Labor and Product Market Deregulation: Partial, Sequential, or Simultaneous Reform?[1]

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Abstract

This study explores the effects of labor and product market deregulation on employment growth. Our empirical results, based on an OECD country panel from 1990-2004, suggest that lower levels of product and labor market regulation foster employment growth, including through sizable interaction effects. Based on these findings, the paper develops a theoretical framework for evaluating deregulation strategies in the presence of reform costs. Optimal deregulation takes various forms depending on the deregulation costs and the strength of reform interactions. Compared to the first best, decentralized decision-making based on a partial market-by-market perspective can lead to excessive or insufficient regulation, depending on the design of the decision process. Securing the first best requires not only coordinating deregulation activities across sectors but also overcoming the partial perspective of decision makers.

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I. INTRODUCTION

Deregulation, despite its ample potential benefits, is not an easy feat. Policymakers often face formidable headwinds in implementing reform. In part, this resistance reflects the economic and political costs of deregulation. Structural change in product and labor markets—while increasing output and employment growth (e.g., OECD 2001 and 2005; Blanchard 2004)—invariably involves up-front costs, including frictional unemployment, and costs associated with scrapping or mobilizing fixed capital. Reforms often also entail some redistribution of income, generating political costs a social planner would ignore. As a result, policymakers tend to curtail or slow reforms thereby foregoing economic gains.

Part of the difficulty in implementing structural reforms is that reforms are most effective if executed in a coordinated fashion. One recent example of a partial approach is Germany's labor market reform (a.k.a. "Hartz IV"), which occurred against the backdrop of a highly regulated service sector—the largest economic sector in terms of employment. The reform has been criticized for its high implementation costs and lack of an apparent early success.[2] But the benefits from partly liberalizing labor markets might have been (and might continue to be) small because high product market regulation constrains labor demand and, thus, dampens the positive employment effects policy makers had hoped for. Ignoring these interactions biases policymakers' anticipated reform benefits downward, leading—in the worst case—to reform abstinence.

Spillovers between labor and product market reform have shown to be important in many countries. For instance, using Italian micro data, Kugler and Pica (2004) show that the effects from changes in employment protection differ between industries depending on the competitive conditions in product markets. In particular, higher dismissal costs after legal changes in 1990 decreased the turnover rate for women, but the effect was smaller in sectors with higher barriers to entry on the product market side. Estevão (2005) shows in a dynamic panel framework for OECD member countries that the impact of lower labor costs on real GDP growth is larger with lower levels of product market regulation.

So how general is the evidence on reform interactions and what deregulation strategy should be pursued in the presence of these interactions? Traditionally, economists endorse an unconditional elimination of regulatory barriers, as they act as a direct brake on economic activity no matter where they occur.[3] However, this view tends to ignore reform spillovers on the benefit side. An implication of the model by Blanchard and Giavazzi (2003) is that sequential deregulation might have advantages. They show that greater competition in product markets reduces the rents available for redistribution in a union-firm bargaining process. Thus, by reforming the product market first, opposition to

[2] See, for instance, Fertig and Kluve (2004) and Boss and Elender (2005) for an analysis of the economic impact of recent German reforms, including Hartz IV. IMF (2005) notes that the fiscal costs associated with Hartz IV have been higher than expected and that implementation needs to be improved.

[3] There are, of course, a number of exceptions to the rule. See, for instance, the discussion in Kauppi and others (2004), who analyze the effects of simultaneous labor and product market imperfections on equilibrium unemployment under exogenous as well as endogenous capital intensity.

(and the political costs of) labor market reforms would decline and prepare the ground for further reforms. The more general question then becomes whether multiple reform strategies can be optimal, and if so, under what circumstances.

The present paper adds to this discussion along two dimensions: first, by providing additional empirical evidence on the interaction of labor and product market reform with an emphasis on employment growth; and, second, by exploring the theoretical implications of deregulation spillovers for optimal policy design in the presence of reform costs.

Empirical work on the employment effects of regulation is relatively scarce, with the exception of a recent study by Nicoletti and Scarpetta (2005) who study employment effects for a small number of sectoral industries in OECD countries. Most studies focus on the impact of regulation on other areas of economic activity such as productivity and investment, mostly confirming a detrimental effect (Alesina and others, 2005, Conway, Janod, and Nicoletti, 2005; Nicoletti and Scarpetta, 2003). But these findings do not automatically generalize to employment growth.[4] Our empirical results, based on an annual OECD panel during the period 1990-2004, suggest that reducing product and labor market regulation indeed foster employment growth, including through sizable interaction effects.

The most promising reform strategy is one of comprehensive deregulation with coordinated reform in the labor and product market. A country moving from median levels of regulation to par with the lowest decile of OECD countries stands to gain about 1 percentage point in annual employment growth. On average, the growth contribution from coordinating reforms (across markets) is 17 percent of the total growth boost, but doubles with a larger reform effort (from 75th percentile of regulation to the lowest decile). While subject to some data caveats, mostly because of the lack of broad-based regulatory measures with sufficient time variation, the econometric results are surprisingly robust across estimators, specifications, and types of regulatory indicators.

