs that workers value at less than their cost will inhibit efficient job separations. These firing costs, in turn, can reduce efficient hiring as well for forward-looking firms. The net effect of reduced hiring and firing is ambiguous for total employment levels and technical efficiency, but overall employment volatility does unambiguously decline.[2]

Within these theoretical models is a common prediction for declining firm-level labor fluctuations due to employment protection. The existing empirical evidence, while small, supports this prediction. Autor et al. (2007) find that US firms reduce their annual and quarterly labor turnover when state-level regulations are passed. Moreover, a substantial decline in the entry of new firms and establishments is evident. Wolfers (2007) also finds EPRs impact high-frequency, seasonal labor adjustments, and Blanchard and Portugal (2001) suggest more rigid EPRs can explain differences in labor market flows between the US and Portugal. Stricter EPRs also account for substantial growth in US temporary help agencies that smooth short-term labor fluctuations for firms. Addison and Teixeira (2003) survey the industry-level evidence of slower labor adjustment speeds under EPRs.

This labor adjustment cost feature of employment protection is different from LMEs, which partially substitute for EPRs in insuring workers against labor market risks. Under a balanced budget, general corporate or personal income taxation may need to be higher to support LMEs than EPRs. The direct incidence of the collective taxation on firm labor adjustments, however, will be weaker in regimes favoring LMEs over employment protection. Thus, firms and industries with high inherent labor volatility are disadvantaged, ceteris paribus, when labor insurance is provisioned through employment protection.[3]

It is well beyond the scope of this paper to determine either the optimal level of labor market insurance or the most appropriate technique for implementing a chosen insurance level. The political economy of employment protection is complex (e.g., Saint-Paul 2002b), and countries may have constraints on their policy choices (e.g., Algan and Cahuc 2007, Brügemann 2007). More importantly, the optimal insurance design may involve both policies to a degree (e.g., Blanchard and Tirole 2007, Boeri et al. 2003). However, we do hope to provide evidence on the economic impact of these different mechanisms, which is a first-order empirical concern.

2.2 Labor Rigidities and PE Firms

We specifically study the impact of these worker insurance policies for PE investments. There are two general ways in which labor rigidities are likely to impact PE investors. First, heavy

[2] Autor et al. (2007) discuss how the basic findings regarding dampened labor adjustment by firms extends to the Mortensen and Pissarides (1994) equilibrium unemployment framework, too.

[3] An Experience Rating system links unemployment insurance contributions of a firm to its dismissal history. This system is employed by the US but otherwise fairly rare. The adjustment costs to firms here are only a partial incidence that remains weaker than EPR regimes.

dismissal costs may hinder the development of the high growth or rapidly restructuring sectors in which these companies specialize. Second, labor rigidities can weaken the reallocation of resources across their portfolio companies, which is necessary for their returns. We discuss each of these effects below, with an initial focus on VC investments. Gompers and Lerner (2002) provide a detailed introduction to these investment models.

Recent work suggests that strict labor regulations hinder the development of high growth or rapidly restructuring sectors. This sector-level prediction is more subtle than the general prediction of declining employment fluctuations noted above. In these models, EPRs reduce the attractiveness of industries where substantial technical change occurs relative to more stable industries, ceteris paribus, as a given job match becomes obsolete faster (e.g., Saint-Paul 2002a, Samaniego 2006, Bartelsman and Hinloopen 2006). These policy differentials result in comparative advantages for countries with more flexible labor markets in developing sectors characterized by high labor volatility (e.g., Cuñat and Melitz 2007). Hopenhayn and Rogerson (1993) also model how labor regulations can slow reallocation across sectors.[4]

VC firms are very sensitive to this weakening of high growth, volatile industries. Growing sectors create opportunities for the rapid development of portfolio companies along with the markets. Moreover, many screening, monitoring, and reputational features of the value-added investment model of VC firms are most beneficial in these settings characterized by incomplete information and uncertainty (e.g., Hsu 2004). VC-backed firms can support the emergence of new technology-based industries, and the available evidence suggests that they are efficient at these investments (e.g., Kortum and Lerner 2000). We should thus anticipate weaker VC investments for high volatility sectors in the presence of strong employment protection as these policies weaken the general attractiveness of these types of industries.

In addition to this industry-level effect, labor rigidities also hinder VC formation by reducing the flexibility of investors to reallocate resources across portfolio companies. The majority of companies in a VC portfolio fail despite the assistance extended, characteristic of most entrepreneurial and innovative endeavors. The majority of investments yield zero or negative returns, with a small number of great successes generating most of the profits (e.g., Huntsman and Hoban 1980, Sahlman 1990, Cochrane 2005). A successful investor needs to maintain a portfolio of projects and to reallocate resources aggressively from failing ventures to high-performing investments. This staged approach yields option values for investments, and an important role of VC investors is to close under-performing ventures for the sake of better opportunities. These economics also underlie many of the legal and structural VC features like syndication, convertible securities, and control rights (e.g., Kaplan and Strömberg 2003).

[4]Heavy labor market regulations may also weaken general incentives for entrepreneurship. Channels include greater benefits during employment and greater difficulty or loss of social standing should the venture fail.

Strict EPRs increase the costs of these adjustments and the closures of under-performing ventures. Importantly, this negative effect is due to the incidence of the taxation, rather than the level of labor insurance provided. All else being equal, a higher provision of public insurance may aid high growth, volatile firms by reducing the compensating differentials required for employees to accept the greater job uncertainty. Stronger unemployment insurance benefits and LMEs can even subsidize volatile sectors when paid for through general taxation. The central question is how the chosen insurance mechanisms shape the costs firms bear when adjusting employment. This motivates our comparison of employment protection and LMEs; it further motivates our efforts to separate the levels and mechanisms effects.

Strict employment regulations are likely to hinder the development of buy-out investors too, but for somewhat different reasons than VC investments. Buy-out investments are much more concentrated in manufacturing and industrial products and services than VC investments; high-tech sectors accounted for only 10% of European buy-out investments in 2000. Moreover, buy-out investors do not target rapid growth for their portfolio firms like VC firms. Nevertheless, buy-out investors seek opportunities that frequently require labor restructurings. Past employment obligations generally transfer to new owners (e.g., a transfer of undertaking). If labor regulations increase the cost of these existing contracts and their duties, the gap between current valuations and potential worth must be larger to induce a takeover and restructuring.

Despite these theoretical linkages, our understanding of how labor regulations shape PE investment is still developing. Much of the literature focuses on the role of flexible labor markets and non-compete clauses in the spatial distribution of the US high-tech industry.[5] Jeng and Wells (2000) first empirically evaluated VC development across countries using multivariate analyses. In cross-sectional analyses, they find strict labor regulations (modeled using labor market tenures) hindered early-stage VC investment but not later-stage investments. In a subsequent study of the cyclicality of the VC industry, Romain and van Pottelsberghe (2004) find that labor market rigidities (modeled through EPR indices) reduce the impact of a country's expansions in GDP or technical knowledge for concomitant growth in its VC industry.[6]

The empirical evidence for industry-level differences due to worker insurance policies is even rarer. The paper closest in spirit to ours is Da Rin et al. (2006). In a very interesting paper, the authors find within-country variations of manager's perceptions of hiring and firing conditions (modeled through IMD management surveys) reduce the ratio of high-tech funding to total PE investments. Given the interests of their study, they do not pursue this angle further. Two papers from the broader economics literature are also relevant for this topic.

[5] See Gilson (1997), Hyde (1998), Stuart and Sorenson (2003), Fallick et al. (2006), and Marx et al. (2009).

[6] Bozkaya and Kerr (2007).provide extended references regarding a second literature strand that considers the impact of labor market policies on entrepreneurship rates. European evidence includes Ilmakunnas and Kanniainen (2001) and Kanniainen and Vesala (2005).

Micco and Pagés (2007) find that stringent employment protection reduces the sizes of sectors characterized by high intrinsic labor volatility. Moreover, employment fluctuations in these volatile sectors is dampened. Cuñat and Melitz (2007) further relate more flexible labor markets to comparative advantages in trade for industries with high labor volatility. Empirical evidence on this prediction is just emerging, and our study contributes evidence from PE placements. We also hope to draw attention to the levels versus mechanism effects.

