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Capital Mobility and Unemployment Dynamics: Evidence from a Panel of OECD Countries

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Abstract
We use a panel of 20 OECD countries over a 30-year period to estimate the implications of international capital mobility for unemployment. We find that the increase in capital flows since the mid1980s has contributed to an amplification of the impulse response of unemployment to country-specific shocks and to a fall in the persistence of unemployment in response to the same shocks.

Keywords: unemployment persistence, unemployment volatility, international capital flows, OECD countries
JEL Classification codes: E24, E32, F15, F21

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1 Introduction

This paper focuses on the labour market effects of international capital mobility. Specifically, our aim is to assess whether and to what extent the remarkable increase in capital mobility experienced by the OECD countries in the last two decades has contributed to unemployment dynamics.

The benefits of capital mobility are well known: the removal of barriers to factors mobility increases efficiency and, by lowering the cost of financial transactions, improves saving and investment both from a quantitative and qualitative point of view. In the long run, higher capital mobility enhances capital accumulation and economic growth. However, in a world in which labour is less mobile than capital, perfect capital mobility will also amplify the impact of country-specific productivity shocks on domestic employment.

The reason why this happens is easy to understand if one considers how an economy adjusts to a temporary reduction in productivity. In an economy without capital mobility, a temporary decrease in productivity leads to a reduction in the rate of return to capital and then to a temporary fall in capital accumulation and labour demand. But in presence of low barriers to international capital mobility, investors diversify country-specific productivity shocks across countries. As a consequence, when a domestic negative shock hits the economy, capital flows abroad, where the rates of return are relatively higher. This further shrinks the demand for labour and deepens the recession. Conversely, if the shock is positive, the inflow of foreign capital accelerates the increase in the demand for labour. These forces result in bigger and sharper fluctuations in labour demand and real wages than would be observed in a closed economy, while the mean unemployment rate is not substantially affected.

In this paper we test the link between capital mobility and unemploy-

ment dynamics by using a panel of 20 OECD countries for the past 30 years. In particular, following Azariadis and Pissarides (2003), we are interested in exploring two possible roles played by capital mobility - first its effect on the persistence of unemployment and second its impact on unemployment responsiveness to idiosyncratic productivity shocks. In our analysis we find evidence for both mechanisms: larger penetration of international capital significantly amplifies the impact of idiosyncratic shocks on domestic unemployment, reduces the duration of the response to the shocks and increases unemployment volatility.

The reminder of the paper is organized as follows. In section 2, we present the theoretical motivations of our study. Section 3 defines the key measures and concepts of unemployment volatility and capital mobility that we use in the empirical analysis along with a preliminary analysis of the data. In section 4 we present the empirical results and simulate the effects of changes in capital mobility on unemployment volatility. Section 5 concludes.

2 Theoretical motivations and empirical evidence

The importance of international capital mobility has been extensively examined in the trade theory. However, still little attention has been devoted to the macroeconomic effects of capital market integration. Indeed, increased capital mobility can produce undesirable effects in economies whose domestic capital becomes more responsive to productivity or price shocks.[1]

[1]There is a large theoretical and empirical literature which relates changes in the business cycle volatility to changes in the degree of capital mobility. On the theoretical side, the effects of increased capital market integration on macroeconomic volatility are in fact

A direct implication of increased international capital mobility is an increase in investment volatility as the substitution between domestic and foreign investment becomes larger. Using a simple neoclassical model, Razin and Rose (1994) show that a reduction in barriers to capital mobility enhances investment opportunities and increases therefore the volatility of investment. These effects are larger when the underlying shocks are idiosyncratic and permanent. A non structural empirical analysis is also performed to test the link between openness and volatility suggested by the theory, finding little support for the theoretical conclusions.[2]

Regarding the effects of increasing international capital mobility on the labour market, Rodrik (1997) is one of the first who emphasizes the link between openness and labour market instability in a world where labour is intrinsically less mobile than capital. The main implication of this asymmetry is that workers have to face greater instability in earnings and hours worked in response to country specific shocks when international mobility of capital increases. Using a simple static model of an open economy, he shows that the elasticity of demand for domestic labour increases with the degree of "openness" of the economy.[3] The intuition is easy to understand. The de-

not clear, and depend on the nature of the underlying shocks. For a discussion of this literature, see the survey of Buch (2002). The analysis of the effects of capital market integration on business cycle volatility goes beyond the scope of this paper. From now on, we will focus our discussion on the implications of increased capital mobility for labour market volatility.

[2]One of the main limitations of this kind of studies is the difficulty of design appropriate measures for the degree of capital mobility. The most frequently used indicators indicate the existence of barriers to capital mobility but they do not measure the intensity of such barriers. As a consequence the data (mainly cross sections) are not powerful enough to deliver any clear-cut implication.

[3]The degree of "openness" of the economy is captured by the increasing cost incurred

mand for any factor used in the production process becomes more sensitive to changes in its own price when other production factors (as for example capital) respond quicker and to a larger extent to economic changes.[4] When an idiosyncratic shock hits the economy (such as an exogenous shock to labour demand caused by an unexpected change in labour productivity) a flatter demand curve will result in larger changes in both employment and wages.[5]

Azariadis and Pissarides (2003) analyse the impact of capital mobility on unemployment dynamics using a labour search framework.[6] Their one-sector equilibrium life-cycle model combines two important characteristics: (1) non-Walrasian labour markets with search frictions, and (2) asymmetry between international mobility of capital and labour, with capital being perfectly mobile across countries and labour perfectly immobile. In this framework, unemployment arises in equilibrium because of the presence of frictions in the matching process between vacancies (opened by firms at a constant unit cost) and available workers. Temporary international differences in total factor productivity determine the allocation of capital across national borders and, through capital adjustments, affect the domestic employment (and unemployment) rate. They show that in an open economy unemployment fluctuations caused by idiosyncratic TFP shocks are larger though less persistent than in a closed economy. The intuition is the follow-

by firms as capital moves across the national borders.

[4] As Rodrik pointed out, this can be seen as a direct consequence of the Le Chatelier-Samuelson principle.

[5] The distribution of volatility between wages and employment depends on the slope of the labour supply curve.

[6] The model is a open-economy version of models previously used to study the implications of search theory in explaining certain phenomena of the business cycle that the standard neoclassical framework cannot explain in a satisfactory way. See among the others Mertz (1995), Andolfatto (1996) and den Haan et al. (1997).

ing. In a closed economy adjustments of capital stock (and consequently of employment) after a productivity shock occur gradually and are driven by changes in domestic savings. In an economy with capital mobility, accumulation and decumulation of capital stock do not occur entirely through changes in domestic savings. Capital is imported from abroad when a positive TFP shock hits the domestic economy and is exported abroad in the case of a negative shock. As a consequence, the adjustment of employment is faster (instantaneous under extreme assumptions) in an open economy than in a closed economy. Under quite general assumptions, the main implications for the unemployment dynamics are that: (1) international capital mobility amplifies the impact on domestic unemployment of idiosyncratic TFP shocks; (2) it shortens the duration of the effect; and (3) it raises the volatility of unemployment. Numerical calibrations of the model show that the variance of the unemployment rate with perfect capital mobility is almost three time larger than in an economy without capital mobility. These results appear to be consistent with the observation that the variability of unemployment has increased in the last decades in almost all the OECD countries, in parallel with the liberalization of international capital markets.

An increased labour market volatility in the United States over the last three decades as been documented in a number of studies. Gottschalk and Moffitt (1994) show a substantial increase in earnings dispersion in the US manufacturing sector between the 70s and 80s, half of which has been related to the increase in the variance of "transitory" movements in earnings.[7] The fact that the change in *short-term* earning volatility appears to persist along any dimensions one can cut the data (e.g. skill groups, sectors, establish-

[7]The increase of the variance of "transitory" or *short-term* changes in earnings captures an increase of the fluctuations of worker's earning from year to year.

ments) may suggest the presence of a common factor (such has globalization, but also institutional changes) which have led to greater wage instability across and within different groups. Recent evidence in Farber (1996, 2003) also shows an increase in job insecurity between the 80s and 90s in the United States. Focusing on the incidence of job loss over the periods 1982-1996 and 1996-2001, Farber finds an increase in job loss rates over time after accounting for the state of the labour market.[8]

As Rodrik pointed out, though neither Farber nor Gottschalk and Moffitt relate the declining job security to the increased integration of international markets, these facts appear to be consistent with an economy in which greater openness interacted with fluctuations in labour demand has led to greater instability in wages and employment.

Regarding the effects of "globalisation" on labour demand, as predicted by Rodrik (1997) and Azariadis and Pissarides (2003), a number of papers analyse the link between international market integration and labour demand elasticity.[9] Using data for the US manufacturing sector from 1961 to 1991, Slaughter (2001) finds that production-labour demand becomes more elastic over time in the overall manufacturing sector and in 5 of the 8 manufacturing industries considered. However, when the estimated (time variant)

[8] In the early 90s (during a weak labour market) job loss rates have been found to be higher than those recorded during the recession in the early 80s. Job loss also increased substantially in the 1999-2001 period in concomitance with the beginning of the recession.

[9] The indicators of international market integration used in the analysis include both measures of trade and capital openness. In fact the effect of international trade on the elasticity of labour demand is analogous to that of international capital mobility. The reason is that firms and consumers can substitute foreign workers for domestic workers by either investing abroad or by importing goods produced abroad (Rodrik, 1997). As explained before, higher labour demand elasticity triggers more volatile responses of wages and employment to any exogenous shocks to labour demand.

labour demand elasticity is regressed on a number of indicators of the degree of trade liberation, the effect of trade liberalization turns out to be not robust to the inclusion of time controls, suggesting the presence of a large unexplained residuals in changes of labour demand elasticities over time. Following a similar approach, Faini et al. (1999)[10] find some evidence of a positive effect of globalisation on labour demand elasticity for the manufacturing sectors in Italy over the period 1985-1995. Finally, Bruno et al. (2003) develop a general framework to test the impact of globalisation on labour demand elasticities that generalises the previous empirical contributions. First a labour demand equation is obtained from the solution of a firm's cost minimization problem and a trade variable is included in this specification. The labour demand is then estimated using an industry panel for a number of OECD countries over the period 1970-1996. The hypothesis that high international integration affects labour demand elasticity receives strong support for France and the UK only.