On the basis of these findings, we develop a framework for analyzing deregulation decisions in an environment where implementing reforms is costly. Two outcomes are compared: the regulation policies of a social planner with the decentralized choices of two market regulators. The analysis suggests that a partial perspective of market regulators leads to suboptimal deregulation outcomes, with the possibility of "too much" or "too little" reform depending on the decision process. Allowing one regulator to commit ex ante to a deregulation policy eliminates the case of excessive reform, but cannot prevent the possibility of suboptimal reform abstinence. Securing the first best in a decentralized environment requires not only coordinating deregulation activities across sectors but also overcoming the partial perspective of decision makers. If the market-by-

[4] Ebell and Haefke (2004) caution that, if there is sufficient excess employment prior to the reform—for instance, in the public sector—product market deregulation might lead to higher production without any measurable change in employment, rendering the employment effects of reforms largely an empirical question. Analyzing the interaction of labor and product market reform might also help understand the puzzling simultaneity of a dismal job-creation record and a declining wage share in output characterizing (with some exceptions) continental Europe in recent years.

market perspective is rooted in the political economy of regulation—for instance, because partial authorities will only receive public credit for their private efforts—this may require changing decision makers' incentives and insulate them from public pressures. If the partial perspective is due to information deficits, for example, a lack the expertise in gauging the effects of the other authority's regulatory activity, a organized information exchange between regulatory authorities might suffice. Another potential problem is the presence of political reform costs. For instance, a too short time horizon of policymakers or the need to appease organized interest groups can reduce perceived net benefits and lead to reform abstinence where the social planner would have opted for deregulation..

The remainder of the paper is structured as follows. Section II develops the intuition for the relevance of spillovers between labor and product market regulation based on the labor demand of a price-setting firm. Section III presents our empirical findings. Section IV discusses policy implications by comparing costly deregulation choices of a social planner with decision made by two market regulators under different settings. Section V concludes.

II. THE THEORETICAL ARGUMENT

The notion that broad-based or coordinated structural reforms create growth "synergies" has drawn attention in the literature lately. Blanchard and Giavazzi (2003) argue that deregulation in product markets paves the way for competitive wage setting in the labor market, by reducing rents in the goods markets. As the scope for distribution between firms and workers shrinks, the wage bargaining process becomes less contentious and moderate wage setting encourages output and employment growth. Others highlight the loss of effectiveness of reforms focused on only one market. Krueger and Pischke (1997) stress that product market regulation such as start-up restrictions might reduce employment by limiting the labor demand reaction to labor costs. Kugler and Pica (2004) formalize a related idea using a matching model illustrating how entry barriers in the product market mitigate the impact of labor market deregulation. The OECD (2005) provides a recent survey of potential reasons why the effects of labor and product market reforms might be correlated.

The intuition behind the interaction effect is that the employment impact of, say, labor market deregulation that boosts labor supply will be larger with lower product market regulation—which generates a more elastic response of labor demand and thus employment. The same is true for the impact of product market reform at different levels of labor market regulation.

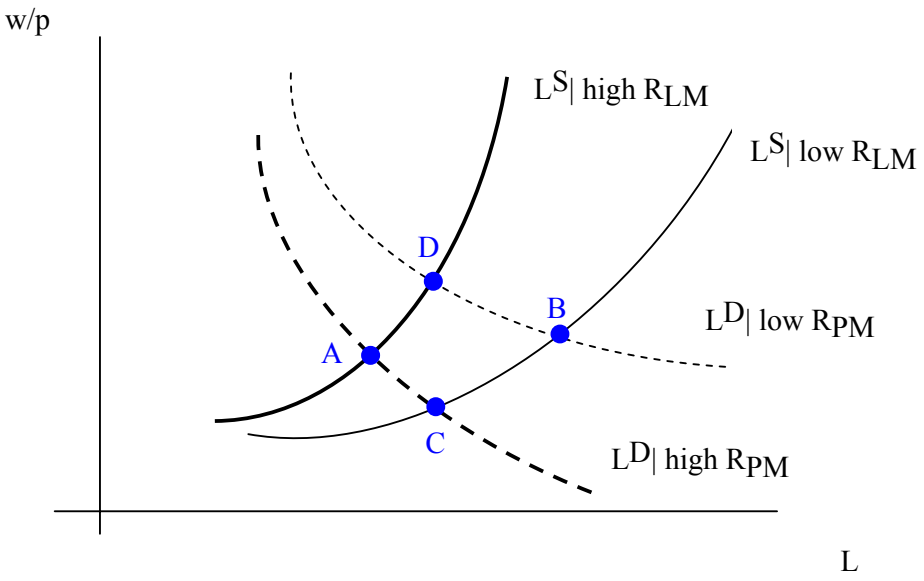
The rationale can be illustrated within a simple static framework.[5] Assume that firms operate without excess labor capacity and under monopolistic competition in product

[5] The model provides an interpretation for the aggregate interaction effects estimated below, but is otherwise only illustrative since shifts or rotations of labor demand and supply curves cannot be identified with available data.

markets, with the degree of competition decreasing in the level of product market regulation. In this case, it is straightforward to show that firms' labor demand becomes steeper and less elastic as the level of product market regulation increases (see Appendix for an illustration). The intuition is that higher product market regulation reduces the elasticity of demand firms face on the product market, which in turn reduces the impact of the real wage on optimal output and factor demand. As a consequence, if product market reforms increase competition, we would observe the derived demand for labor shift right and become flatter in the relevant range of real wages.

To complete the argument, assume that labor supply, too, depends not only on the real wage, but also on the level of labor market regulation. It is probably safe to assume that, at a given real wage, less restrictive labor market regulation will increase the supply of labor. For instance, because a reduction in employment protection makes employers more willing to hire workers while it weakens the position of unions in a right-to-manage bargaining framework (Estevão 2005). Also, a more flexible contractual framework leads to increases in the workforce.[6] Quite plausibly less labor market reform will also contribute to a more wage elastic labor supply, which will influence the employment impact of shifts in the labor demand curve.