3 Data Preparation

This section describes our data sources. We begin with our data on labor market policies. We then document the PE data used to measure our dependent variables. We finally discuss our measurement of the inherent volatilities of different industries.

3.1 Labor Market Insurance Policies

Our EPR index is sourced from the OECD (2004b) with a theoretical range from zero to five. Higher EPR scores indicate more heavily regulated labor markets, factoring in a wide variety of legislation concerning the individual and collective dismissals of both temporary and regular workers. In practice, the lowest score in 1998 is the US at 0.2, while Turkey is judged to have the most stringent restrictions at 3.8.

Table 1 documents the index for our European sample. Switzerland (1.1), Denmark (1.4), and Portugal (3.7) are the extreme values for 1998 within the Continental Europe sample. The UK (0.6) and Ireland (0.9) provide intermediate levels between the US (0.2) and the most flexible labor markets in Continental Europe. Most countries either receive the same EPR rating in 1990 and 1998 or move toward more flexible labor markets, especially for temporary workers. Only France increases its protection, from 2.7 to 3.0.

LMEs are taken from the OECD Social Expenditures database and include unemployment insurance benefits and active labor market policy expenditures. Unemployment insurance comprises approximately 60% of the total, with this share declining somewhat in recent years. Active labor market programs include all social expenditures, excepting education, that are designed to improve the beneficiaries' prospects for finding employment or increasing earnings. Examples include labor market training, school-to-work transition assistance for youth, and labor market programs to promote employment for the unemployed.

Table 1 documents each country's average annual LMEs expressed as nominal ECUs/Euros per capita. Denmark provides the highest LMEs per capita (1482) in 1998-2001, over 50%

larger than the next highest observation of Sweden (865). Portugal (165) and the UK (173) are the lowest values in the sample, with Greece (67) and the US (140) providing even less. The unweighted average of nominal LME per capita is roughly constant across the 1990-1997 and 1998-2001 periods, with a mixture of countries increasing or decreasing.

3.2 European PE Data

Our PE data are taken from the European Private Equity and Venture Capital Association (EVCA) and Venture Economics (VE). EVCA surveys are conducted by PriceWaterhouse Coopers and Thomson Financial. The EVCA provided us statistics on fifteen European nations from 1990 to 2004. Table 1 documents country-level PE investments by domestic investors over the period. The largest European PE community, in both absolute and per capita investment terms, is the UK. Continental European countries with high per capita investment levels are Sweden and the Netherlands, while France, Germany, Italy, and Spain also maintain significant aggregate investment levels due to their large country sizes. In examining Table 1, it should be noted that a number of zeros are small investment levels that appear zero on a per capita basis.[7]

The central advantage of the EVCA data are their fairly consistent measurement of PE markets across European countries and industrial sectors during the 1990-2004 period. This consistency for innovative sectors is substantially better than most other sources of economic data. There are, however, two liabilities that directly influence our empirical approach. First, VC and buy-out investments are separately reported at the aggregate level but not within sectors. This is unfortunate as many of the rationales in the previous section would suggest a stronger impact for VC investors than buy-out firms, and we would prefer to quantify these differences.

Second, the EVCA data do not allow us to consider cross-border investments within Europe. Approximately 75% of European PE investments recorded by the EVCA are raised within the investing country (an unweighted average across countries). Our EVCA data report the amounts invested abroad by European countries, but the destination countries are not identified. Again, this distinction is not made at the sector level either. We focus on the investment amounts for countries in this paper.

We also look at US-based investments into Europe using data taken from Thomson Financial's Venture Economics (VE) database. The EVCA surveys all PE firms with a physical presence in Europe, regardless of EVCA membership status. VE contains deal-level data for US PE firms that allow us to tally investments originating in the US for European portfolio firms. In some cases, the US PE firms may have opened offices in Europe, although this practice was

[7] We exclude Greece from the analysis due to incomplete EVCA and VE data. We will use Greece, however, in our calculations of labor insurance levels and mechanisms below.

not common until the end of our sample. The US data are thus important for providing a comprehensive view of the emergence of European PE markets.

Moreover, the US-sourced investments provide several methodological advantages. Most importantly, aggregating from individual deals allows us to separate VC and buy-out investments by country and sector for US investments into Europe, a joint disaggregation not feasible with the EVCA data. Second, these cross-border investments are less influenced than domestic European investments by unmodeled factors like public venturing. Finally, these cross-border investments are a recent phenomena, largely coming about during the last decade, long after labor insurance policies have been devised. This timing aids in assigning causal directions to the analyses.

One liability of the VE data is that investment amounts are missing from about 30% of the reported deals. For this reason, much of our analyses below focus on the count of deals by country-sector, which we can identify consistently in both data sources. To analyze the overall value of the PE markets, we impute the missing VE values through a two-step procedure.[8] This imputation is mainly for descriptive purposes and of limited analytical consequence. We note where a deviation occurs as we present the results, and the use of imputed data is always in the direction of making our results more conservative.

Finally, it is important to note that substantive differences exist between the PE-supported entrepreneurship studied here and entrepreneurship defined through self employment. The survey by Addison and Teixeira (2003) notes a consistent empirical finding of a positive association between stronger employment protection and self-employment rates. Table 1 suggests that this relationship is unlikely to hold in estimations of cross-country PE differences within Europe. Southern European countries like Portugal and Greece rank very high on self-employment scales but have smaller PE per capita markets. On the other hand, Scandinavian countries rank low on self-employment indices, but have been among the most successful European countries in attracting VC and buy-out investments.[9]

3.3 Sector Labor Volatilities

Our analysis centers on differences across industries in inherent labor volatilities in an empirical framework similar to Rajan and Zingales (1998) and Carlin and Mayer (2003). Measuring the

[8] We first regress available deal amounts on vectors of fixed effects for countries, industries, years, and number of investors. We then predict deal values for missing observations using the estimated parameters. The predictions take negative values for a small fraction of the observations, which we replace in the second step with the minimum deal amount by industry and type for these cross-border transactions in VE. This procedure is done separately for VC and buy-out investments.

[9] Ardagna and Lusardi (2009) and Glaeser and Kerr (2009) further discuss these differences in entrepreneurship metrics and policy environments. Bottazzi et al. (2004) and Bozkaya and Kerr (2007) provide a deeper introduction for European PE markets.

inherent labor volatilities, as opposed to the realized labor volatilities by country and sector, is important given that labor regulations directly influence realized employment flows. We model these inherent volatilities using US labor turnover calculated from the Longitudinal Business Database (LBD). We take the labor volatility of firms in the US to be the most unconstrained as in Figure 1. In a hypothetical industry with no inherent labor volatility, we would not expect significant differences across European regimes. Employment dismissal costs are likely to be more binding, however, in sectors where the US demonstrates substantial labor churn. Under some conditions, these sector-level differences are augmented by the general equilibrium effects of comparative advantage and trade.

Sourced from US tax records and Census Bureau surveys, the LBD provides annual observations for every private-sector establishment with payroll from 1976 onwards. In 1997, the data include 108 million workers and 5.8 million establishments. Each establishment is given a unique, time-invariant identifier that can be longitudinally tracked. Second, the LBD assigns firm identifiers that facilitate the linkages of establishments. Davis et al. (1996) and Kerr and Nanda (2009) further describe these data. Our primary measure of labor volatility is the absolute employment change of an establishment e in year t from the previous year,

$$ABS_{e,t} = \frac{|E_{e,t} - E_{e,t-1}|}{(E_{e,t} + E_{e,t-1})/2}, \tag{1}$$

where E is the employee count of the establishment. We calculate ABS at the establishment level, versus the firm level, to allow the most accurate sector assignments possible. This measure is bounded between zero and two and reduces the impact of outliers. Autor et al. (2007) further motivate the ABS metric of labor volatility and relate it to the reallocation metrics developed by Davis et al. (1996).