A different approach is followed in two recent papers by Krishna et al. (2001) and Fajnzylber and Maloney (2001), which investigate the link between openness and labour demand elasticities in countries experiencing dramatic changes in trade regimes.[11] Both papers find little support to the conjecture of more-elastic labour demand in response to trade liberalization.

[10]This paper follows the approach used in a preliminary version of Slaughter's study published in the NBER working paper series in 1997.

[11]Krishna et al. (2001) analyse the impact of trade liberalization in Turkey where significant import liberalization measures were announced in December 1983 and implemented soon after. The 1984 import liberalization program significantly reduced both tariff and non-tariff barriers. Fajnzylber and Maloney (2001) use dynamic panel techniques to estimate labor demand relations for manufacturing establishments in Chile, Colombia, and Mexico across their periods of reforms.

3 Employment dynamics and capital mobility: a preliminary analysis

As we have seen in the previous section, the theory predicts that economies with larger international capital flows have higher volatility of investment (Razin and Rose, 1994) and unemployment (Azariadis and Pissarides, 2003). In this section we consider some preliminary evidence of the relationship between capital mobility and unemployment (and investment) volatility by looking at the correlation between different measures of international capital flows and our variables of interest. The analysis is based on annual data for 20 OECD countries over the period 1970-2001[12].

We consider three measures of the penetration of foreign capital in the OECD countries, namely the FDI inflows (FDI_in), the absolute value of FDI inflows net of FDI outflows (FDI_net), and the sum of FDI inflows and outflows as a proxy of the overall FDI activity (FDI_sum). The FDI flows are normalized by dividing them by domestic investment. The data on FDI flows are available from the International Financial Statistics of the IMF for almost all the OECD countries for the period under investigation.[13] Measures of capital mobility based on FDI intensity have the advantage that data on FDI are readily available on a comparable basis for a large number of countries. However, some limitations remain due to existing divergences

[12] A full list of the countries included in the analysis and the definition of variables used is given in Appendix 6.4.

[13] The IMF publishes annual data on FDI inflows (direct investment in the reporting economy) and FDI outflows (direct investment abroad) in the Balance of Payments Statistics Yearbook, which are also available in the International Financial Statistics.

Table 1: Capital mobility and volatility of unemployment and investment rate

	FDIin	**FDIout**	**FDIsum**	**FDInet**	**sd_un**	**sd_inv**
			1970-2001			
sample mean (1)	0.084	0.092	0.177	0.059	0.011	0.072
			1970-1985			
sample mean (2)	0.033	0.032	0.064	0.029	0.009	0.070
			1986-2001			
sample mean (3)	0.125	0.138	0.265	0.082	0.013	0.075
sample mean ratio (3)/(2)	**6.721**	**8.450**	**5.642**	**3.936**	**1.667**	**1.139**

in the compilation methodologies, definitions and classifications.[14]

Following a standard approach in the real business cycle literature, we calculate the investment and unemployment rates volatility as the standard deviation of the cyclical component of the time series under investigation. We detrended the data using the Hodrick-Prescott filter, setting the smoothing parameter λ equal to 100 as suggested for annual data (Hodrick and Prescott, 1997). Raw data on unemployment and investment are available from the OECD National Account Statistics and Economic Outlook.

Table 1 reports the sample average volatility of unemployment and investment rates and the average of the previously defined measures of FDI flows for the whole period (1970-2001) and for two sub-periods, before and after 1985. The striking feature of the data is the remarkable increase in international capital mobility after the mid 1980s. The sharp increase in FDI inflows affected almost all the countries in the sample[15] and, in accordance with the prediction of the theory, this coincides with an increase in

[14]For a discussion on the international comparability of FDI statistcs, see the excellent survey by Falzoni (2000).

[15]Tables 1A-3A in appendix 6.1 report FDI statistics, unemployment and investment volatility for individual OECD countries.

Table 2: Spearman correlation between unemployment/investment volatility and capital mobility

	FDIin	**FDIsum**	**FDInet**
		1970-2001	
sd_un	0.54**	0.51**	0.52**
sd_inv	0.27*	0.42*	0.46**
		1970-1985	
sd_un	0.20	0.25	0.38*
sd_inv	0.34	0.03	0.32
		1986-2001	
sd_un	0.59**	0.61**	0.69**
sd_inv	0.37*	0.43**	0.44**

Notes. **5 percent significance *10 percent significance

the volatility of unemployment and investment. On average the standard deviation of the unemployment rate is almost 70 percent higher in the period 1986-2001 than in the previous period while the rise in the investment rate standard deviation is about 15 percentage points.

A preliminary assessment of the cross country correlation between unemployment and investment volatility and our measures of capital mobility is provided in Table 2, where the Spearman correlation coefficients are reported for the whole period and for the two sub-periods separately[16]. The results show that both unemployment volatility and investment volatility are strongly positively correlated with all the measures of capital mobility considered. The rank correlation is not significant in the period 1970-1985, but it turns to be strongly significant in the most recent period.

Finally, Figures 1 and 2 plot each measure of capital mobility against the volatility of unemployment rate and investment rate respectively. There is a strong evidence that countries characterized by a higher degree of openness to international capital flows have higher unemployment and investment volatil-

[16]Spearman rank correlation coefficients are reported rather then simple correlation coefficients since the former are less sensitive to the presence of outliers than the latter.

Figure 3.1: Unemployment volatility and capital mobility

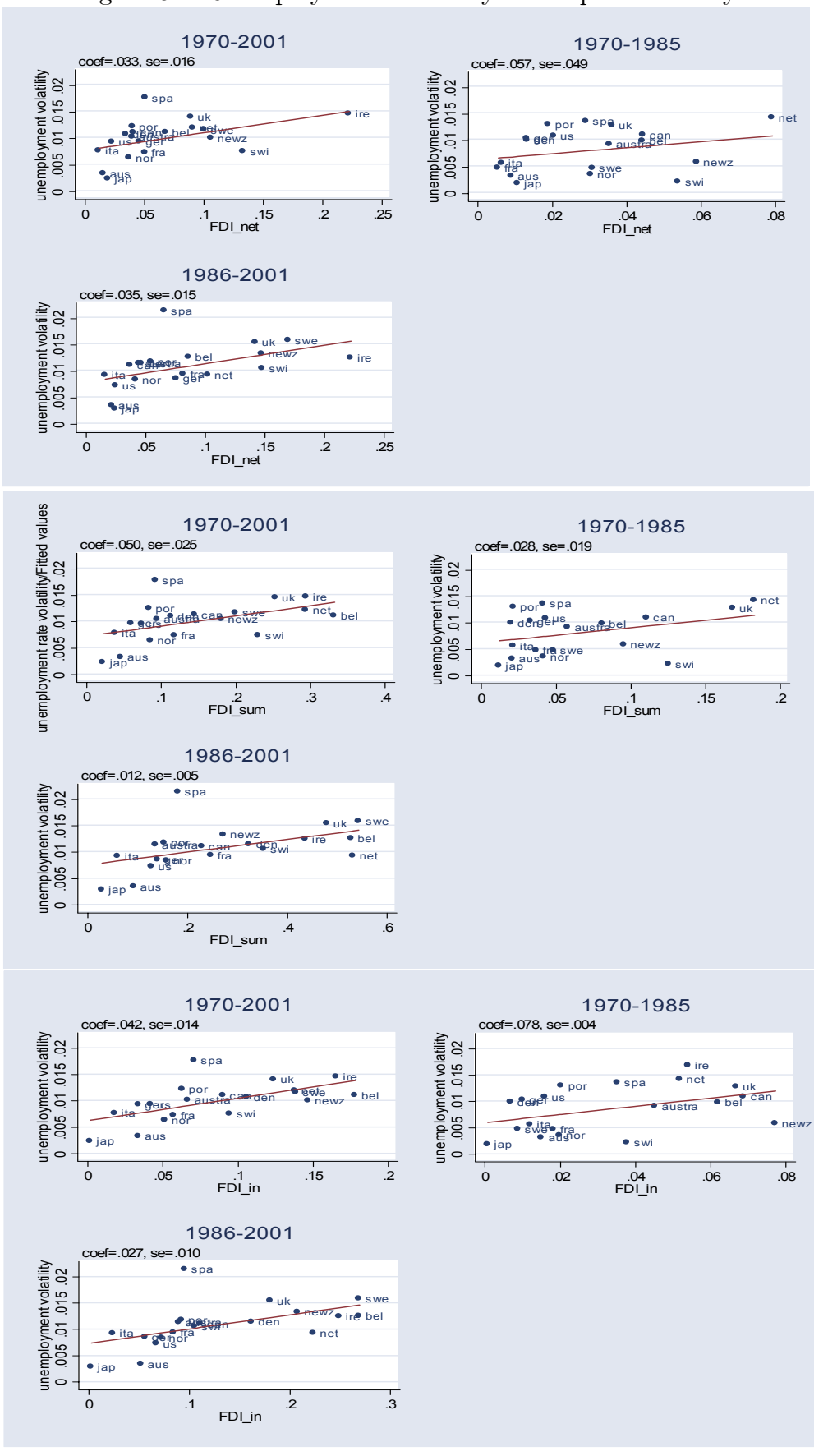
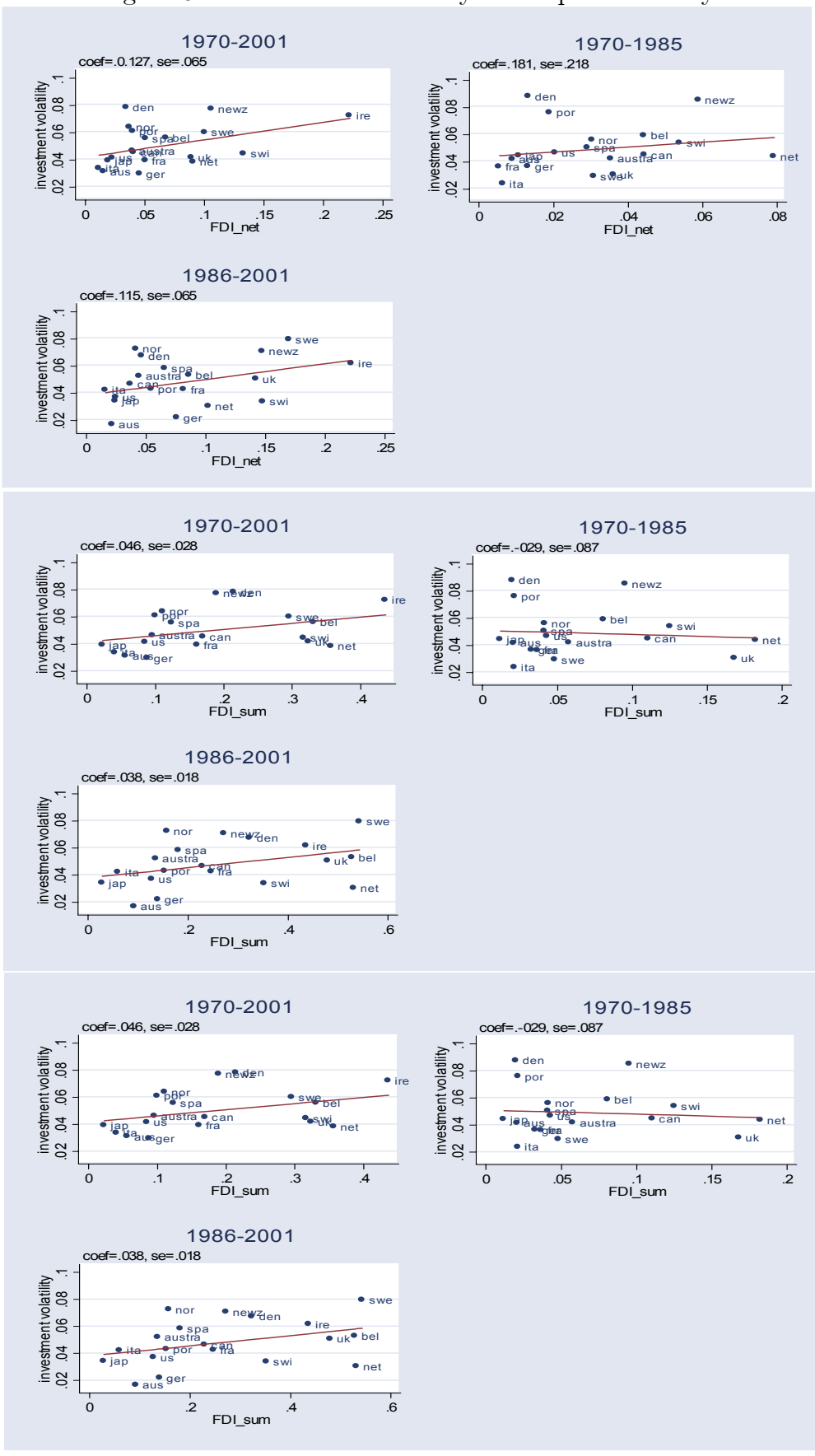