Figure 1. Regulatory Reform and Employment



We are now ready to illustrate the interaction of regulatory reform on the labor and product markets (Figure 1). The employment impact of a reduction in labor market regulation depends on the degree of product market regulation. Assume that the initial equilibrium is at point A, and that the reform shifts the labor supply curve downward to

[6] Under the wage bargaining interpretation, regulation would influence the position of the so-called wage curve rather than the traditional labor supply. The analysis is otherwise comparable.

the right as depicted in the graph. While the employment effect is always positive (from A to C), it is higher when the level of product market regulation is low (starting at D to point B). The simple reason is that the elasticity of labor demand is increasing as product market regulation declines. In other words, high product market regulation dampens the employment effects of labor market deregulation. Formally, this means that the first derivative of the equilibrium employment level L^* with respect to product market regulation R_{LM} is negative: $L^*_{R_{LM}} < 0$. The presence of a magnifying interaction effect of regulation across markets means then that the negative employment effect becomes smaller at higher levels of product market regulation R_{PM}, that is, $L^*_{R_{LM},R_{PM}} > 0$.[7]

A similar mechanism could be at work for product market regulation. In the model a decrease in product market regulation always boosts employment. But, if the elasticity of labor supply depends negatively on the level of labor market regulation, a given decrease in product market deregulation will have smaller employment effects at higher levels of labor market regulation than at lower levels. In Figure 1, starting from point A with high labor and product market regulation, the upward-right shift of labor demand triggered by lower product market regulation will move us to point D. However, starting at point C, with low labor market regulation, product market regulation reform leads us to point B as a new equilibrium, a shift associated with larger employment gains. Clearly, high labor market regulation can reduce the employment effects of product market reform, that is $L^*_{R_{PM},R_{LM}} > 0$.

III. Empirical Evidence: Employment Effects of Regulation

A host of new data on regulatory activity allows us to test the economic significance of market regulation by comparing regulatory activity across sectors, countries, and over time. The general tenor of the empirical research so far is that excessive product market regulation has a measurable negative effect on economic activity and is at least partly responsible for divergences in economic performance among industrial countries. In particular, high regulation is associated with lower investment and multifactor productivity growth (Alesina and others, 2005, Nicoletti and Scarpetta, 2003; OECD, 2005). There is also some evidence that wages are higher and hiring decisions are adversely affected by excessive regulation (Jean and Nicoletti, 2004). The evidence regarding the impact of labor market regulation is somewhat more mixed—but a number of studies suggest a negative impact on real activity (OECD, 2004a; Nickell and others, 2005; Young, 2003).

The presence of interaction effects between product and labor markets regulation has been the focus of a number of studies: Kugler and Pica (2004) find that labor market

[7] Note that, in a dynamic setting, the described changes in equilibrium employment levels are likely to take some time if employment is persistent, leading to higher employment growth rates during the (possibly long) transition to the new steady state. Whether changes in the level of product and/or labor market regulation influence steady-state employment growth rates themselves is another question.

liberalization has larger positive employment effects in less regulated product markets. In other words, competitive barriers in product markets dampen the deregulation effects in labor markets. Estevão (2005) shows that wage moderation—measured by the productivity and unemployment level adjusted wage change—is more effective in stimulating growth if it occurs in countries with more deregulated product markets. Again the implication is that insufficient competition limits the benefits of labor market reforms. Annett and Debrun (2004) explore indirect evidence for the advantages of sequencing of reforms a là Blanchard and Giavazzi. They find that within the euro area, product market reforms Granger-cause labor market reforms suggesting sequential effects and one-directional spillovers.[8]

This study examines the role of interaction effects on employment growth. Assuming monopolistic markets, deregulation should foster employment growth in line with the induced output growth.[9] Our empirical strategy is to evaluate the impact of regulation in labor and product markets on aggregate employment growth. To this end we develop a panel data set of OECD countries by matching aggregate employment growth data with data on regulation indices. The following subsections describe the compilation of the data set, baseline results and robustness checks, and conclude with a discussion of the size of the estimated effects.

A. Data

The analysis covers the years 1980-2004, with most regressions starting in 1990 in line with the availability of the regulation data.[10] The database covers the following OECD member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Iceland, Ireland, Japan, Korea, Mexico, Netherlands, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. Employment is measured by the number of persons employed during a given year in the business sector.[11]

A limitation shared with all studies in the field is the lack of time variation in broad-based regulation indicators. The OECD country measures described below, while preferable in terms of their depth and coverage, are only available for a selected few years. An alternative set of indicators is the one developed by Nicoletti and others (2000) which contains annual regulatory indicators of overall regulation, barriers to entry, and public

[8] Burda (2000) discusses some of the earlier literature. See Daveri and Tabellini (2000) for an instructive discussion of the impact of taxation (in particular labor taxes) on unemployment and real growth in Europe.

[9] This claim is supported by evidence in Messina (2004) who finds the share of service sector employment in OECD countries is lower in more regulated product markets. However, as already noted, the theoretical implication is ambiguous. The presence of wage bargaining in a monopolistic market environment can also lead to excessive hiring of workers (e.g., Ebell and Haefke 2004). An increase in competition through deregulation and the elimination of profitable margins of distribution would then reverse the overhiring, but need not increase employment. It is therefore an empirical question whether deregulation has positive employment effects.

[10] The data source is the OECD (STAN) database. The full panel is used to support the use of lagged variables.