After calculating ABS at the establishment-year level, we take the mean across establishments within each sector over the 1977-1999 period. We denote this sector-level mean as $Labor_s^{US}$. We also calculate a second version of ABS at the sector level for 1992-1999 (i.e., net employment changes at the sector-year level). These two metrics have a 0.73 correlation across industries. We find consistent results across a range of approaches and time periods for calculating US labor volatility, and we report these two as representative cases.

As the LBD classifies establishments with the SIC4 framework, we develop concordances that link the EVCA sectors, VE technology codes, and the US SIC system. Table 2 lists the 17 EVCA sectors and the two volatility calculations. The Computer-Related (0.52) and Energy (0.49) sectors have the largest mean US labor turnover, while Chemicals and Materials (0.28) and Industrial Products and Services (0.31) have the lowest. Appendix Table 1 provides the EVCA's sector definitions. The LBD cannot support accurate calculations for Agriculture,

Construction, and Other sectors. These sectors are small in terms of PE investment and are excluded below. The concordances used in this project are available upon request.

4 Empirical Results with Base Policies

We have two predictions to test. Our first hypothesis is that countries providing worker insurance through LMEs versus employment protection will have comparatively stronger PE development in sectors characterized by high intrinsic labor volatility. Our second and related hypothesis is that the mechanism used to provision worker insurance is more important for these placement patterns than the absolute level of worker insurance provided. This section confirms the first prediction with country-sector regressions that model the base policies. We introduce a simple linear test in a multivariate framework that is comparable to previous studies. We analyze the second prediction in the next section after transforming the base policies.

4.1 Empirical Specification

Our basis specification takes the form,

$$PE_{c,s} = \phi_c + \eta_s + \beta_{EPR} EPR_c \cdot Labor_s^{US} + \beta_{LME} LME_c \cdot Labor_s^{US} + \varepsilon_{c,s}. \quad (2)$$

We use this empirical framework to test separately both the extensive and intensive margins of PE investment by country-sector. In extensive margin frameworks, $PE_{c,s}$ is a dichotomous indicator variable for PE investment in country c and sector s in the 1990-2004 period. The dependent variables in the intensive margin estimations are the log counts and value of PE investments by country-sector. We also discuss average deal sizes.

Multiple country-sector observations receive very small investments over the period studied. Accordingly, we define the entry threshold for extensive margin analyses as annual PE investment of one Euro/ECU per capita in the sector. In the EVCA, 56% of domestic-sourced PE observations at the country-sector level achieve this investment threshold. For US-sourced PE investments, 21% of VC and 23% of buy-out observations reach this level. This threshold mainly influences the domestic-sourced entry calculation, as every country-sector combination has at least a trace amount of investment over the 1990-2004 period in the EVCA data. The results presented below are generally robust to adjusting this threshold amount so long as a meaningful degree of variation remains.

For explanatory variables, we interact the two labor market policies, EPR_c and LME_c, with the sector-level US labor volatility metric $Labor_s^{US}$. LME_c is the log value of LMEs per capita.

ϕ_c and η_s are vectors of country and sector fixed effects, respectively. Country fixed effects absorb the main effects of the labor market policies, while sector fixed effects absorb the main effects of $Labor_s^{US}$. As these fixed effects also control for overall European PE investment behavior by country and sector, we only exploit residual variation for identification. The explanatory variables are transformed to have unit standard deviation for interpretation. Estimations are weighted by an interaction of country population with total sector size across countries. The interaction of 15 countries and 14 sectors yields 210 observations per regression on the extensive margin. Intensive margin analyses are conducted over country-sector observations where positive investments exist.

4.2 Domestic European Investments

Table 3 presents the results for domestic PE investments. The first two columns are extensive margin analyses, while the last four columns document the intensive margin estimations. Dependent variables are indicated by column headers. The first column for each outcome measure uses the establishment-level calculation of US labor volatility; the second column employs the sector-level calculation. While some minor differences emerge within these pairs, the results are generally robust to the volatility calculation employed.

Focusing on Columns 1 and 2 of Table 3, we find a negative β_{EPR} elasticity in both models. This suggests that employment rigidities lower PE investment entry in volatile sectors, but the results are not very strong or conclusive. On the other hand, the β_{LME} coefficient is positive and indicative of stronger labor market insurance expenditures increasing PE investment in volatile sectors. Both elasticities are statistically significant at a 90% confidence level. Based upon these elasticities, one might conclude that labor policies are only marginally important for the entry of domestic PE firms. Yet, the introduction and Figure 1 emphasize how these policies are jointly chosen. This suggests that their joint strength may be more important than their partial elasticities.

To test this, we begin with a conceptual model where the level of worker insurance provided is determined by $g(EPR, LME) = \alpha_{EPR}EPR_c + \alpha_{LME}LME_c$. This $g(\cdot)$ function assumes the two policies are additive and separable, and the alphas weight the importance of each policy for worker insurance. Consider the scenario where a policy maker seeks to maintain a level of insurance I but to move from an EPR-based regime to greater LMEs. Holding I constant and assuming relationship (2) is correctly defined, the comparative static for moving along the insurance mechanism frontier defined in $g(\cdot)$ for its impact on PE investment is $\Delta PE = \beta_{LME} - \beta_{EPR} \cdot (\alpha_{LME}/\alpha_{EPR})$.

The bottom of Table 3 presents this comparative static with $g(\cdot)$ defined by $\alpha_{LME} = \alpha_{EPR}$. This equal contribution of EPRs and LMEs to worker insurance is motivated by the policy

trade-off within Continental Europe in Figure 1. The linear combinations of $\beta_{LME} - \beta_{EPR}$ are much more stable and well measured than the individual policies are. The joint test suggests that a one standard deviation change from employment protection towards LMEs is associated with an 8% higher probability of PE entry for sectors with high labor volatility compared to sectors with low volatility. In a much clearer way than the individual policies do, this joint effect confirms the importance of the mechanism used to provision labor insurance on the pattern of PE placements. The implied magnitude of a contemplated policy reform is also twice as large.

The next two columns consider the intensive margin of PE entry through the log counts of investments. The sample size remains the same as the first two columns since at least one deal is observed for every country-sector in the EVCA data. The individual interactions of both policies are now larger and statistically significant. Their joint effect again suggests that a policy movement along the insurance frontier will have twice the effect that the individual coefficients would suggest. Comparing Columns 3 and 4, the measured joint elasticity is also more stable than the individual policy coefficients. This greater stability for the linear difference compared to the levels of the underlying coefficients is repeatedly observed in our analysis.

A one standard deviation policy adjustment by a nation towards LMEs from employment protection is associated with 20% more deals in high labor volatility industries compared to low volatility industries. While this numerical value is larger than the entry probability adjustment of 8%, the earlier 8% effect is larger in terms of the underlying variation in the data. The contemplated policy adjustment is associated with a 0.2 standard deviation change in entry levels and a 0.13 standard deviation change in investment magnitudes. Both margins are thus important.

Finally, the last two columns of Table 3 find similar effects for log investment levels. Comparing Columns 3 and 4 with Columns 5 and 6 would suggest that as deal counts grow, average deal sizes slightly decline. This pattern would be expected in many investment selection models, but the declines in average deal size are quite small and one cannot reject the null hypothesis of constant average deal size. The impact of the labor policy environment thus appears stronger on the number of domestic deals undertaken (i.e., market formation and size) versus deal size.[10]

4.3 US-Sourced Investments

To complement Table 3's domestic analysis, Table 4 examines US-sourced investments into Europe. Panel A provides results for venture capital placements, and Panel B documents buy-out investments. These US-based investments were very trivial at the start of the sample period,

[10]Related work on estimating average sizes includes Ardagna and Lusardi (2010), Da Rin et al. (2010), and Kerr and Nanda (2010).

but grew remarkably after 1990. The patterns of overseas placements, coming well after basic labor policies were established, thus aid in a causal interpretation of the findings. As noted in the data description, US-based investors are also less likely to be influenced by public venturing and similar industrial policies, which we have not yet controlled for in the analysis.