Figure 3.2: Investment volatility and capital mobility



ity. This relationship holds irrespective of the measure for capital mobility used. Again the positive correlation is more significant for the years after 1985, when international capital flows into and out of the OECD countries recorded a substantial increase.

In what follows we present more systematic evidence of the effects of capital mobility on unemployment dynamics.

4 Empirical analysis

4.1 Empirical specification

In this section we present econometric evidence of the effects of capital mobility on unemployment persistence and on the adjustment dynamics of unemployment in response to TFP shocks as predicted by Azariadis and Pissarides (2003).

The baseline framework is a reduced form dynamic equation for unemployment where we include controls for labour market institutions and the (ex ante) real interest rate, which may affect the equilibrium rate of unemployment. We also include a TFP shock, a price shock and an import shock which may affect the short run dynamics of unemployment[17]. Among the institutional variables we consider two indicators of the duration and generosity of unemployment insurance systems (benefit duration and benefit replacement ratio), the tax wedge between the real (monetary) labour cost faced by the firms and the consumption wage received by the employees and union density[18]. Fixed effects for each country, a country specific trend and

[17] See Layard *et al.*, 1991 and Nickell *et al.* (2001) for the derivation of the reduced form for the unemployment equation.

[18] Data on labour market institutions are taken from Nickell and Nunziata Labour Mar-

time dummies for each year in the sample are also included.

The baseline unemployment equation is as follows:

$$\begin{aligned} u_{it} &= \sum_{j=1}^{p}\theta_j u_{it-j} + \sum_{j=0}^{q}\gamma_j tfp\_sh_{it-j} + \boldsymbol{\alpha}_1'\mathbf{inst}_{it} + \alpha_2 rint_{it} \\ &\quad +\alpha_3 pr\_sh_{it} + \alpha_4 imp\_sh_{it} + c_{it}t + \lambda_t + c_i + \varepsilon_{it} \end{aligned} \tag{1}$$

where $i = 1, .., 20$, $t = 1, ..., 31$, tfp_sh is the TFP shock, **inst** denotes the set of institutional variables included in the regression, $rint$ is the (ex ante) real interest rate, pr_sh is an inflationary shock and imp_sh is an import price shock as defined in Nickell *et al.* (2001). c_i and λ_t capture country-specific effects and time effects respectively and c_{it} reflects those country-specific factors which may have an impact on the change of unemployment. Finally, ε_{it} captures all the other shocks to the unemployment rate, and it is assumed to be serially uncorrelated.

The inclusion of lagged dependent variables can lead to finite sample biases with the within-group estimator. The results in Nickell (1981), however, show that the magnitude of the bias diminishes in the length of the time series in the panel. Since the sample runs for 31 years, the size of this bias is likely to be small. The asymptotic unbiasedness of the coefficients crucially depends on the absence of serial correlation in the errors. This will be investigated by using a serial correlation test described by Baltagi (1995)[19].

ket Institutions database. The information is available till 1995. Updated series for the years after 1995 are obtained from the OECD. Net union density series is updated using the new data in Visser (2000) and national sources. All the other data are derived from the OECD National Account Statistics and Economic Outlook. See appendix 6.4 for a detailed description of the variables and data sources.

[19]The test is an LM statitistic which tests for an $AR(1)$ and/or an $MA(1)$ structure in the residuals in a fixed-effects model. It is asymptotically distributed as $N(0, 1)$ under the null. See Baltagi (1995).

As a measure of persistence we use the sum of the coefficients on the lags of unemployment, that is $\rho = \sum_{j=1}^{p} \theta_j$. For $\rho \in [-1, 1]$ the cumulative effect of a shock on unemployment is given by $1/(1-\rho)$. A larger ρ is then associated with shocks having a larger cumulative effect on unemployment over time, implying larger persistence (Pivetta and Reis, 2001).

Following Nickell et al. (2001), the TFP shock (tfp_sh in the equation) has been measured as the deviation of the Solow residual from its Hodrick-Prescott filtered trend. The existence of a negative relationship between the variable shock and the unemployment rate implies that the sum of the coefficients on the current and lagged variable shock should be negative. We choose both p and q equal to 2 and 1 respectively, in order to satisfy standard dynamic properties of the model. In particular, the two lags of the dependent variable have been chosen in order to obtain serially uncorrelated residuals.

As suggested in the above discussion we are interested in exploring two possible roles played by capital mobility - first its effect on unemployment persistence and second its impact on the responsiveness of unemployment to an idiosyncratic TFP shock. We thus interact our measures of capital mobility[20] with the lags of unemployment to capture the effect on persistence, and with the TFP shock (both current and lagged) to capture the effect on the responsiveness to a productivity shock. We also enter the measures of capital mobility in levels to control for any possible effect of capital mobility on the level of unemployment rate. The equation we estimate takes then the following form:

[20] In order to smooth out spurious fluctuations in capital flows and obtain a more relaible measure of capital mobility, we use four-year moving avarages of FDI inflows and outflows.

$$u_{it} = \sum_{j=1}^{p}(\theta_j + \theta'_j FDI_{mit-1})u_{it-j} + \sum_{j=0}^{q}(\gamma_j + \gamma'_j FDI_{mit-1})tfp\_sh_{it-j} \quad (2)$$
$$\beta FDI_{mit-1} + \boldsymbol{\alpha}'\mathbf{z}_{it} + c_{it}t + \lambda_t + c_i + \varepsilon_{it}$$

where $m = IN, SUM, NET$, and z_{it}[21] denotes a set of other controls as in equation 1. We use lagged rather than current values of FDI flows in order to avoid endogeneity arising from potential correlation between the error term and current FDI flows caused, for example, by unexpected aggregate shocks on employment[22].

The measure of persistence now becomes $\rho = \sum_{j=1}^{p}(\theta_j + \theta'_j \overline{FDI}_m)$. If we expect that capital mobility reduces unemployment persistence, the null hypothesis we want to test is $H_0 : \sum_{j=1}^{p}\theta'_j \geqq 0$ versus $H_1 : \sum_{j=1}^{p}\theta'_j < 0$. If the null is rejected, we can conclude that higher capital mobility leads to a lower persistence of unemployment.

Similarly, capital mobility increases the responsiveness of unemployment to a TFP shock if the sum of the coefficients on the variable shock interacted with our proxies for capital mobility is significantly lower than zero. Formally, $H_0 : \sum_{j=0}^{q}\gamma'_j \geqq 0$ versus $H_1 : \sum_{j=0}^{q}\gamma'_j < 0$[23].