[11] A preferable measure would have been total hours worked per year to capture movements between full and part-time employment, but this level of detail was not available for a sufficiently large number of countries.

ownership in OECD member countries but is limited in its coverage to just a number of non-manufacturing industries. Moreover, those data end in 1998, while the latest broad-based data include 2003.

In light of these constraints, we opted for a dual approach. In the main part of the empirical exercise we work with the broad-based OECD data, relying on indicators for the years 1988, 1998, and 2003 for the labor market and 1998 and 2003 for product markets. Available data points are mapped forward annually until a new regulation data point was available. In addition, product market regulation during the years 1990-98 is assumed to be at the 1998 level. As a robustness check, we also present results based on the annual data by Nicoletti and others (2000). We find the results to be consistent.

To exploit the existing (if limited) time variation of our broad-based regulatory indicators while safeguarding against spurious results, we make use of standard time-series panel techniques employing fixed or random effect estimators. An alternative approach would be to collapse the data set into a cross-country pool framework, treating missing observations on the regulatory indicators as unavailable. As a rule, this type of cross-country analysis produces comparable results.[12] But since there is little reason not to make use of the information contained in the within-country changes in regulatory activity, we report the panel results using fixed and random effects to prevent the slow-moving regulatory indicators from picking up country effects.

The OECD indicators of product market regulation capture different aspects of regulation that have the potential to limit competition.[13] This information comes from detailed questionnaires sent to OECD member governments. The study uses six of these measures: aggregate regulation, administrative regulation, economic regulation, barriers to entrepreneurship, degree of state control, and barriers to trade and investment. The regulation indicators take a value of zero when entry is free and a value of six when competition is severely restricted. Intermediate values represent partial liberalization of entry.

Regulation of labor markets is captured by the OECD employment protection index (EPL) for the years 1988, 1998, and 2003 (OECD 2004a). EPL measures the strictness of legal protection of regular employment, temporary employment, and collective dismissals and are based on a similar scale of zero to six, with six indicating the highest degree of legal protection.[14] The empirical findings rely mainly on the aggregate EPL index. In past research this indicator has successfully explained developments in different labor market segments, even though the evidence on overall unemployment effects is mixed (Young 2003, OECD 2004). Other data used in the study come from the OECD, the IMF World Economic Outlook, and the International Financial Statistics database. The data are merged into an annual panel.

[12] Available on request.
[13] The OECD indicators were developed to illustrate broad differences in product market policies and are described in detail in Conway, Janod, and Nicoletti (2005).
[14] While both the OECD's EPL and product market measure work with a zero-six scale, this does not mean that the intensity of regulation at a given level, say four, is directly comparable. We will return to this issue in the empirical application.

B. Empirical Results

The baseline results are derived from an unrestricted dynamic model of employment growth. Special attention was given to interaction effects between product and labor market regulation:

$$\Delta E_{it} = \alpha + \alpha_1 \Delta E_{i\,t-p} + \alpha_2 R_{PMt} + \alpha_3 R_{LMt} + \gamma\, R_{PMt}\ x\ R_{LMt} + \delta\, X_{it} + \varepsilon_{it}$$

where Δ is a general growth rate operator, p indicates the lag length chosen, and X_{it} refers to other control variables.

The main findings are reported in Table 1 and differentiate between two definitions of the dependent variable: the models in the first two columns and column five measure employment growth as the average annual growth rate over a five year span to remove business cycle variations. The models in columns three, four, and six refer to the annual employment growth rate. Only the estimates for the regulation variables are shown. All models have a dynamic specification and also include other controls as discussed in Table 1.[15] Models one and three are estimated with fixed effects and models two and four use random effects. Model five presents the results using lagged GDP growth as an instrument for the lagged dependent variable. The final model applies the GMM estimator proposed by Arellano-Bond.

[15] The left-hand-side variables exhibit significant autocorrelation. Alternative specifications that more directly test for cyclical effects found a positive association with lagged and current GDP growth. However, since GDP growth becomes insignificant in the presence of lagged dependent variables, and in order to avoid multicollinearity and endogeneity problems, GDP growth was dropped subsequently from the baseline specification.

Table 1. Employment Growth and Regulation: Annualized Five-year Growth, 1990-2003 1/

	Employment Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta^5 E_t$	$\Delta^5 E_t$	ΔE_t	ΔE_t	$\Delta^5 E_t$	ΔE_t
R_{PM}	-0.005	-0.006	-0.000	-0.005	-0.003	-0.0002
	(1.52)	(2.36)*	(0.07)	(2.35)*	(1.06)	(0.06)
R_{LM}	-0.007	-0.007	-0.008	-0.003	-0.008	-0.005
	(3.37)***	(4.92)***	(2.45)**	(2.11)**	(3.72) ***	(1.29)
R_{PM} x R_{LM} 2/	0.013	0.015	0.010	0.007	0.014	0.005
	(3.95)**	(5.40)***	(1.85) *	(2.58)***	(4.16) ***	(1.03)
Estimation 3/	FE	RE	FE	RE	IV	AB
Observations	330	330	347	347	330	422
Countries	27	27	28	28	28	28
R-squared	0.01	0.14	0.29	38.7	50.6	...
Wald-Test 4/	10.5***	54.5***	2.8**	13.5***	11.3***	...

Source: OECD and author's estimates

Notes: absolute value of t statistics in parentheses; * significant at the 10 percent, ** at the 5 percent, and *** significant at the 1 percent level.