The pattern in Panel A is very similar to Table 3's domestic analysis. The entry probability is 8%-9% higher, and investment counts are 25% higher. The sizes of the two effects are comparable to the underlying data at approximately 0.2 standard deviations. There is some evidence of larger investment sizes in this context, but the precision of the underlying average deal size effect again does not yield a conclusive finding regarding deal traits.[11]

The pattern for buy-out investors, however, is somewhat different. We again see evidence for greater investment counts in volatile sectors as policies shift away from employment protection. The magnitude, however, is half of the comparable effect for US-sourced VC placements. This diminished impact is true in both reported elasticities and in comparison to the underlying data variation. There is also no evidence for an entry margin effect. In fact, both policies have negative elasticities, a point to which we return in the next section when discussing the level of labor market insurance. Finally, there is perhaps the best evidence for a change in investment size with respect to these buy-out placements. While interesting, we again cannot reject the null hypothesis that deal size is unaffected.

Overall, Table 4 finds fairly consistent evidence that US-sourced VC placements are quite sensitive to these labor insurance policies, while buy-out investors are less influenced. It is likely that a similar pattern would hold if we could disaggregate domestic-sourced PE investments. While we cannot directly undertake this test, we do know at the national level from the EVCA data the share of domestic PE investments that are buy-out investments. Unreported estimations find that the measured labor policy effect is higher in countries with smaller buy-out shares than in those with larger buy-out communities. We hope that future studies can develop data to confirm this suggestive effect.

Taken as a whole, Tables 3 and 4 support the hypothesis that labor insurance mechanisms matter. Effects of these policy choices are stronger in sectors with greater labor volatility, measured through the relatively unconstrained US case, than those with weaker labor turnover. We provide further robustness checks on this pattern at the end of the next section, but we next turn to transformation of the underlying policies that are easier to interpret.

[11] Entry margin estimations in Columns 1 and 2 without the imputed VE deal values yield larger effects than the reported estimations. We believe this added strength is spurious, however, and prefer the more conservative approach that uses all available data.

5 Empirical Results with Transformed Policies

The previous section highlights that incorporating base labor market policies directly into regressions captures both differences across nations in the level of labor insurance provided and differences in the technique employed. Our proposed linear test provides a more consistent estimator, but the ideal estimation would separately quantify both traits as they are distinct from a policy perspective. While both traits are exceptionally complex and multi-dimensional, this section develops simple proxies defined as $LbrInsLevel_c$ and $LbrInsMech_c$. These transformations are used to test our second hypothesis that the insurance mechanism is more important for PE development and specialization than the overall insurance level.

5.1 Policy Transformations

To calculate $LbrInsLevel_c$ and $LbrInsMech_c$, we first transform EPR_c and LME_c to have zero mean and unit standard deviation. The resulting metrics are less dependent upon the scale through which they are originally measured. We then measure the single-dimension distance for each policy from the lowest observed values in the OECD sample (i.e., US in employment protection, Greece in LMEs per capita). Both of these distances have a maximum of less than four standard deviations. We calculate $LbrInsLevel_c$ as the average of these distances for each observation. This level index estimates in standard deviations the distance from a country's joint provision of (EPR, LME) to the lowest observed values in the OECD. Table 1 documents these values, and the vertical axis of Figure 4 plots these distance metrics. The UK provides the weakest labor market insurance measured through this technique, followed by Ireland and Switzerland. Belgium, Denmark, and Sweden are among the highest insurance levels.

The second metric, $LbrInsMech_c$, describes the mechanism employed for providing this labor market insurance. It is a radian measure of the LME distance divided by the EPR distance. $LbrInsMech_c$ can be thought of as the slope of a ray extending from the origin of Figure 1 to the nation's position in (EPR, LME) space. The radian measure is a simple monotonic transformation of the base distance ratio that is bounded by $[0, \pi/2]$. This transformation eliminates the asymmetry that arises with a simple ratio. Larger values of $LbrInsMech_c$ indicate greater reliance on LMEs than EPRs for providing worker insurance. Portugal, Italy, and Spain are the lowest values, indicating very strong dependency on employment protection, while Denmark, Switzerland, Ireland, and the UK most emphasize LMEs. The values are again listed in Table 1 and are plotted as the horizontal axis of Figure 4.

The trend line for Continental Europe in Figure 4 is very flat, illustrating better than Figure 1 the empirical substitution of European economies between LMEs and EPRs for the provision

of labor insurance. This approximate orthogonality of the two indices for Continental Europe is not by construction but instead the result of selected policy levels. Including Ireland and the UK in the trend line results in a negative correlation of about -0.4. In words, countries providing higher levels of labor market insurance tend to employ more stringent employment protection when the Anglo-Saxon economies are incorporated. Within Continental Europe itself, however, there is no clear relationship between the estimated level of labor insurance provided and the mechanisms employed.

5.2 Domestic and US-Sourced European Investments

Tables 5 presents our domestic analyses with these transformed policy variables in a framework similar to specification (2). As would be expected, our results for labor mechanism index closely parallel the estimates discussed in Table 3. We again find strong evidence that labor insurance policies tilted away from employment protection are associated with stronger PE entry and investment levels in more volatile sectors. The transformation of the underlying policies makes the results easier to interpret.

Our proposed transformation also allows us to assess the relative importance of the total level of worker insurance provided as opposed to the policy mechanism used to implement it. The levels coefficients in Table 5 are uniformly smaller than the mechanism coefficients. When employing sector-level labor volatility measures, the elasticities for insurance levels are statistically different from zero and suggest that higher levels of insurance, conditional on the mechanism employed, promote more PE investment in more volatile sectors. The positive effects using the establishment-level volatility calculation, however, are not statistically different from zero.

Tables 6 presents our analyses of US-sourced investments with these transformed policy variables. The patterns for US-sourced VC investments are very strong with respect to insurance mechanisms. On the other hand, the levels of worker insurance provided do not appear to influence these investors. Buy-out investors again behave differently with respect to the entry margin and similarly in terms of investment counts. Our evidence suggests that the entry of buy-out firms is negatively influenced by the level of labor insurance provided, even after controlling for the mechanism used to implement it. This was reflected in Table 4's finding that both base policies had a negative elasticity for buy-out entry. We do not have a strong rationale for this effect, and we hope that others evaluate whether this finding holds more generally.

We thus conclude that the mechanism used to provide worker insurance is the more important attribute for PE investors. The evidence suggests that the absolute level of insurance provision can have a positive or negative effect depending upon investment type and margin analyzed.[12]

[12] Our discussion also suggests a broader prediction that PE investment for a country as a whole will be

5.3 Robustness Checks

Table 7 provides some basic robustness checks on our specification design. We report the patterns for the EVCA domestic inventors, with the US-based investments showing comparable sensitivities. Panel A repeats the base estimation for convenience.

Panel B incorporates additional national policies to test whether the insurance mechanism index is simply reflecting other policies that encourage PE formation. Similar to the main regressors, these additional policies are interacted with US labor volatility by sector. Our factors include the strength of IPO markets (e.g., Black and Gilson 1998, Michelacci and Suarez 2004), corporate tax rates (e.g., Da Rin et al. 2009), business entry regulation barriers (e.g., Fonseca et al. 2001, Klapper et al. 2006, Ciccone and Papaioannou 2007), and the share of national investments made by public investment funds (e.g., Leleux and Surlemont 2003). As discussed above, we also control for the share of buy-out investment in the country. The unreported coefficients for these additional explanatory variables are mostly small and insignificant. This would be expected due to the conditional interaction of the policies with industry labor volatility. The mechanism results are broadly robust to these additional interactions, while the estimated levels coefficients shrink towards no effect.[13]

Panel C incorporates interactions of two other traits, the national population and the national GDP per capita. The results of this test are a bit more mixed. The PE entry effect due to labor insurance mechanisms decline somewhat in economic magnitude and becomes statistically insignificant due to larger standard errors. On the other hand, the intensive margin regressions maintain much of their economic size and statistical strength.