[21] $\mathbf{z}_{it} = (union_{it}, bd_{it}, brr_{it}, tw_{it}, rint_{it}, pr\_sh_{it}, imp\_sh_{it})$

[22] We obtain very similar results when the current value of FDI flows rather than the lagged one is used in the regressions.

[23] Given that the coefficient on the interaction term is always negative on both the current and lagged shock (and then the sum of the two coefficients turns to be always significantly less then zero), to save space the t-statistic and p-value of the null hypotesis $H_0 : \sum_{j=0}^{q}\gamma'_j \geqslant 0$ are not reported in the tables with the empirical results.

4.2 Empirical results

We begin in Table 3 by showing estimates of the coefficients of a baseline model with no interactions with TFP shocks. The estimates are reported for the whole sample and for the small countries only, in order to check whether there are significant differences in the impact of capital mobility related to the size of the countries considered.[24]

In columns (1), (2) and (3) the lags of unemployment are interacted with the net FDI inflows, the sum of FDI inflows and outflows and FDI inflows respectively. Capital mobility reduces the coefficient on the first lag of unemployment and increases the coefficient on the second lag. The net effect on persistence (the sum of the two coefficients) is negative and significant as revealed by the t-test reported at the bottom of the table.[25] This result is robust to two of the three measures for capital mobility considered, namely *FDIsum* and *FDIin,* and it holds for both the whole sample and the small countries sample. When we consider the net FDI inflows, the coefficients on the interactions have still the expected sign, their sum is negative and marginally significant, though they are not individually nor jointly significant. There is no evidence of any effects of capital mobility on the level of unemployment. All the other controls behave as predicted by the theory with union density, benefit duration and tax wedge having a positive a significant impact on unemployment. Real interest rate is well signed and significant as well. As expected, both the current and lagged TFP shocks have a negative and significant effect on the unemployment rate.

[24]The small countries sample is obtained by excluding all the G7 countries with the exception of Canada.

[25]The t-statistic and p-value of the null hypotesis $H_0 : \sum_{j=1}^{p} \theta'_j \geqslant 0$ are reported on the lower panel of Table 3.

Table 3: Capital mobility and unemployment persistence (whole period)

u_{it}	Whole Countries			Small Countries		
Independent Variables	(1)	(2)	(3)	(1')	(2')	(3')
u_{it-1}	1.301	1.360	1.343	1.301	1.357	1.351
	(21.35)	(26.23)	(23.53)	(18.28)	(22.97)	(20.60)
u_{it-2}	-0.498	-0.552	-0.536	-0.509	-0.566	-0.559
	(8.57)	(10.79)	(10.04)	(7.45)	(10.00)	(9.36)
$u_{it-1} * FDIm_{it-1}$	0.150	-0.330	-0.372	0.041	-0.341	-0.541
	(0.19)	(3.18)	(0.96)	(0.05)	(3.33)	(1.29)
$u_{it-2} * FDIm_{it-1}$	-0.412	0.222	0.134	-0.351	0.233	0.274
	(0.57)	(1.86)	(0.40)	(0.43)	(1.82)	(0.77)
$FDInet_{it-1}$	0.004			0.012		
	(0.20)			(0.52)		
$FDIsum_{it-1}$		-0.004			0.004	
		(0.70)			(0.60)	
$FDIin_{it-1}$			0.018			0.016
			(1.63)			(1.32)
$FDIout_{it-1}$			-0.002			-0.001
			(1.33)			(0.41)
$union_{it}$	0.036	0.039	0.039	0.036	0.040	0.039
	(2.94)	(3.22)	(3.22)	(2.68)	(2.88)	(2.88)
bd_{it}	0.007	0.008	0.007	0.011	0.010	0.011
	(1.65)	(1.72)	(1.66)	(2.01)	(2.00)	(2.04)
brr_{it}	-0.001	-0.002	0.000	-0.007	-0.007	-0.005
	(0.12)	(0.22)	(0.01)	(0.59)	(0.65)	(0.64)
tw_{it}	0.027	0.027	0.029	0.045	0.046	0.469
	(2.02)	(2.04)	(2.14)	(2.23)	(2.76)	(2.77)
$rint_{it}$	0.043	0.041	0.040	0.051	0.050	-0.048
	(2.20)	(2.08)	(2.05)	(2.23)	(2.19)	(2.10)
pr_sh_{it}	0.003	0.002	0.003	0.006	0.004	0.004
	(0.29)	(0.16)	(0.22)	(0.42)	(0.31)	(0.30)
imp_sh_{it}	0.005	0.011	0.015	0.017	0.021	0.025
	(0.20)	(0.43)	(0.53)	(0.55)	(0.71)	(0.82)
tfp_sh_{it}	-0.041	-0.043	-0.042	-0.030	-0.033	-0.032
	(2.45)	(2.66)	(2.55)	(1.17)	(4.97)	(1.83)
tfp_sh_{it-1}	-0.091	-0.089	-0.090	-0.085	-0.083	-0.083
	(5.83)	(5.79)	(5.89)	(5.01)	(4.97)	(5.06)
Serial Corr (p-value)	0.29	0.25	0.19	0.15	0.31	0.12
Obs.	544	544	544	372	372	372
Fixed effects	20	20	20	14	14	14
F-tests (p-values):						
$H_0 : \theta_1 = 0, \theta_2 = 0$	0.43	0.00	0.12	0.47	0.00	0.06
$H_0 : \theta_1 + \theta_2 \geqq 0$	0.14	0.02	0.05	0.13	0.04	0.25

Notes. Robust t-statistics in parenthesis. Serial Correlation is an LM test distributed N(0,1) under the null (H0: no autocorrelation). In columns (1), (2) and (3) the lags of the unemployment rate are interacted with FDInet, FDIsum and FDIin respectively.

Next we investigate the role that capital mobility plays in increasing the responsiveness of unemployment to a temporary TFP shock. Thus we interact the current and lagged tfp_sh with the proxies of capital mobility. The interaction term is expected to be negative: the higher the economy's level of capital mobility, the greater the impact of a TFP shock on the unemployment rate. From Table 4, the interaction terms with both the current and lagged shock are indeed negative, though not always statistically significant at conventional levels. The negative effect of capital mobility on the persistence of unemployment remains negative and significant.

From a preliminary exploration of our data (paragraph 3) we noticed that the bivariate relationship between capital mobility and unemployment volatility appears to have been significant only since the mid eighties, when capital flows became more important in the OECD countries. Prior to the mid 1980s capital flows were much smaller and they were not measured as accurately as in the more recent period, so it is possible that the earlier measures are dominated by measurement errors, or that barriers to international capital mobility render our empirical model inappropriate.

We therefore ask whether the effect of capital mobility on both persistence and responsiveness of unemployment to TFP shocks is stronger for the years after 1985. Table 5 presents these results. We interact both the lags of the unemployment rate and the current and lagged TFP shocks with a period dummy taking value 1 for years after 1985 and 0 otherwise. We also interact both the lags of unemployment and current and lagged TFP shock with the period dummy and the proxies for capital mobility. The coefficients of the first set of interactions will capture the effects of any factors at play that may influence the persistence and responsiveness of unemployment to TFP shock between the two periods rather than capital mobility. The coefficients

Table 4: Capital mobility, unemployment persistence and responsiveness (whole period)

u_{it}	Whole Countries			Small Countries		
Independent Variables	(1)	(2)	(3)	(1')	(2')	(3')
u_{it-1}	1.304	1.366	1.349	1.303	1.361	1.354
	(21.56)	(24.04)	(23.22)	(18.40)	(21.21)	(20.43)
u_{it-2}	-0.499	-0.557	-0.540	-0.509	-0.570	-0.560
	(8.62)	(10.10)	(9.95)	(7.45)	(9.35)	(9.24)
$u_{it-1} * FDIm_{it-1}$	0.231	-0.368	-0.425	0.150	-0.370	-0.542
	(0.30)	(2.23)	(1.08)	(0.17)	(2.20)	(1.29)
$u_{it-2} * FDIm_{it-1}$	-0.561	0.257	0.156	-0.543	0.256	0.258
	(0.79)	(1.57)	(0.47)	(0.66)	(1.49)	(0.73)
$FDInet_{it-1}$	0.010			0.020		
	(0.49)			(0.83)		
$FDIsum_{it-1}$		0.004			0.004	
		(0.73)			(0.69)	
$FDIin_{it-1}$			0.022			0.019
			(1.88)			(1.45)
$FDIout_{it-1}$			-0.004			-0.002
			(1.04)			(0.72)
$union_{it}$	0.034	0.039	0.039	0.034	0.040	0.039
	(2.77)	(3.22)	(3.23)	(2.50)	(2.86)	(2.86)
bd_{it}	0.007	0.008	0.007	0.011	0.011	0.011
	(1.63)	(1.73)	(1.66)	(2.05)	(2.00)	(2.04)
brr_{it}	-0.000	-0.002	0.000	-0.006	-0.008	-0.005
	(0.05)	(0.23)	(0.01)	(0.54)	(0.66)	(0.64)
tw_{it}	0.026	0.027	0.028	0.044	0.046	0.046
	(1.93)	(2.05)	(2.09)	(2.71)	(2.75)	(2.70)
$rint_{it}$	0.042	0.041	0.040	0.049	0.050	0.047
	(2.17)	(2.10)	(2.01)	(2.16)	(2.18)	(2.04)
pr_sh_{it}	0.004	0.002	0.004	0.007	0.005	0.005
	(0.36)	(0.17)	(0.29)	(0.52)	(0.32)	(0.34)
imp_sh_{it}	0.005	0.009	0.013	0.016	0.020	0.025
	(0.18)	(0.37)	(0.49)	(0.53)	(0.65)	(0.80)
tfp_sh_{it}	-0.061	-0.045	-0.050	-0.051	-0.035	-0.036
	(2.93)	(2.47)	(2.75)	(2.26)	(1.82)	(1.96)
tfp_sh_{it-1}	-0.092	-0.086	-0.093	-0.084	-0.082	-0.089
	(4.91)	(4.57)	(5.16)	(4.12)	(4.13)	(4.60)
$tfp\_sh_{it} * FDI_{mit-1}$	-0.449	-0.007	-0.155	-0.430	-0.017	-0.119
	(2.21)	(0.12)	(1.56)	(1.93)	(0.32)	(1.14)
$tfp\_sh_{it-1} * FDI_{mit-1}$	-0.039	-0.030	-0.069	-0.024	-0.001	-0.099
	(0.18)	(0.33)	(0.56)	(0.10)	(0.01)	(0.81)
Serial Corr (p-value)	0.34	0.25	0.18	0.19	0.14	0.17
Obs.	544	544	544	361	361	361
Fixed effects	20	20	20	14	14	14
			-			
F-tests (p-values):						
$H_0 : \theta_1' = 0, \theta_2' = 0$	0.27	0.03	0.20	0.29	0.03	0.22
$H_0 : \theta_1' + \theta_2' \gtreqless 0$	0.09	0.03	0.04	0.08	0.04	0.04
$H_0 : \gamma_1' = 0, \gamma_2' = 0$	0.08	0.91	0.29	0.13	0.93	0.47