1/ The dependent variable in models (1), (2), and (5) is the annualized employment growth rate (persons) averaged over 5 years, in models (3), (4), and (6) it is the annual growth rate. Other control variables not shown in models (1), (2), and (5) are the five-year lag of the average growth. Models (3) and (5) include the first to the fifth lag of the annual employment growth rate. Model (5) is an instrumental variable estimation using the annualized real GDP growth rate averaged over 5 years lagged five year as an instrument on the lagged dependent variable. The specification includes country dummies equivalent to a FE specification. Model (6) presents Arellano-Bond estimates based on a four lag structure and covers the period 1985-2004. All models include population size as a control for country size and a constant. Lagged dependent variables in all models are significant.

2/ Dummy interaction effect. 1 if both labor and product market regulation are at or above the average level of the sample of OECD countries, and 0 otherwise.

3/ FE=fixed effects, RE=random effects, IV= instrumental variables, AB= Arellano-Bond.

4/ Test of joint significance of regulation variables.

The first aspect worth noticing in Table 1 is the consistent sign pattern of the estimated coefficients across models. The direct effect of market regulation is negative while the interaction term has an offsetting positive effect in all specifications. Although product market regulation is not always statistically significant,[16] Wald-tests indicate joint significance of all three regulation variables. The interaction term is a dummy variable and set to be equal to one if a country has above average product and labor market regulation and zero otherwise. This specification avoids potential compatibility problems with the metric of the two indicators and provides a better fit than a multiplicative term.[17] We show results for both random and fixed effects estimators.[18]

The empirical results provide evidence of cross-market synergies from deregulation in both markets. This can be demonstrated by analyzing the employment effect of partial deregulation. The full impact of partial changes is the sum of the direct impact and the offsetting effects from the interaction term. The model parameters imply that the (marginal) employment effect from deregulating one market increases as the level of regulation decreases in the other market, thus reflecting positive synergies from joint deregulation.

In general, the estimated net effect of partial deregulation is positive, that is, enhances employment growth—but for a few countries, however, the marginal reform effect becomes negative due to a large offsetting interaction term. This somewhat counterintuitive result highlights the importance of the cross-market spillover: a partial deregulation effort in one market at very high levels of regulation in the other is not guaranteed to be successful. But the result is reversed as the level of regulation in the other market falls and does not appear in most deregulation scenarios (see Table 5 below).

In order to understand better which regulation channels affect employment growth, we also explore the relative importance of different subcomponents of the regulation indices. The results are reported in Tables 2 and 3. To assess the effects of labor market regulation, we estimate the effects of three subindices measuring the degree of employment protection of regular employment, temporary employment, and large-scale dismissals. Columns (1) to (4) in Table 2 compare the estimates for the overall index with its subcomponents. The largest negative employment effects stem from employment protection of full-time employment and large-scale dismissals. Regulations affecting temporary employment seem to play a smaller role. These results suggest that employment protection interferes with job growth primarily by raising the cost of regular full-time employment contracts.

[16] A plausible explanation is inflated standard errors due to the positive correlation of the regulation variables. Product market regulation is statistically significant in models which exclude labor market regulation and the interaction term (see below).

[17] The multiplicative interaction terms consistently come out with a positive sign, but is not always statistically significant at conventional levels.

[18] Although the Hausman specification tests rejects the hypothesis of consistency of random effects in favor of the fixed effect model, there is a potential conflict between using fixed effects and the less time variation of the regulatory indicators.

Analysis of product market subindices hint at increased costs for creating new jobs (Table 3). Columns (1) to (6) present the overall index compared to five subcomponents. Employment growth is mostly hampered by a high administrative burden and barriers to entrepreneurship, trade, and investment. Comparatively less important are economic regulations—for instance, through price ceilings or quotas—or excessive state control via public ownership. Although still based on fairly general indicators, the findings suggest that regulation especially hampers job creation in startups or small firms as they are most sensitive to administrative burdens and barriers to entry of entrepreneurship and investment. This interpretation is consistent with large competitive barriers in the service sector in several European countries, where most small enterprises are concentrated (Berger and Danninger, 2005).

Table 2. Employment Growth and Regulation: EPL Subindices, 1990-2004 1/

	Change in Employment			
	(1) $\Delta^5 E_t$	(2) $\Delta^5 E_t$	(3) $\Delta^5 E_t$	(4) $\Delta^5 E_t$
R_{LM}	-0.007			
	(3.62)***			
Regular Employment		-0.016		
		(5.06)***		
Temp. Employment			-0.003	
			(2.49)**	
Collective Dismissal				-0.015
				(3.08)***
Observations	330	330	330	170
Countries	27	27	27	27
Estimation 2/	FE	FE	FE	FE
R^2 (within)	0.25	0.28	0.24	0.55

Notes: absolute value of t statistics in parentheses; * significant at the 10 percent, ** at the 5 percent, and *** significant at the 1 percent level.

1/ Dependent variable is annualized employment growth rate average over five years. Regulation subindices measure regulation of regular employment contracts, regulation of temporary employment contracts, and regulation of collective dismissals Estimation technique is fixed effects. Models include 5-year lagged dependent variable, population size, fixed effects, and a constant. Lagged dependent variables are significant.

2/ FE=fixed effects

Table 3. Employment Growth and Regulation: Product Market Regulation Subindices 1990-2004 1/

	Change in Employment					
	(1) $\Delta^5 E_t$	(2) $\Delta^5 E_t$	(3) ΔE_t	(4) ΔE_t	(5) $\Delta^5 E_t$	(6) $\Delta^5 E_t$
R_{LM}	-0.008					
	(2.83)***					
Administrative Regulation		-0.009				
		(3.78)***				
Economic Regulation			-0.003			
			(1.34)			
Barriers to Trade and Investment				-0.009		
				(2.66)***		
Extent of State Control					-0.004	
					(1.98)**	
Barriers to Entrepreneurship						-0.009
						(3.32)***
Observations	330	330	330	330	330	330
Countries	27	27	27	27	27	27
R^2 (within)	0.24	0.26	0.23	0.24	0.23	0.25

Source: OECD and author's estimates.