Finally, and perhaps most importantly, Panel D includes interactions for differences across countries in their legal origins. A number of studies conclude that the legal origins of countries are important for their modern institutions and concomitant economic development. These institutions and legal regimes impact the development of PE markets beyond the labor insurance policies we explicitly model (e.g., Cumming and Johan 2009, Cumming et al. 2009). Botero et al. (2004) find that legal origins explain more of the existing differences in labor regulations across countries than recent political outcomes. Given these deep antecedents, we include indicator variables for whether countries are of Germanic, Scandinavian, or UK legal origin, with

stronger when worker insurance policies favor LMEs over employment protection, conditional on the level of worker insurance provided. This prediction is similar in spirit to Figures 2 and 3, but accounts for joint policy determination and is invariant to including Anglo-Saxon nations. We find this prediction to be true, but these results are subject to typical concerns of a cross-sectional analysis with country-level observations. These results are available upon request.

[13] Further specifications verify the robustness of the results to including metrics of product market regulations, collective bargaining, government ownership of banks, total government expenditures per capita, average education levels, technology opportunities modeled through patents issued by the European Patent Office, and the level of captive investments.

the reference category being French/Spanish. The legal origin dummies partly act as region-industry fixed effects, too. These controls further emphasize the mechanism effect, suggesting that insurance policy variations are important even within nations of similar legal origin.[14]

5.4 Alternative Mechanism Designs

In addition to the robustness check described in Table 7, we also tested several modifications to our index design. We find similar outcomes when replacing $LbrInsMech_c$, which employs a bounded radian measure of policy ratios, with a simple ratio of policy distances. Likewise, we find similar results when modelling the overall insurance level through Euclidean distances rather than linear distances. The Euclidean distance can be thought of as the length of a ray from the origin of Figure 1 to the nation's position in (EPR, LME) space. The estimated importance of how labor insurance is provisioned is robust to both of these index variants, and this stability holds for the other empirical findings of this paper.

One natural question is whether EPRs and LMEs should be weighted equally in determining the labor insurance level. We are only aware of one study that attempts to estimate α_{LME} and α_{EPR} directly. Clark and Postel-Vinay (2009) empirically evaluate whether EPRs or unemployment insurance benefits (UIBs, the largest portion of LME) better promote job security as measured through the European Community Household Panel (ECHP) surveys. Strikingly, these authors find that EPRs do not raise worker perceptions of security; if anything, Clark and Postel-Vinay's (2009) estimates imply stricter EPRs lower perceived labor market insurance by private-sector workers. On the other hand, UIBs robustly increase perceived insurance.

As a final index variant, we used Clark and Postel-Vinay's coefficients to weight an alternative $g(.)$ function that replaces $LbrInsLevel_c$. The importance of $LbrInsMech_c$ continues to hold, whereas the level of insurance proxied by the worker security perception further weakens as a predictor. This heavy weighting of the LMEs versus employment protection does, however, make it more difficult to separate the two effects when many covariate interactions are included. This nonetheless reinforces the emphasis, both here and in Clark and Postel-Vinay (2009), on the importance of insurance mechanisms.

Ultimately, there is no single approach for estimating the level of labor market insurance. While employment protection and LMEs are likely the two most important policy levers for providing labor insurance, other techniques do exist. Moreover, the outcome measures could be extended from policy choices or worker security perceptions to other economic data (e.g., worker

[14] These classifications follow La Porta et al. (1997). French/Spanish countries include Belgium, France, Italy, Netherlands, Portugal, and Spain. Germanic countries include Austria, Germany, and Switzerland. Scandinavian countries include Denmark, Finland, Norway, and Sweden. The UK origin countries include Ireland and the UK. For this sample, the common versus civil law distinction overlaps entirely with the UK origin.

income stability, job loss and gain rates). To some degree, the weighting employed will always involve normative values as well as positive models, and these values differ within and across societies (e.g., Kerr 2007).

Nevertheless, we believe $LbrInsMech_c$ captures a meaningful, first-order policy trade-off that is evident empirically and grounded in theory (e.g., Pissarides 2001, Blanchard and Tirole 2007). The conclusion of this study is that the mechanism used to provision labor market insurance is important for PE formation. We are unable to draw consistent conclusions regarding the level of insurance provided except that it is of lesser importance than the mechanism. The transformed variables demonstrate the mechanism's importance in an intuitive manner. We hope that future research will further refine our understanding of the $g(.)$ function's structure.

6 Conclusions

European economies empirically substitute between employment protection regulations and labor market expenditures (e.g., unemployment insurance benefits, job transition assistance) as mechanisms for providing worker security. A growing body of theoretical and empirical evidence finds employment protections act as a tax on firm adjustments, while the incidence of labor expenditures on this margin is less direct. Many European policy makers and business leaders want to replicate US venture capital and buy-out communities in their home countries. Both of these private equity groups, however, operate in dynamic environments that require frequent adjustments of the labor forces of their portfolio companies. Their business models make these investors very sensitive to strict labor regulations.

We find that worker insurance policies favoring labor expenditures over employment protection encourage greater private equity entry and larger investment levels. This is true for both domestic investors and US-inbound venture capital investments. This effect is conditional on the level of worker insurance provided, which is of lesser importance for private equity patterns than the policy mechanisms employed. Policy choices regarding the optimal levels and mechanisms of labor market insurance are complex and should consider many economic and non-economic factors. This study highlights one factor that should influence the trade-off between employment protection and labor market expenditures.

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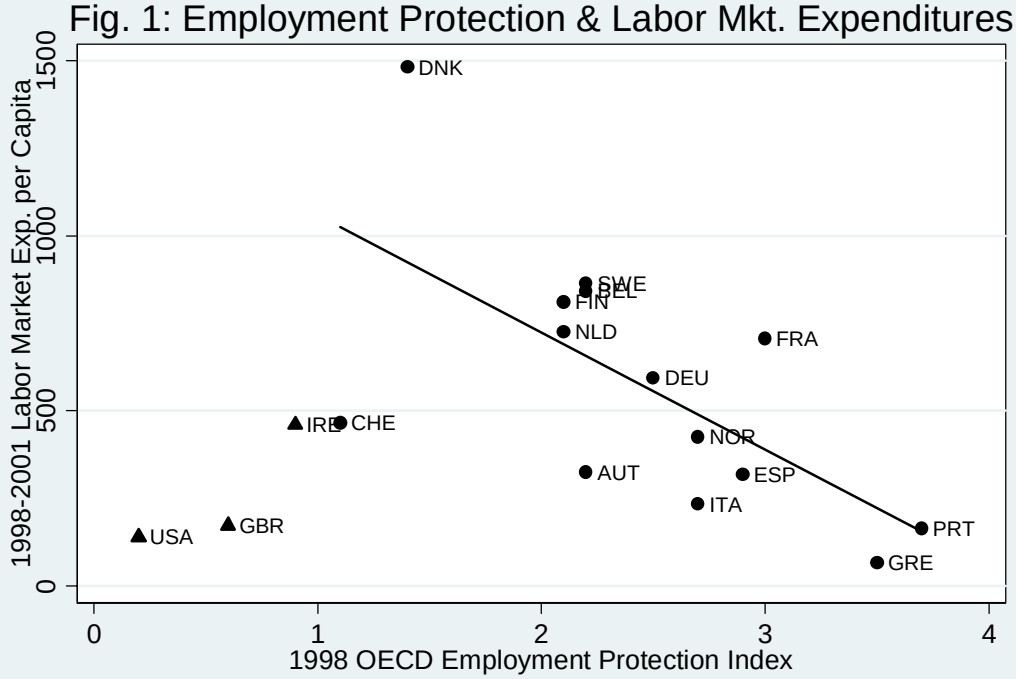
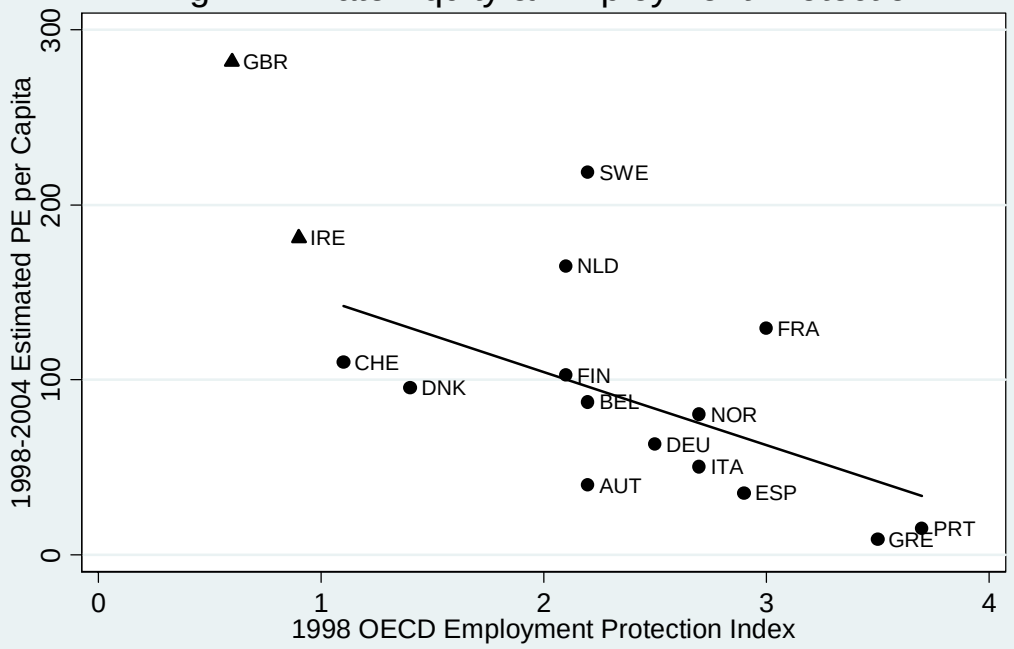
Fig. 1: Employment Protection & Labor Mkt. Expenditures