Notes. Robust t-statistics in parenthesis. Serial Correlation is an LM test distributed N(0,1) under the null (H0: no autocorrelation). In columns (1), (2) and (3) the lags of the unemployment rate are interacted with FDInet, FDIsum and FDIin respectively.

of the second set of interactions will capture the additional effect of capital mobility after 1985.[26]

The results are consistent with those for the whole period and the coefficients are significant at conventional levels. In particular, capital mobility is found to significantly reduce the persistence of unemployment after 1985, the sum of the FDI interaction terms being negatively signed and statistically significant at 10% level and 5% level in all the specifications considered. The fact that some coefficients are jointly but not always individually significant and their sum is significantly negative suggests the presence of some degree of collinearity. Nevertheless, this still indicates a significant negative effect of capital mobility on unemployment persistence.

Turning to the effect of capital mobility on the responsiveness of unemployment to TFP shocks, the coefficients on the capital mobility interactions are negative, quantitatively important and statistically significant irrespectively of the proxy of capital mobility used. This result shows that, after controlling for all the factors driving unemployment, international capital flows have a positive effect on the responsiveness of unemployment. Consistently with what we found in the preliminary analysis reported in paragraph 3, this effect appears to be stronger after 1985 when the FDI activity is more quantitatively relevant.

[26]The specification followed is:

$$\begin{aligned} u_{it} &= \sum_{j=1}^{p}(\theta_j + \theta_j'' d85 + \theta_j' d85 * FDI_{mt-1})u_{it-j} \\ &+ \sum_{j=0}^{q}(\gamma_j + \gamma_j'' d85 + \gamma_j' d85 * FDI_{mit-1})tfp\_sh_{it-j} \\ &+ \boldsymbol{\alpha}'\mathbf{z}_{it} + \beta FDI_{mit-1} + \boldsymbol{\alpha}'\mathbf{z}_{it} + c_{it}t + \lambda_t + c_i + \varepsilon_{it} \end{aligned}$$

where $d85 = 0$ if $year \in [1970; 1985]$, and $d85 = 1$ otherwise.

Table 5: Capital mobility, unemployment persistence and responsiveness after 1985

u_{it}	Whole Countries			Small Countries		
Independent Variables	(1)	(2)	(3)	(1')	(2')	(3')
u_{it-1}	1.269	1.293	1.287	1.263	1.289	1.287
	(21.79)	(21.61)	(21.44)	(18.26)	(18.30)	(18.37)
u_{it-2}	-0.374	-0.461	-0.457	-0.432	-0.457	-0.460
	(7.68)	(7.86)	(7.95)	(6.29)	(6.60)	(6.78)
$u_{it-1} * d85$	0.042	0.054	0.049	0.021	0.025	0.026
	(1.08)	(1.29)	(1.20)	(0.60)	(0.64)	(0.64)
$u_{it-2} * d85$	-0.097	-0.098	-0.090	-0.083	-0.083	-0.077
	(2.67)	(2.51)	(2.48)	(2.45)	(2.38)	(2.29)
$u_{it-1} * d85 * FD\,\mathrm{Im}_{it-1}$	-0.290	-0.374	-0.428	-0.208	-0.308	-0.460
	(0.40)	(2.22)	(1.11)	(0.25)	(1.63)	(1.10)
$u_{it-2} * d85 * FD\,\mathrm{Im}_{it-1}$	-0.033	0.245	0.113	-0.190	0.174	0.114
	(0.05)	(1.53)	(0.63)	(0.24)	(0.97)	(0.33)
tfp_sh_{it}	-0.028	-0.030	-0.028	-0.009	-0.010	-0.009
	(1.19)	(1.35)	(1.28)	(0.37)	(0.67)	(0.40)
tfp_sh_{it-1}	-0.085	-0.084	-0.085	-0.072	-0.071	-0.072
	(4.31)	(4.20)	(4.16)	(3.47)	(3.38)	(3.43)
$tfp\_sh_{it} * d85$	-0.066	-0.031	-0.036	-0.093	-0.051	-0.054
	(1.93)	(1.03)	(1.19)	(2.51)	(1.54)	(1.58)
$tfp\_sh_{it-1} * d85$	-0.032	-0.030	-0.029	-0.063	-0.066	-0.066
	(0.94)	(0.85)	(0.85)	(1.68)	(1.72)	(1.93)
$tfp\_sh_{it} * d85 * FDI_{mit-1}$	-0.622	-0.080	-0.212	-0.719	-0.099	-0.210
	(2.10)	(1.63)	(2.11)	(3.08)	(1.66)	(1.93)
$tfp\_sh_{it-1} * d85 * FDI_{mit-1}$	-0.382	-0.104	-0.198	-0.499	-0.185	-0.329
	(1.73)	(1.12)	(1.58)	(2.05)	(1.95)	(2.54)
other controls	*see appendix Table 4A*					
Serial Corr (p-value)	0.25	0.22	0.16	0.12	0.11	0.11
Obs.	544	544	544	372	372	372
Fixed effects	20	20	20	14	14	14
F-tests (p-value):						
$H_0 : \theta_1' = 0,\ \theta_2' = 0$	0.14	0.03	0.10	0.31	0.08	0.10
$H_0 : \theta_1' + \theta_2' \geqq 0$	0.08	0.02	0.02	0.08	0.03	0.02
$H_0 : \gamma_1' = 0,\ \gamma_2' = 0$	0.00	0.11	0.06	0.00	0.08	0.02

Notes. Robust t-statistics in parenthesis. Serial Correlation is an LM test distributed N(0,1) under the null (H0: no autocorrelation). In columns (1), (2) and (3) the lags of the unemployment rate are interacted with FDInet, FDIsum and FDIin respectively. See Appendix 6.2 for the complete table with the coefficients and t-statistics for the other controls.

To conclude, the evidence in Table 5 suggests that countries characterized by larger penetration of international capital are more responsive to idiosyncratic TFP shocks and consequently experience amplified fluctuations in employment.

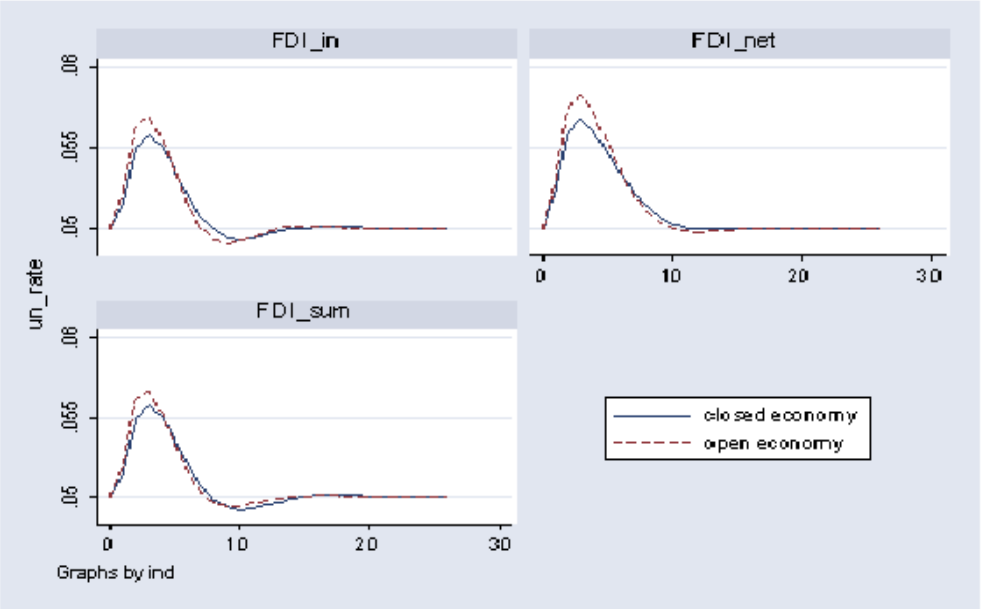
4.3 Simulation: unemployment response to temporary productivity shocks

In this part of the analysis we illustrate the importance of capital mobility for the dynamics of unemployment. By using the results from the last set of regressions (Table 5), we simulate the responsiveness of unemployment to a (negative) one-standard deviation TFP shock. We trace the response of unemployment to the TFP shock in a baseline economy with no capital mobility (closed economy) and we then compare this baseline case with an economy experiencing positive international capital flows (open economy). The exercise is repeated for all the three proxies of capital mobility. In order to quantify the effect of capital mobility on unemployment persistence and responsiveness in the open economy, we use the sample average of the three capital mobility indicators in the period 1985-2001, that is $\overline{FDInet} = 0.082$, $\overline{FDIsum} = 0.265$ and $\overline{FDIin} = 0.125$.