Notes: absolute value of t statistics in parentheses; * significant at the 10 percent, ** at the 5 percent, and *** significant at the 1 percent level.

1/ The dependent variable is annualized employment growth rate average over five years. Regulation subindices measures the level of administrative regulation, level of economic regulation, barriers to trade and investment, extent of state control, and barriers to entrepreneurship. Models include five-year lagged dependent variable, population size, fixed effects, and a constant. Lagged dependent variables are significant.

C. Robustness Checks

Several different modifications to the baseline model were examined to assess the robustness of the baseline results. In a first step different control variables were added to examine the scope of an omitted variable bias. One potential factor suggested in the literature is the tax wedge on labor which increases the cost of labor and thereby could reduce employment growth. Adding either the level or the growth rate of the tax wedge—both are highly significant—does not alter the sign or joint significance of the regulation effects. Similarly, controlling for union density or the coverage of collective bargaining—both variables are insignificant—has no effect on the baseline results.[19] We also test for heterogeneity across regional country groupings but do not detect a country cluster effect (e.g., transition economies).

To control for the potential endogeneity of the lagged dependent variable an instrumental variable (IV) model is estimated with lagged GDP growth as an instrument. The IV model produces the same sign pattern and significance patterns as in the baseline model.[20] To deal with potential estimation problems arising from the dynamic panel specification, the annual model was reestimated using the procedure proposed by Arellano-Bond. Again the sign-pattern of the regulation effects remained intact although the coefficients were no longer statistically significant.[21] These results are reported in columns (5) and (6) of Table 1.

Next, we see whether the qualitative results from the cross-country panel hold up in a industry-level data set. The main benefit of the alternative panel is higher frequency data on product and labor market regulation, but with the drawback of covering an earlier time period (1980-98), includes fewer countries (six), and restricts the analysis to just four non manufacturing sectors.[22] Annual product markets regulation data come from Nicoletti and others (2000) and have been used in explaining relative economic performance (e.g., Alesina and others, 2005). Data on employment protection legislation are taken from Table 12 in Nickell (2003) to obtain an elongated time-series. All other industry data come from the OECD STAN database.

Results from baseline regressions on this panel confirm the presence of negative regulation effects with cross-market interactions. Table 4 presents the sectoral regulation effects for two model specifications using five year and annual employment growth rates. The model specifications are the same as in Table 1, but also include industry dummies. The Hausman specification test suggests random effects to be the preferable model. In both the five-year average and the annual specification, the same regulation pattern

[19] Data sources for the tax wedge are OECD "Taxing Wages" (various issues). Union density and collective bargaining coverage are taken from Nickell (2003), tables 8 and 9. Results are available from the authors upon request.

[20] All three regulation variables were jointly significant at the 1 percent level. All were individually significant with the exception of product market regulation.

[21] Given the fact that this procedure was developed for large micro-data panels, and due to the limited time variation of the current sample, the applicability of the dynamic panel estimator is doubtful.

[22] Electricity production, telecommunications, transportation, and postal services.

emerges. The sign pattern is the same as in the cross-country panel and at least in the case of the five-year growth rates, the estimated effects are statistically significant.[23]

Table 4. Employment Growth and Regulation:
Industry Level Data 1980-98 1/

Degree of Regulation	(1) $\Delta^5 E_t$	(2) ΔE_t
R_{PM}	-0.006	-0.527
	(2.69)**	(1.47)
R_{LM}	-0.023	-1.715
	(3.48)**	(1.81)
R_{PM} x R_{LM}	0.005	0.367
	(3.13)**	(1.44)
Estimation 2/	RE	RE
Observations	103	183
Countries	6	6
Sectors	4	4
R-squared	0.62	0.32
Wald-Test 3/	7.1**	4.7

Source: OECD and author's estimates
Absolute value of z statistics in parentheses; * significant at 10 percent ** at 5 percent *** significant at 1 percent.
1/ Sectoral employment growth (persons) in four non-manufacturing industries (electricity production, telecommunications, transportation, and postal services) covering the years 1980-88 sourced from the OECD STAN database. Market regulation indicators are taken from Nicoletti and others (2000) and Nickell (2003) Table 12. Baseline regressions include sectoral dummy variables and in model one a five-year lag of the dependent variable and in models two the first to the fifth lag. Lagged dependent variables are significant. Interaction term is the product of the market regulation indicators.
2/ RE=random effects.
3/ Test of joint significance of regulation variables.

[23] The results are at odds with Nicoletti and Scarpetta (2005). Using an extended sectoral data set up to 2002 and a selection of labor market regulation indicators, they find evidence of complementarities between product market regulation and labor market policies, implying that product market deregulation will yield larger employment gains at *higher* levels of labor market regulation. While the empirical studies are hard to compare for a number of reasons, including differences in specification and estimation techniques, this suggests that at the sectoral level the sign of the interaction term may be somewhat less informative than at the cross-country level.