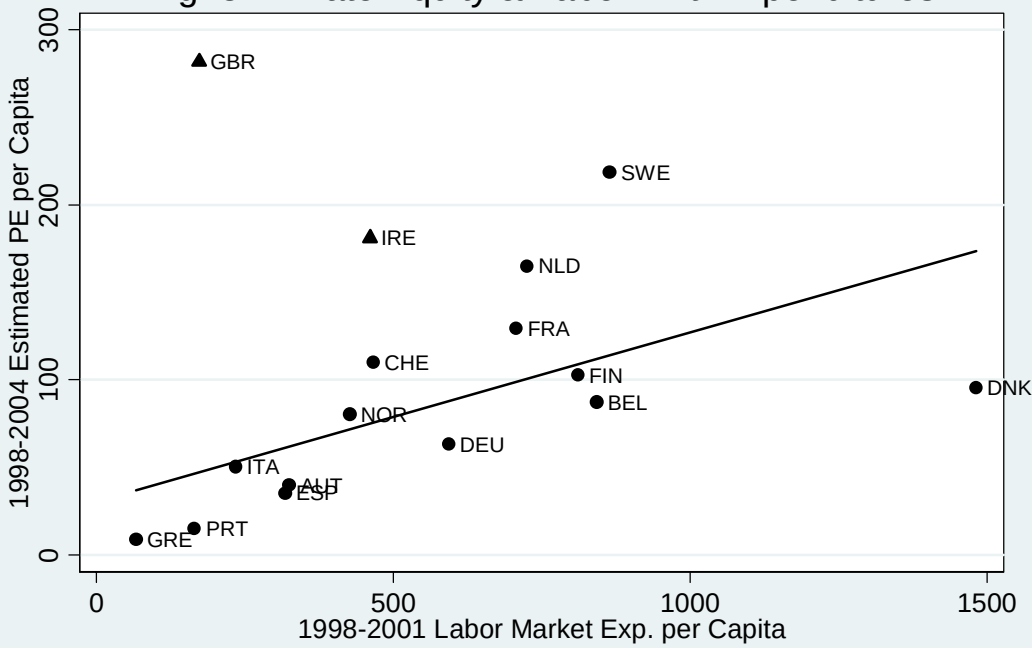
Notes: Trend Line Estimated for Continental Europe

Fig. 2: Private Equity & Employment Protection



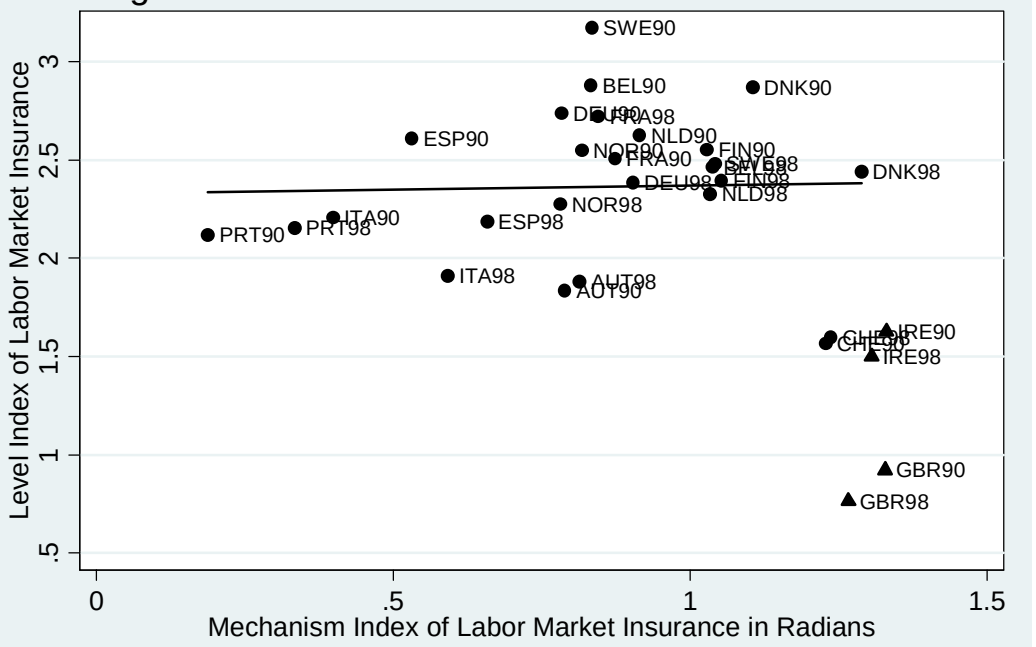
Notes: Trend Line Estimated for Continental Europe

Fig. 3: Private Equity & Labor Mkt. Expenditures



Notes: Trend Line Estimated for Continental Europe

Fig. 4: Level & Mechanism Indices of Labor Insurance



Notes: Trend Line Estimated for Continental Europe

Table 1: Descriptive Statistics for European Private Equity Sample

	OECD Employment Protection Index		Annual Labor Mkt. Expenditures per Capita		Annual Domestic Private Equity Inv. per Capita		Annual US-Sourced Private Equity Inv. per Capita		Level Index of Labor Market Insurance		Mechanism Index of Labor Market Insurance	
	90	98	90-97	98-01	90-97	98-04	90-97	98-04	90-97	98-04	90-97	98-04
Austria	2.2	2.2	290	325	0	15	0	25	1.8	1.9	0.8	0.8
Belgium	3.2	2.2	760	842	11	40	3	48	2.9	2.5	0.8	1.0
Denmark	2.3	1.4	1469	1482	4	48	0	47	2.9	2.4	1.1	1.3
Finland	2.3	2.1	873	811	7	61	0	42	2.6	2.4	1.0	1.1
France	2.7	3.0	600	707	17	69	2	61	2.5	2.7	0.9	0.8
Germany	3.2	2.5	602	593	9	40	0	23	2.7	2.4	0.8	0.9
Ireland	0.9	0.9	548	461	8	35	2	146	1.6	1.5	1.3	1.3
Italy	3.6	2.7	188	234	7	37	1	13	2.2	1.9	0.4	0.6
Netherlands	2.7	2.1	732	726	25	99	10	67	2.6	2.3	0.9	1.0
Norway	2.9	2.7	554	427	17	57	0	24	2.5	2.3	0.8	0.8
Portugal	4.1	3.7	112	165	5	11	0	4	2.1	2.2	0.2	0.3
Spain	3.8	2.9	313	318	4	27	0	9	2.6	2.2	0.5	0.7
Sweden	3.5	2.2	983	865	19	159	2	59	3.2	2.5	0.8	1.0
Switzerland	1.1	1.1	425	466	9	46	2	64	1.6	1.6	1.2	1.2
UK	0.6	0.6	216	173	42	197	6	84	0.9	0.8	1.3	1.3
Average	2.6	2.2	578	573	12	63	2	48	2.3	2.1	0.9	0.9

Notes: The Employment Protection Regulations (EPR) Index is taken from the OECD. It has a theoretical range of 0 to 5, with higher scores indicating stronger employment protection. Labor market expenditures (LME) and populations are taken from the OECD Social Expenditures and Labour Force databases. Domestic and US-sourced private equity (PE) investments are taken from the European Venture Capital Association (EVCA) and Venture Economics (VE) databases, respectively. PE includes buy-out funds and venture capital placements. Investments and expenditures are in nominal ECUs/Euros per capita.