We then make use of the following equations in the simulations:

$$\begin{aligned} u_t &= (1.31 - 0.29 * \overline{FDInet})u_{t-1} - (0.47 - 0.31 * \overline{FDInet})u_{t-2} \\ &\quad -(0.09 + 0.32 * \overline{FDInet})shock_t - (0.12 + 0.38 * \overline{FDInet})shock_{t-1} \\ &\quad +Const_1 \end{aligned} \tag{3}$$

Figure 3: Response of unemployment to a TFP shock



$$u_t = (1.35 - 0.37 * \overline{FDI}sum)u_{t-1} - (0.56 - 0.25 * \overline{FDI}sum)u_{t-2} \quad (4)$$
$$-(0.06 + 0.08 * \overline{FDI}sum)shock_t - (0.11 + 0.10 * \overline{FDI}sum)shock_{t-1}$$
$$+Const_2$$

$$u_t = (1.34 - 0.43 * \overline{FDI}in)u_{t-1} - (0.55 - 0.11 * \overline{FDI}in)u_{t-2} \quad (5)$$
$$-(0.06 + 0.21 * \overline{FDI}in)shock_t - (0.11 + 0.20 * \overline{FDI}in)shock_{t-1}$$
$$+Const_3$$

where $Const_i$ are "constants," by which we mean all variables not varied in the simulations.

Figure 3 shows the adjustment dynamics of the unemployment rate after one-standard deviation temporary TFP shock when capital mobility affects both the persistence and responsiveness of unemployment to a TFP shock. The initial response of unemployment to the shock is larger in presence of international capital mobility, the increase of the unemployment rate being on

average 0.15 percentage points lower in absence of capital mobility.[27] However, the adjustment to the pre-shock level of unemployment is faster in the economy with capital mobility because of the lower degree of persistence. In fact, the estimated mean lag, which gives a summary measure of the speed of adjustment of unemployment to the productivity shock, is on average 13 percent shorter in the open economy than in the closed economy.[28]

Figure 4 and Figure 5 show the adjustment of the unemployment rate to a one-standard deviation temporary TFP shock after separating the two effects of capital mobility on persistence and responsiveness respectively. It emerges that international capital movements significantly amplify the impact on unemployment of temporary shocks (Figure 4) though the duration of the response is shorter (Figure 5).

Table 6 shows the volatility of the unemployment rate for the period 1986-2001 generated in the previous simulation where the volatility of unemployment in the economy without capital mobility (closed economy) is normalized to 1. The results indicate that the simulated standard deviation of the unemployment rate in the open economy is on average 16 percent higher than in the economy with no capital mobility.

Finally, in a second simulation we use our empirical model to illustrate the impact of the observed increase in capital mobility on unemployment volatility. We repeat the previous exercise for two levels of capital mobility, before and after 1985. The results are reported in Table 7, where the simulated volatility of unemployment for the period 1970-1985 is normalized to 1. Columns 1 and 2 show the simulated volatility of unemployment af-

[27] The impact coefficient of the productivity shock is on avarage 28 percent higher in the open economy than in the closed economy.

[28] The estimated mean lag decreases from 2.1 time-periods (about 25 months) in the closed economy to 1.8 time-periods (about 21 months) in the open economy.

Figure 4: Response of unemployment to a TFP shock - Effect on responsiveness

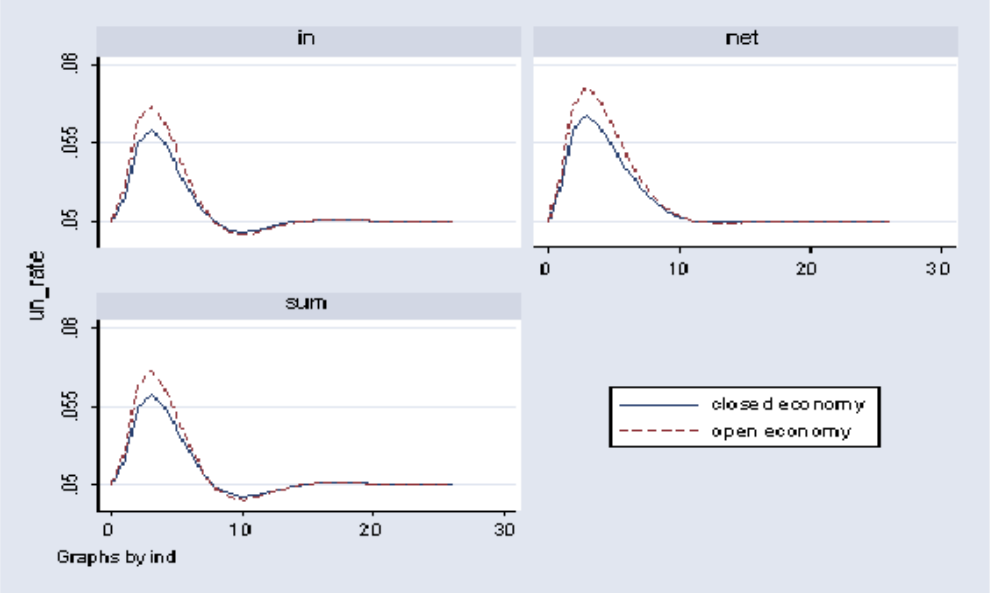


Figure 5: Response of unemployment to a TFP shock - Effect on persistence

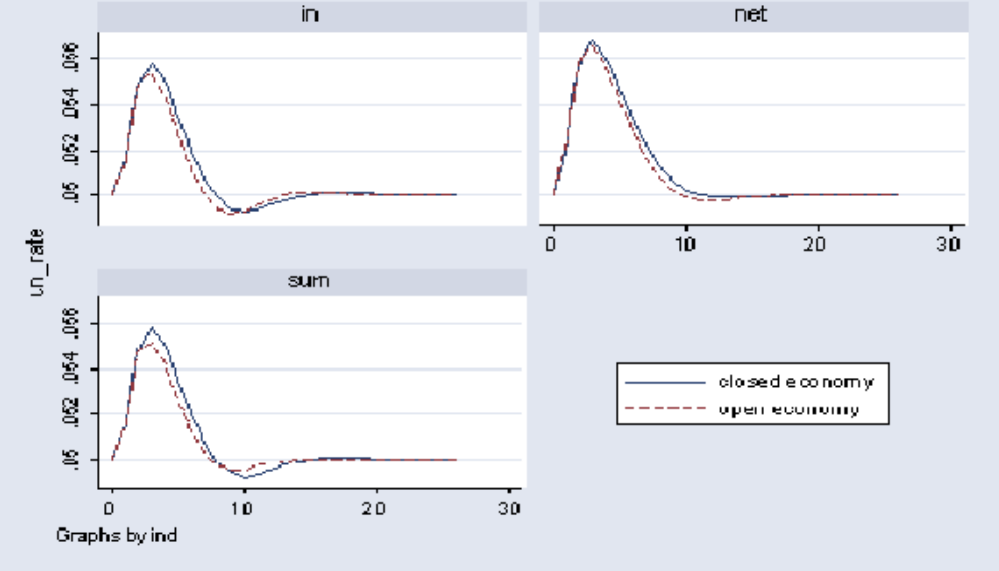


Table 6: Simulated unemployment volatility: 1986-2001

		simulated volatility (1986-2001)	
	$\overline{FDI}_m$	closed economy	open economy
Sim:			
FDInet	0.08	1	1.23
FDIsum	0.26	1	1.11
FDIin	0.12	1	1.18

ter 1985 if FDI remained to pre-85 levels and if FDI is allowed to increase by the observed amount respectively. The table shows that the estimated contribution[29] of the increase in capital mobility to unemployment volatility (Column 3) varies from about 9 percent when net FDI and FDI inflows are used to almost 13 percent when the other measure is considered[30]. Overall, these estimates suggest that the increase in international capital flows observed in many OECD countries in the second half of 80s can generate sizeable increases in the volatility of unemployment.

5 Conclusions

In this paper we presented empirical evidence for the OECD countries to show that increased international capital mobility has contributed to higher variance in the unemployment rate. Our findings confirm that unemployment in countries characterized by larger penetration of international capital is more

[29] The contribution of capital mobility (Column 3) is calculated as the ratio of the percentage (simulated) variation of volatility induced by the increase in capital mobility to the total percentage (simulated) increase in volatility between the two periods. For example for the measure *FDInet*, the increase in volatility induced by higher international capital flows is 9.2 percent and the total increase in volatility between the two periods is 77 percent. Therefore, the estimated contribution of capital mobility to the increase of unemployment volatility is 12 percent.

[30] Table 5A in Appendix 6.3 reports the contribution of capital mobility to unemployment volatilty for individual OECD countries.

Table 7: Capital mobility contribution to variation in unemployment volatility before and after 1985

	unemployment volatility: 1986-2001 simulated		
	pre-1985 FDI level (1)	after-1985 FDI level (2)	cap. mob. contr. (sim) (3)
Sim:			
FDInet	2.05	2.30	**0.084**
FDIin	1.63	1.75	**0.091**
FDIsum	1.68	1.90	**0.129**

Notes. The simulated unemployment volatilities for the period 1970-1985 have been normalized to one. The contribution of capital mobility (Column 3) is calculated as the ratio of the percentage (simulated) variation of volatility induced by the increase in capital mobility to the total percentage (simulated) increase in volatility between the two periods.

responsive to idiosyncratic shocks and consequently these countries experience amplified fluctuations in employment. The time it takes for equilibrium to be restored, however, is shorter with international capital mobility.

We used our empirical model to simulate the response of the unemployment rate to a one-standard error temporary TFP shock. The results suggest that for the period 1986-2001 the simulated unemployment volatility in the economy with positive international capital mobility is on average 16 percent higher than in the economy with no capital mobility.

We then used the model's estimates to illustrate the extent to which capital mobility can account for the higher unemployment volatility occurred in many OECD countries since mid 80s. The model predicts that an increase of international capital flows of the same magnitude of that observed in the data after 1985 accounts for 9-13 percent of the (simulated) increase of unemployment volatility. This suggests a significant role played by international flows of capital in explaining the rise in unemployment fluctuations.