D. The Economic Impact of Deregulation

To simulate the employment growth effects from deregulation, Table 5 presents the findings for a number of reform scenarios based on the econometric results in Table 1 above. These results are based on two different reform strategies (comprehensive and partial) and two levels of the deregulation effort (small and large). A comprehensive reform is defined as coordinated deregulation in both the product and labor markets (i.e., a decline of the regulation index in both markets). A partial reform is a unilateral decrease of the regulation index in only one market. A large deregulation effort represents movement from the 75h to the 10th percentile in the OECD distribution of the respective regulation index, a small reform effort is defined as a decline in the regulation level from the median to the 10th percentile. When conducting a partial reform experiment, we assume that the level of regulation in the non reforming market remains at the pre-reform level of the reforming market.

The economic effects appear to be large in all reform scenarios, irrespective of which empirical model is applied. The first five columns in Table 5 report the annual employment growth effect based on different empirical models (see Table 1). The average effect across models is reported in the last column. Partial reforms lead on average to additional employment growth of between 0.5 or 0.6 percent across all models. The size of the effort does not change the result much. Comprehensive reform trivially doubles the impact to between 1.0 and 1.2 percent simply because it involves a double effort in both markets.

However, in addition, policy coordination also generates a positive synergy effect due to the interaction term identified in the empirical exercise. This effect can be measured by the difference between the sum of partial product and labor market deregulation and a comprehensive reform. On average, coordinating reform efforts across markets increases the estimated employment effects by about 17 percent in the small effort scenario (i.e., the shift from median to 10th percentile) and by 38 percent in the large effort scenario (75th to 10th percentile). And while the size of the estimated effects varies substantially across models, the coordination effects generally significantly boosts the overall effect.

Table 5. Employment Effect from Partial and Comprehensive Deregulation 1/

Model 3/	A	A	B	B	A	B	
Technique 4/	FE	RE	FE	RE	IV	AB	Mean
				Partial Reform 2/			
75pct → 10 pct							
Average growth effect	1.3	0.2	0.7	0.1	0.8	0.4	0.6
Median → 10 pct							
Average growth effect	0.9	0.4	0.5	0.2	0.6	0.3	0.5
				Comprehensive reform 2/			
75pct → 10 pct							
Overall effect	3.0	1.5	1.5	0.9	2.1	0.8	1.6
o/w coordination	0.4	1.0	0.2	0.6	0.4	0.1	0.5
% increase over partial reform	15.6	210.3	15.4	213.2	27.0	6.6	38.4
Median → 10 pct							
Overall effect	1.9	1.2	1.0	0.7	1.4	0.5	1.1
o/w coordination	0.1	0.4	0.1	0.2	0.2	0.0	0.2
% increase over partial reform	7.9	44.1	7.5	45.6	12.6	3.5	16.6

Source: Author's calculations.

1/ Reported estimates measure annual employment growth impact.

2/ Partial policy simulations refers to a move from 50th to the 10th percentile on the regulation index in one market. Comprehensive reform refers to a simultaneous move to the 10th percentile in both markets.

3/ Model A based on five-year averages, model B on annual data. See Table 1 for details.

4/ FE=fixed effects, RE=random effects, IV= instrumental variable, AB= Arellano-Bond.

IV. Implications for the Political Economy of Deregulation

One implication of the empirical results is that optimal deregulation policies need to take into account direct as well as indirect interaction effects across markets. A benevolent social planner will take a holistic view of the economy, considering de-regulation in both the labor and product market to maximize overall welfare. Of course, in actual decisions policymakers often take a market-by-market perspective. As we will show below, however, such a partial perspective will, as a rule, lead to inefficient policy results in the presence of sizable interaction effects.

In addition to the economic benefits of deregulation, decision makers will also take into account its economic costs. For the social planner, such costs may include transaction costs—for instance, frictional unemployment or the cost of moving or scrapping physical capital—that occur when resources are being reallocated to more efficient uses.[24] The planner will weigh the benefits of a particular reform scenario on both the labor and product markets with costs and proceed only if there is a net benefit.[25]

[24] The report of the Australian Competition Commission (2004) provides a comprehensive account of such costs.

[25] Actual decision-making may be also influenced by political costs. For instance, interest groups will try to influence the distributional effects of a reform or politicians might take into account the potential loss of votes from the displaced workers and their dependents. Because the social planner would ignore political costs, however, taking them into account (just like taking a partial perspective on benefits) will lead to suboptimal policy results. See section D below.

In the remainder of the section, we compare optimal deregulation policies derived in different policy environments based on a simple decision model that describes the net benefit from reforms of the labor and/or product markets. The model illustrates the rationale for policy-coordination across sectors and thus explains when a social and when a partial planner would reform. Differences depend on the degree of internalization of market specific benefits and the possibility to communicate between multiple decision makers.

A. Social Planner

Deregulation policies will be implemented when their marginal benefit exceeds the marginal cost.[26] The stylized facts from the empirical section suggest that employment growth or, more generally, benefits (B) have the general form

$$B = \overline{\alpha} - \alpha_{LM} R_{LM} - \alpha_{PM} R_{PM} + \gamma R_{LM} R_{PM},$$

where the α terms as well as γ are constants and the R_i, with i=LM, PM, are the measures of the level of regulatory activity in the labor and product market introduced earlier.