Level and Mechanism Indices of Labor Market Insurance are transformations of the EPR and LME policies. The Level Index estimates the joint insurance provided through these two policies; higher values indicate greater worker insurance provision. The Mechanism Index estimates the relative importance of the two policies; higher values indicate greater reliance on LMEs versus EPRs in the provision. EPRs and the log value of LMEs per capita are transformed to have zero mean and unit standard deviation. Univariate distances are measured from the lowest provision of each policy among the reporting countries (US EPR, Greece LME). The Level Index averages these univariate distances. The Mechanism Index is the radian measure of the transformed LME to EPR ratio. The text provides additional details.

Table 2: Sector-Level Descriptive Statistics

	US Calculations of Sector-Level Labor Volatility		Domestic Total Private Equity Investments		US-Sourced Total Private Equity Investments	
	Establishment	Sector	1990-1997	1998-2004	1990-1997	1998-2004
Communications	0.3425	0.0317	3.7%	12.7%	10.3%	17.2%
Computer-Related	0.5216	0.0794	5.8%	9.0%	3.2%	12.0%
Others Electronics-Related	0.3599	0.0211	3.9%	2.4%	0.6%	4.1%
Biotechnology	0.4252	0.0397	2.1%	2.8%	11.4%	4.1%
Medical/Health-Related	0.3475	0.0190	4.2%	6.6%	13.4%	4.6%
Energy	0.4947	0.0520	1.4%	1.4%	0.2%	1.2%
Consumer-Related	0.4054	0.0334	21.2%	19.4%	26.3%	16.9%
Industrial Products and Services	0.3063	0.0285	13.6%	9.7%	1.4%	2.7%
Chemicals and Materials	0.2751	0.0263	3.5%	3.6%	4.8%	6.4%
Industrial Automation	0.3265	0.0507	1.1%	1.2%	0.1%	0.2%
Other Manufacturing	0.3670	0.0311	10.0%	8.0%	10.6%	8.4%
Transportation	0.3499	0.0214	4.7%	2.8%	4.4%	7.0%
Financial Services	0.3953	0.0334	4.0%	2.7%	3.0%	4.9%
Other Services	0.4126	0.0354	11.0%	8.9%	1.9%	3.8%
Agriculture	n.a.	n.a.	1.4%	0.5%	1.7%	0.5%
Construction	n.a.	n.a.	4.1%	2.8%	4.9%	4.4%
Other	n.a.	n.a.	4.4%	5.5%	1.8%	1.6%
Average (Unwtd)	0.3817	0.0359				

Notes: US labor volatility metrics are calculated for establishments from US Census Bureau data for 1977-1999. Volatility is defined as the mean absolute change in establishment employment from the previous year divided by the average employment in the current and previous year. The sector-level calculation employs the same formula using industry-level data from 1992-1999. Further details on the construction of the metrics are included in the text. Domestic private equity investments are taken from the EVCA database. US-sourced private equity investments are taken from the VE database. Private equity includes buy-out funds and venture capital placements. Values are presented as shares of total investments over the 1990-1997 and 1998-2004 sample periods.

Table 3: European Domestic Private Equity Investments with Base Labor Market Policies

	Extensive Margin (0,1) Invest >1 Euro/Cap		Intensive Margin Log Count of Investments		Intensive Margin Log Value of Investments	
	(1)	(2)	(3)	(4)	(5)	(6)
OECD Employment Protection Index	-0.030	-0.035	-0.107	-0.068	-0.077	-0.037
Interacted with US Labor Volatility by Sector	(0.026)	(0.019)	(0.040)	(0.025)	(0.052)	(0.035)
Log Labor Market Expenditures per Capita	0.057	0.065	0.091	0.132	0.083	0.121
Interacted with US Labor Volatility by Sector	(0.034)	(0.026)	(0.046)	(0.033)	(0.059)	(0.050)
Linear Combination for Policy Mechanism:	0.087	0.100	0.198	0.201	0.160	0.158
$\beta_{LME}-\beta_{EPR}$	(0.051)	(0.041)	(0.067)	(0.050)	(0.085)	(0.076)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	210	210	210	210

Notes: Country-sector estimations consider private equity investments (PE) in Europe for 1990-2004. The dependent variable in Columns 1 and 2 is an indicator variable for PE investments above one Euro per capita in the country-sector. The dependent variable in Columns 3 and 4 is the log count of PE investments made. The dependent variable in Columns 5 and 6 is the log value of PE investments made. Explanatory variables interact country-level employment regulations (EPR) and labor market expenditures per capita (LME) with sector-level labor volatility of establishments in the US. Main effects are demeaned prior to interactions and are absorbed by country and sector fixed effects. Variables are transformed to have unit standard deviation for interpretation. Regressions include country and sector fixed effects, are weighted by country populations interacted with aggregate sector size, and report robust standard errors. The bottom row presents the linear difference βLME-βEPR and its standard error. This difference approximates a policy change that holds the level of worker insurance provided constant but adjusts the insurance mechanism from EPRs towards LMEs.

Table 4: US-Sourced Investments into Europe with Base Labor Market Policies

	Extensive Margin (0,1) Invest >1 Euro/Cap		Intensive Margin Log Count of Investments		Intensive Margin Log Value of Investments	
	(1)	(2)	(3)	(4)	(5)	(6)
	A. US-Sourced Venture Capital Placements					
OECD Employment Protection Index	-0.065	-0.049	-0.152	-0.110	-0.265	-0.198
Interacted with US Labor Volatility by Sector	(0.024)	(0.016)	(0.064)	(0.037)	(0.132)	(0.113)
Log Labor Market Expenditures per Capita	0.015	0.045	0.110	0.141	0.209	0.264
Interacted with US Labor Volatility by Sector	(0.031)	(0.028)	(0.073)	(0.049)	(0.164)	(0.153)
Linear Combination for Policy Mechanism:	0.080	0.094	0.263	0.250	0.474	0.462
β_{LME}-β_{EPR}	(0.035)	(0.027)	(0.109)	(0.076)	(0.275)	(0.260)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	186	186	186	186
	B. US-Sourced Buy Out Placements					
OECD Employment Protection Index	-0.045	-0.035	-0.078	-0.031	0.020	0.048
Interacted with US Labor Volatility by Sector	(0.021)	(0.016)	(0.049)	(0.025)	(0.074)	(0.070)
Log Labor Market Expenditures per Capita	-0.057	-0.036	0.057	0.103	-0.138	-0.106
Interacted with US Labor Volatility by Sector	(0.030)	(0.024)	(0.051)	(0.030)	(0.100)	(0.101)
Linear Combination for Policy Mechanism:	-0.011	-0.001	0.135	0.134	-0.157	-0.154
β_{LME}-β_{EPR}	(0.037)	(0.029)	(0.071)	(0.045)	(0.146)	(0.150)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	151	151	151	151

Notes: See Table 3.