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6 Appendix

6.1 Summary statistics

Table 1A: FDI flows, unemployment and investment volatility: 1970-2001

	FDIin	**FDIout**	**FDIsum**	**FDInet**	**sd_un**	**sd_inv**
Australia	0.067	0.029	0.097	0.04	0.010	0.046
Austria	0.034	0.023	0.057	0.016	0.003	0.031
Belgium[31]	0.178	0.154	0.332	0.068	0.011	0.056
Canada	0.09	0.080	0.171	0.041	0.011	0.045
Denmark	0.106	0.109	0.215	0.035	0.011	0.078
Finland	0.064	0.138	0.202	0.078	0.022	0.082
France	0.058	0.104	0.162	0.051	0.007	0.039
Germany	0.034	0.055	0.089	0.046	0.009	0.029
Ireland	0.166	0.107	0.437	0.222	0.015	0.072
Italy	0.018	0.023	0.041	0.011	0.008	0.033
Japan	0.002	0.021	0.023	0.019	0.002	0.039
Netherlands	0.138	0.220	0.358	0.091	0.012	0.038
New Zealand	0.147	0.043	0.190	0.106	0.010	0.077
Norway	0.051	0.059	0.111	0.037	0.006	0.064
Portugal	0.063	0.037	0.100	0.040	0.012	0.061
Spain	0.071	0.053	0.124	0.051	0.018	0.056
Sweden	0.139	0.157	0.296	0.100	0.012	0.060
Switzerland	0.095	0.223	0.317	0.133	0.008	0.045
United Kingdom	0.124	0.200	0.324	0.089	0.014	0.042
United States	0.042	0.043	0.085	0.023	0.009	0.042

[31] Average FDI flows for Belgium are calculated excluding the are calculated excluding the years 1999 and 2000. Data from the OECD (2003) show that the increase in FDI activity was largely driven by few M&A transactions foe which were paid exceptional high prices. This not truly reflect the increase in capital mobility.

Table 2A: FDI inflows, unemployment and investment volatility: 1970-1985

	FDIin	**FDIout**	**FDIsum**	**FDInet**	**sd_un**	**sd_inv**
Australia	0.046	0.013	0.059	0.036	0.009	0.041
Austria	0.015	0.006	0.021	0.009	0.003	0.041
Belgium	0.062	0.019	0.081	0.045	0.010	0.058
Canada	0.069	0.042	0.111	0.045	0.011	0.044
Denmark	0.007	0.013	0.020	0.0413	0.010	0.087
Finland	0.005	0.012	0.017	0.008	0.010	0.048
France	0.018	0.019	0.037	0.006	0.005	0.036
Germany	0.010	0.023	0.033	0.013	0.010	0.036
Ireland	0.054	-	-	-	0.016	0.082
Italy	0.012	0.010	0.022	0.007	0.005	0.023
Japan	0.001	0.012	0.012	0.011	0.017	0.044
Netherlands	0.052	0.131	0.183	0.079	0.014	0.044
New Zealand	0.077	0.018	0.096	0.059	0.006	0.085
Norway	0.020	0.022	0.042	0.030	0.003	0.056
Portugal	0.020	0.001	0.022	0.019	0.012	0.076
Spain	0.035	0.006	0.041	0.029	0.013	0.050
Sweden	0.009	0.040	0.048	0.031	0.005	0.029
Switzerland	0.038	0.088	0.126	0.054	0.021	0.054
United Kingdom	0.067	0.102	0.168	0.036	0.013	0.030
United States	0.016	0.027	0.043	0.020	0.011	0.047

Table 3A: FDI inflows, unemployment and investment volatility: 1986-2001

	FDIin	**FDIout**	**FDIsum**	**FDInet**	**sd_un**	**sd_inv**
Australia	0.090	0.047	0.137	0.045	0.011	0.052
Austria	0.053	0.041	0.093	0.022	0.003	0.017
Belgium	0.270	0.260	0.529	0.086	0.013	0.053
Canada	0.112	0.118	0.230	0.037	0.011	0.046
Denmark	0.162	0.162	0.324	0.047	0.012	0.067
Finland	0.105	0.225	0.329	0.126	0.030	0.107
France	0.085	0.163	0.248	0.082	0.009	0.042
Germany	0.056	0.085	0.141	0.076	0.009	0.022
Ireland	0.250	0.107	0.437	0.222	0.012	0.062
Italy	0.024	0.036	0.061	0.016	0.009	0.042
Japan	0.002	0.026	0.029	0.024	0.003	0.034
Netherlands	0.224	0.308	0.532	0.102	0.009	0.030
New Zealand	0.208	0.064	0.272	0.147	0.013	0.071
Norway	0.073	0.085	0.158	0.042	0.008	0.072
Portugal	0.093	0.061	0.154	0.054	0.012	0.043
Spain	0.095	0.085	0.181	0.066	0.021	0.058
Sweden	0.269	0.275	0.544	0.170	0.016	0.079
Switzerland	0.105	0.248	0.353	0.148	0.011	0.034
United Kingdom	0.181	0.299	0.480	0.142	0.015	0.051
United States	0.068	0.060	0.127	0.025	0.007	0.037

6.2 Regression tables

Table 4A: Capital mobility, unemployment persistence and responsiveness before and after 1985

u_{it}	Whole Countries			Small Countries		
Independent Variables	(1)	(2)	(3)	(1')	(2')	(3')
u_{it-1}	1.269	1.293	1.287	1.263	1.289	1.287
	(21.79)	(21.61)	(21.44)	(18.26)	(18.30)	(18.37)
u_{it-2}	-0.374	-0.461	-0.457	-0.457	-0.457	-0.460
	(7.68)	(7.86)	(7.95)	(6.29)	(6.60)	(6.78)
$u_{it-1} * d85$	0.042	0.054	0.049	0.021	0.025	0.026
	(1.08)	(1.29)	(1.20)	(0.60)	(0.64)	(0.64)
$u_{it-2} * d85$	-0.097	-0.098	-0.090	-0.083	-0.083	-0.077
	(2.67)	(2.51)	(2.48)	(2.45)	(2.38)	(2.29)
$u_{it-1} * d85 * FD\,\mathrm{Im}_{it-1}$	-0.290	-0.374	-0.428	-0.208	-0.308	-0.460
	(0.40)	(2.22)	(1.11)	(0.25)	(1.63)	(1.10)
$u_{it-2} * d85 * FD\,\mathrm{Im}_{it-1}$	-0.033	0.245	0.113	0.190	0.174	0.114
	(0.05)	(1.53)	(0.63)	(0.24)	(0.97)	(0.33)
$FDInet_{it-1}$	0.008			0.021		
	(0.21)			(0.46)		
$FDInet_{it-1} * d85$	-0.005			0.033		
	(0.05)			(0.72)		
$FDIsum_{it-1}$		0.016			-0.001	
		(0.77)			(0.06)	
$FDIsum_{it-1} * d85$		-0.012			0.003	
		(0.54)			(0.12)	
$FDIin_{it-1}$			0.020			-0.012
			(0.48)			(0.30)
$FDIin_{it-1} * d85$			0.004			0.035
			(0.09)			(0.93)
$FDIout_{it-1}$			-0.015			-0.013
			(0.71)			(0.64)
$FDIout_{it-1} * d85$			0.011			0.011
			(0.59)			(0.54)
$union_{it}$	0.035	0.041	0.041	0.035	0.043	0.041
	(2.83)	(3.32)	(3.34)	(2.61)	(3.16)	(3.04)
bd_{it}	0.008	0.007	0.008	0.012	0.011	0.011
	(1.85)	(1.76)	(1.80)	(2.32)	(2.20)	(2.21)
brr_{it}	0.003	-0.001	0.003	0.004	-0.001	0.002
	(0.30)	(0.07)	(0.27)	(0.32)	(0.09)	(0.16)
tw_{it}	0.027	0.027	0.028	0.046	0.046	0.047
	(2.00)	(2.04)	(2.00)	(2.92)	(2.75)	(2.77)
$rint_{it}$	0.038	0.039	0.036	0.038	0.042	0.039
	(1.97)	(1.99)	(1.85)	(1.75)	(1.90)	(1.78)

(continued)

Table 4A (continued)						
pr_sh_{it}	-0.002	0.002	0.003	-0.009	0.003	0.003
	(0.13)	(0.16)	(0.23)	(0.37)	(0.19)	(0.98)
$imppr\_sh_{it}$	-0.005	0.009	0.023	0.072	0.013	0.029
	(0.19)	(0.34)	(0.80)	(3.47)	(0.46)	(0.98)
tfp_sh_{it}	-0.028	-0.030	-0.028	-0.093	-0.010	-0.009
	(1.19)	(1.35)	(1.28)	(2.51)	(0.67)	(1.10)
tfp_sh_{it-1}	-0.085	-0.084	-0.085	-0.072	-0.071	-0.072
	(4.31)	(4.20)	(4.16)	(3.47)	(3.38)	(3.43)
$tfp\_sh_{it} * d85$	-0.032	-0.031	-0.036	-0.093	-0.051	-0.054
	(0.94)	(1.03)	(1.19)	(2.51)	(1.54)	(1.58)
$tfp\_sh_{it-1} * d85$	-0.622	-0.030	-0.029	-0.063	-0.066	-0.066
	(2.10)	(0.85)	(0.85)	(1.68)	(1.72)	(1.93)
$tfp\_sh_{it} * d85 * FDI_{mit-1}$	-0.221	-0.080	-0.212	-0.719	-0.099	-0.210
	(2.10)	(1.63)	(2.11)	(3.08)	(1.66)	(1.93)
$tfp\_sh_{it-1} * d85 * FDI_{mit-1}$	-0.382	-0.104	-0.198	-0.499	-0.185	-0.329
	(1.73)	(1.12)	(1.58)	(2.05)	(1.95)	(2.54)
Serial Corr (p-value)	0.25	0.22	0.16	0.12	0.11	0.11
Obs.	544	544	544	372	372	372
Fixed effects	20	20	20	14	14	14
			-			
F-tests (p-value):						
$H_0 : \theta_1' = 0, \theta_2' = 0$	0.14	0.03	0.10	0.31	0.08	0.10
$H_0 : \theta_1' + \theta_2' \geqq 0$	0.08	0.02	0.02	0.08	0.03	0.02
$H_0 : \gamma_1' = 0, \gamma_2' = 0$	0.00	0.11	0.06	0.00	0.08	0.02