Table 5: European Domestic Private Equity Investments with Transformed Labor Market Policies

	Extensive Margin (0,1) Invest >1 Euro/Cap		Intensive Margin Log Count of Investments		Intensive Margin Log Value of Investments	
	(1)	(2)	(3)	(4)	(5)	(6)
Levels Index of Labor Market Insurance	0.041	0.048	0.044	0.105	0.057	0.113
Interacted with US Labor Volatility by Sector	(0.033)	(0.026)	(0.048)	(0.031)	(0.064)	(0.045)
Mechanism Index of Labor Market Insurance	0.072	0.078	0.156	0.162	0.137	0.135
Interacted with US Labor Volatility by Sector	(0.042)	(0.034)	(0.054)	(0.041)	(0.070)	(0.063)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	210	210	210	210

Notes: See Table 3. The Level and Mechanism Indices of Labor Market Insurance are transformations of country-level employment protection (EPR) and labor market expenditures (LME) policies. The Level Index estimates the joint insurance provided through these two policies; higher values indicate greater worker insurance provision. The Mechanism Index estimates the relative importance of the two policies; higher values indicate greater reliance on LMEs versus EPRs in the provision. The construction of these indices is detailed in the text and Table 1.

Table 6: US-Sourced Investments into Europe with Transformed Labor Market Policies

	Extensive Margin (0,1) Invest >1 Euro/Cap		Intensive Margin Log Count of Investments		Intensive Margin Log Value of Investments	
	(1)	(2)	(3)	(4)	(5)	(6)
	A. US-Sourced Venture Capital Placements					
Levels Index of Labor Market Insurance	-0.021	0.013	0.039	0.089	0.112	0.176
Interacted with US Labor Volatility by Sector	(0.033)	(0.030)	(0.074)	(0.045)	(0.122)	(0.106)
Mechanism Index of Labor Market Insurance	0.053	0.068	0.205	0.199	0.378	0.358
Interacted with US Labor Volatility by Sector	(0.029)	(0.024)	(0.087)	(0.059)	(0.200)	(0.195)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	186	186	186	186
	B. US-Sourced Buy Out Placements					
Levels Index of Labor Market Insurance	-0.073	-0.045	0.020	0.093	-0.127	-0.082
Interacted with US Labor Volatility by Sector	(0.031)	(0.025)	(0.058)	(0.031)	(0.090)	(0.080)
Mechanism Index of Labor Market Insurance	-0.024	-0.011	0.105	0.114	-0.143	-0.147
Interacted with US Labor Volatility by Sector	(0.032)	(0.025)	(0.054)	(0.031)	(0.112)	(0.109)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector
Country and Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210	210	151	151	151	151

Notes: See Table 5.

Table 7: Robustness Checks on European Domestic Private Equity Investments

	Extensive Margin (0,1) Invest >1 Euro/Cap		Intensive Margin Log Count of Investments		Intensive Margin Log Value of Investments	
	(1)	(2)	(3)	(4)	(5)	(6)
	A. Base Regressions with Country and Sector Fixed Effects					
Levels Index of Labor Market Insurance	0.041	0.048	0.044	0.105	0.057	0.113
Interacted with US Labor Volatility by Sector	(0.033)	(0.026)	(0.048)	(0.031)	(0.064)	(0.045)
Mechanism Index of Labor Market Insurance	0.072	0.078	0.156	0.162	0.137	0.135
Interacted with US Labor Volatility by Sector	(0.042)	(0.034)	(0.054)	(0.041)	(0.070)	(0.063)
	B. Including Extended Interactions of Other National Policies					
Levels Index of Labor Market Insurance	-0.025	-0.010	-0.004	0.070	-0.047	0.030
Interacted with US Labor Volatility by Sector	(0.036)	(0.039)	(0.061)	(0.049)	(0.063)	(0.043)
Mechanism Index of Labor Market Insurance	0.063	0.078	0.162	0.102	0.158	0.090
Interacted with US Labor Volatility by Sector	(0.046)	(0.037)	(0.065)	(0.050)	(0.076)	(0.060)
	C. Including Extended Interactions of Other National Traits					
Levels Index of Labor Market Insurance	0.010	-0.005	0.019	0.041	-0.003	0.015
Interacted with US Labor Volatility by Sector	(0.041)	(0.036)	(0.053)	(0.042)	(0.061)	(0.041)
Mechanism Index of Labor Market Insurance	0.067	0.050	0.151	0.121	0.177	0.116
Interacted with US Labor Volatility by Sector	(0.060)	(0.050)	(0.077)	(0.059)	(0.084)	(0.069)
	D. Including Extended Interactions of Legal Origins					
Levels Index of Labor Market Insurance	0.008	0.029	0.037	0.171	0.052	0.142
Interacted with US Labor Volatility by Sector	(0.061)	(0.039)	(0.083)	(0.050)	(0.096)	(0.050)
Mechanism Index of Labor Market Insurance	0.081	0.082	0.164	0.145	0.147	0.126
Interacted with US Labor Volatility by Sector	(0.048)	(0.035)	(0.057)	(0.042)	(0.062)	(0.050)
Volatility Metric Employed	Establish.	Sector	Establish.	Sector	Establish.	Sector

Notes: See Table 5. Panel B includes additional interactions of sector labor volatility with the strength of IPO markets, corporate tax rates, business entry regulation barriers, the share of national investments made by public investment funds, and the share of buy-out investment in the country. Panel C includes interactions with national populations and GDP per capitas. Panel D includes interactions with the legal origins of countries.

App. Table 1: EVCA Sector Definitions

Communications - Internet Technology: browsers, portals, search engines and other internet enabling technologies, website design and consultancy, ISPs. Telecommunications (Hardware): voice and data communications equipment, cable/mobile/satellite network equipment excluding telecommunications carriers. Telecommunications (Carriers): cable/mobile/satellite telecommunications carriers. Communications (other): TV and radio broadcasting, media houses, publishing.

Computer-Related - Computer (Hardware): computer mainframes, laptops, minicomputers, PDA/hand-held devices, optical scanning equipment, voice synthesis/recognition equipment. Computer (Semiconductors): semiconductors, electronic components (e.g., integrated circuits, transistors), semiconductor fabrication equipment. Computer (Services): data processing, hardware maintenance, IT consulting, IT training. Computer (Software): application software products, operating systems and systems-related software for all types of hardware, systems integration, software development. Includes manufacturers, resellers, and distributors.

Other Electronics Related - batteries, power supplies, fibre optics, analytical and scientific instrumentation.

Biotechnology - agricultural/animal biotechnology (e.g., plant diagnostics), industrial biotechnology (e.g., derived chemicals), biotechnology related research and production equipment

Medical/Health-Related - Medical (Healthcare): health institutions, hospital management, handicap aids & basic healthcare supplies. Medical (Instruments/Devices): technologically advanced diagnostic & therapeutic products and services. Medical (Pharmaceuticals): drug development, manufacture and supply.

Energy - oil and gas exploration and production, exploration and drilling services and equipment, coal related, energy conservation related, alternative energy.

Consumer-Related - Consumer (Retail): retailing of consumer products and services (including leisure and recreational products). Consumer (Other): manufacture and supply of consumer products.

Industrial Products and Services - industrial equipment and machinery, pollution and recycling related, industrial services.

Chemicals and Materials - agricultural chemicals, commodity chemicals, specialty or performance chemicals/materials, coating and adhesives, membranes and membrane-based products.

Industrial Automation - industrial measurement and sensing equipment, process control equipment, robotics, machine vision systems, numeric and computerized control of machine tools.

Other Manufacturing - business products and supplies, office furniture, textiles, hardware and plumbing supplies, pulp and paper, printing and binding, packaging products and systems.

Transportation - airlines, railways, buses, airfield and other transportation services, mail and package shipment.

Financial Services - banking, insurance related, real estate, securities and commodities brokers.

Other Services - engineering services, advertising and public relations, distributors, importers and wholesalers; consulting services (excluding IT consulting – see Computer: Services).

Agriculture - animal husbandry, crop cultivation, fishing, forestry.

Construction - construction services, manufacture of building materials, manufacture of pre-fabricated buildings and systems.

Other - mining, utilities, conglomerates.

Source: Compiled from EVCA Private Equity Survey Guidance Notes and Glossary by EVCA (2005), Thomson Venture Economics, and PriceWaterhouseCoopers.