6.3 Simulation tables

Table 5A: Capital mobility contribution to variation in unemployment volatility before and after 1985

		unemployment volatility: 1986-2001 simulated		
		pre-1985 FDI level (1)	after-1985 FDI level (2)	cap. mob. contr. (sim) (3)
	Sim:			
Australia	**FDInet**	2.07	2.12	**0.022**
	FDIsum	1.62	1.68	**0.054**
	FDIin	1.72	1.82	**0.071**
Austria	**FDInet**	1.93	2.00	**0.036**
	FDIsum	1.59	1.65	**0.058**
	FDIin	1.65	1.74	**0.074**
Belgium	**FDInet**	2.12	2.31	**0.068**
	FDIsum	1.76	1.88	**0.077**
	FDIin	1.59	2.17	**0.312**
Canada	**FDInet**	2.12	2.08	**-0.017**
	FDIsum	1.66	1.73	**0.058**
	FDIin	1.77	1.87	**0.065**
Denmark	**FDInet**	1.96	2.13	**0.078**
	FDIsum	1.59	1.79	**0.159**
	FDIin	1.63	1.97	**0.215**
Finland	**FDInet**	1.93	2.50	**0.197**
	FDIsum	1.59	1.79	**0.159**
	FDIin	1.63	1.85	**0.159**
France	**FDInet**	1.92	2.29	**0.149**
	FDIsum	1.61	1.74	**0.109**
	FDIin	1.65	1.74	**0.074**
Germany	**FDInet**	1.96	2.67	**0.217**
	FDIsum	1.60	1.68	**0.074**
	FDIin	1.63	1.81	**0.136**
Ireland	**FDInet**	-	-	**-**
	FDIsum	-	-	**-**
	FDIin	1.74	2.13	**0.198**
Italy	**FDInet**	1.93	1.97	**0.021**
	FDIsum	1.59	1.62	**0.030**
	FDIin	1.64	1.67	**0.027**
Japan	**FDInet**	1.95	2.01	**0.030**
	FDIsum	1.59	1.60	**0.010**
	FDIin	1.61	1.61	**0.000**
(continued)				

Table 5A (continued)				
	Sim:			
Netherlands	**FDInet**	2.28	2.38	0.032
	FDIsum	1.65	1.89	0.163
	FDIin	1.73	2.09	0.191
New Zealand	**FDInet**	2.18	2.59	0.118
	FDIsum	1.65	1.76	0.088
	FDIin	1.79	2.06	0.142
Norway	**FDInet**	2.04	2.10	0.027
	FDIsum	1.61	1.69	0.072
	FDIin	1.66	1.78	0.093
Portugal	**FDInet**	1.89	2.16	0.123
	FDIsum	1.60	1.69	0.082
	FDIin	1.66	1.78	0.093
Spain	**FDInet**	2.04	2.22	0.072
	FDIsum	1.61	1.70	0.080
	FDIin	1.69	1.82	0.094
Sweden	**FDInet**	2.05	262	0.172
	FDIsum	1.61	1.89	0.195
	FDIin	1.63	2.17	0.283
Switzerland	**FDInet**	2.16	2.59	0.125
	FDIsum	1.67	1.80	0.097
	FDIin	1.70	1.85	0.104
UK	**FDInet**	2.07	2.57	0.154
	FDIsum	1.69	1.86	0.117
	FDIin	1.77	2.00	0.130
US	**FDInet**	1.99	2.02	0.015
	FDIsum	1.61	1.67	0.056
	FDIin	1.65	1.77	0.094
Average	**FDInet**	2.05	2.30	0.084
	FDIsum	1.63	1.75	0.091
	FDIin	1.68	1.90	0.129

Notes. Both actual and simulated unemployment volatilities have been normalized to one for the period 1970-1985.

6.4 Data appendix

6.4.1 Sample composition

The countries in the sample are:

Australia	Finland	Japan	Spain
Austria	France	Netherlands	Sweden
Belgium	Germany	Norway	Switzerland
Canada	Ireland	New Zealand	United Kingdom
Denmark	Italy	Portugal	United States

6.4.2 Data definitions and sources

u Unemployment rate (*source*: OECD Economic Outlook).

sd_un Unemployment rate volatility. This is calculated as the standard deviation of the cyclical component of the unemployment rate. We detrended the data using the Hodrick-Prescott filter, setting the smoothing parameter λ equal to 100 as suggested for annual data (Hodrick and Prescott, 1997).

sd_inv Investment rate volatility where the investment rate is defined as the ratio of real investment to real GDP (*source*: OECD National Accounts). Volatility is calculated as the standard deviation of the cyclical component of the investment rate. We detrended the data using the Hodrick-Prescott filter, setting the smoothing parameter λ equal to 100 as suggested for annual data (Hodrick and Prescott, 1997).

FDIin Foreign direct investment inflows (*source*: International Financial Statistics, IMF) normalized to nominal domestic investment (*source*: OECD National Accounts).

FDIout Foreign direct investment outflows (*source*: International Financial Statistics, IMF) normalized to nominal domestic investment (*source*: OECD National Accounts).

FDInet Net foreign direct investment flows: $FDInet = |FDIin - FDIout|$.

FDIsum Sum of foreign direct investment inflows and outflows: $FDIsum = FDIin + FDIout$.

w Real labour cost: $w = \left(\frac{WSSE}{def_{GDP}}\right)/(L - L_{self})$, where WSSE is the compensation of employees at current price and national currencies (*source*: OECD Economic Outlook), def_{GDP} is the GDP deflator, base year 1990 (*source*: OECD National Accounts), L is total employment and L_{self} is the total number of self- employed (*source*: OECD National Accounts).

K Real capital stock. The calculation of the capital stock is made according to the Perpetual Inventory Method: $K = (1-\delta)K_{-1} + \left(\frac{I^n}{def_{INV}}\right)_{-1}$, where I^n is the gross fixed capital formation at current prices and national currencies (*source*: OECD National Accounts) and def_{INV} is the gross fixed capital formation price index, base year 1990 (*source*: OECD National Accounts) and the depreciation rate, δ, is assumed constant and equal to 8 percent, which is consistent with OECD estimates (Machin and Van Reenen, 1998). Initial capital stock is calculated as: $K_0 = \frac{I_0}{g+\delta}$, where g is the average annual growth of investment expenditure and I_0 is investment expenditure in the first year for which data is available.

tfp_sh TFP shock. This is computed as the deviation of the Solow residual from its (Hodrick-Prescott) trend (Nickell *et al.* 2001). The Solow residual is calculated using the following formula: $dlnA = \frac{1}{1-\overline{\alpha}}[d\ln Y - \overline{\alpha} d\ln K - (1-\overline{\alpha}) d\ln L]$, where Y is gross domestic output at constant price and national currencies (*source*: OECD National Accounts), K is capital stock as defined above, L is total employment (*source*: OECD Economic Outlook), $(1-\overline{\alpha})$ is a smoothed share of labour following the procedure described in Harrigan (1997). Labor share is defined as $(1-\alpha) = \frac{wL}{Y}$.

p Consumer price index , base year 1990 (OECD, Main Economic Indicators).

pr_sh Price shock. This is computed as the change in inflation: $pr\_sh = \Delta^2 p$

imp_sh Import price shock. This is measured by proportional changes in real import prices weighted by the trade share (Nickell *et al.* 2001): $imp\_sh = \frac{M}{Y_n}\Delta \ln\left(\frac{P_M}{P_Y}\right)$ where M (*source*: OECD Outlook) and Y_n (*source*: OECD National Accounts) are imports and GDP at current

prices, P_M (*source*: OECD Outlook) and P_Y (*source*: OECD National Accounts) are the import price deflator and the GDP deflator (*source*: OECD National Accounts) both with 1995 as base year .

rint Real long term interest rate deflated by the 3-year expected inflation rate: $r = i - E(d \ln p_{+1})$, where i is the long term nominal interest rate (*source*: OECD Economic Outlook). $E(d \ln p_{+1})$ are fitted values from the regression $d \ln p = \gamma_1 d \ln p_{-1} + \gamma_2 d \ln p_{-2} + \gamma_3 d \ln p_{-3} + \nu$, where $d \ln p$ is the inflation rate based on the consumer price index p (*source*: OECD National Accounts) and the coefficients on the right side are restricted to sum to one, indicating inflation neutrality in the long run (see Cristini, 1999).

union Net union density, defined as the percentage of employees who are union members (*source:* Nickell et al. 2001). For the years after 1995 the series has been updated using the new data in Visser (2000) and national sources.

tw Tax wedge, calculated as the sum of the employment tax rate, the direct tax rate and the indirect tax rate (*source:* Nickell et al. 2001). Updated series for the years after 1995 are obtained from the OECD. When necessary, we extrapolated the series for the period 1999-2001.

br Benefit replacement ratio, defined as the ratio of unemployment benefits to wages for a number of representative types (*source:* Nickell et al. 2001, constructed from OECD data sources). Updated series for the years after 1995 are obtained from the OECD. When necessary, we extrapolated the series for the period 1999-2001.

bd Benefit duration, defined as a weighted average of benefits received during the second, third, fourth and fifth year of unemployment divided by the benefits in the first year of unemployment (*source:* Nickell et al. 2001, constructed form OECD data source). Updated series for the years after 1995 are obtained from the OECD. When necessary, we extrapolated the series for the period 1999-2001.

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