To keep the model simple, we make a number of assumptions. First, regulation can only take two values, high and low, $R_i = \{\overline{R}_i, \underline{R}_i\}$. Second, the status quo in both markets is a high level of regulation. Third, the economic cost of deregulation $\overline{R}_i - \underline{R}_i \equiv \Delta R_i > 0$ is a positive constant

$$C_i > 0.$$

Optimal Strategies

Given the discrete setup, the single planner will either decide to reform both markets, not reform at all, or reform only one market. When will the planner implement **full reform**? For the planner to prefer full reform over no reform in either market is that the net-benefits (taking into account reform costs) in the former case exceed net-benefits in the latter

$$(-\alpha_i \underline{R}_i - \alpha_{\neq i} \underline{R}_{\neq i} + \gamma \underline{R}_i \underline{R}_{\neq i} - C_i - C_{\neq i}) - (-\alpha_i \overline{R}_i - \alpha_{\neq i} \overline{R}_{\neq i} + \gamma \overline{R}_i \overline{R}_{\neq i}) \geq 0,$$

which implies after some manipulations

[26] This is true no matter the specific nature of these costs. To the extent that marginal costs reflect economic (or transaction) costs, the rule ensures first-best efficiency. Policy failure arises, if marginal political costs are the decisive factor in upholding regulation in any market, while a comparison of benefits and economic costs alone would suggest otherwise. Given informational constraints, the rule might still yield a second-best result, however.

$$\alpha_i \Delta R_i + \alpha_{\neq i} \Delta R_{\neq i} - \gamma(\Delta R_{\neq i} \overline{R}_i + \Delta R_i \underline{R}_{\neq i}) \geq C_i + C_{\neq i}.$$

From a similar argument the condition for full reform dominating partial reform can be derived as

$$\Delta R_{\neq i}(\alpha_{\neq i} - \gamma \underline{R}_i) \geq C_{\neq i}.$$

When both conditions hold, the planner will deregulate both the product and the labor market. In Figure 2 spanning the space of possible reform cost combinations, this area refers to the grey-colored area marked by relatively low levels of reform costs in both markets around the origin.

Following the same logic, the planner will prefer **partial reform** of market *i* over no reform if

$$\Delta R_i(\alpha_i - \gamma \overline{R}_{\neq i}) \geq C_i,$$

and partial reform of market *i* over full reform if

$$\Delta R_{\neq i}(\alpha_{\neq i} - \gamma \underline{R}_i) < C_{\neq i}.$$

Because of the symmetry of the setup, similar conditions hold for the $\neq i$ market. In Figure 2, the cost-combinations (C_i, $C_{\neq i}$) meeting these conditions are depicted by the horizontal-striped areas in the upper left and lower right.

Finally, the planner will choose **no reform** if the net-benefits from full deregulation are negative, that is when we have

$$\Delta R_i \alpha_i + \Delta R_{\neq i} \alpha_{\neq i} - \gamma(\Delta R_i \overline{R}_{\neq i} + \Delta R_{\neq i} \underline{R}_i) < C_i + C_{\neq i},$$

and, at the same time, the net-benefits of no reform exceed the net-benefits of partial reform

$$\Delta R_i(\alpha_i - \gamma \overline{R}_{\neq i}) < C_i.$$

In Figure 2, the cost-combinations fulfilling both conditions are marked by the downward-striped area to the right of the (A, A)-line parting the no reform from the full reform area, and to the right and above the partial reform areas.

Figure 2. The Planner's Reform Decisions

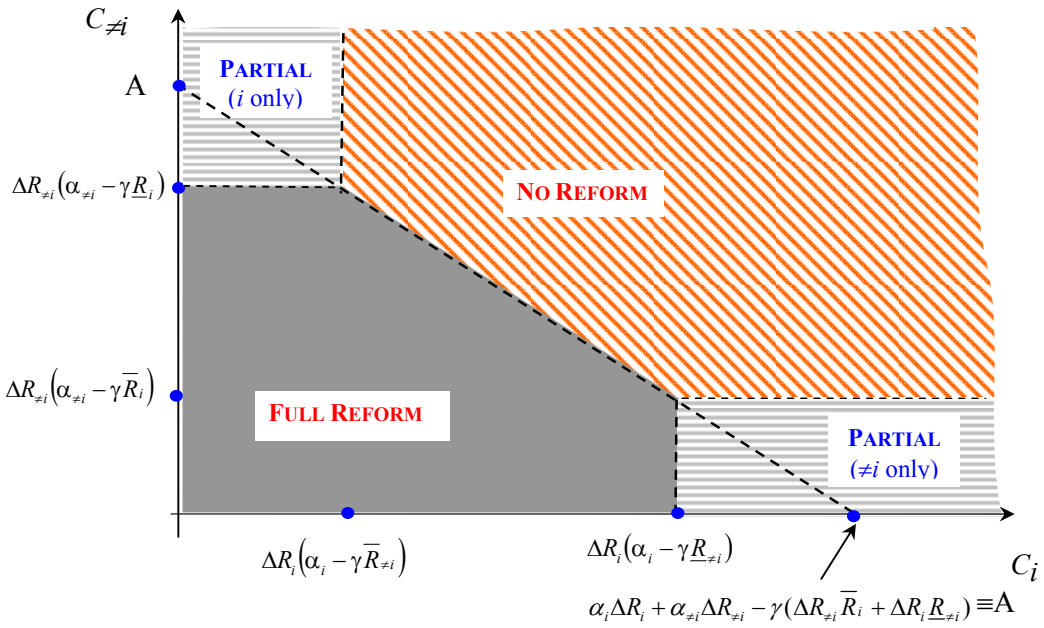


Figure 2 illustrates that, in the presence of reform costs, full deregulation may not always be optimal even from a fist-best perspective. While the social planner will reform both the labor and the product market when deregulation is associated with symmetrical low reform costs, the planner may leave regulation at high status quo levels if reform costs are sufficiently high. And, despite the planner's overall perspective, optimal reform may take the form of only partial deregulation in scenarios were reform costs are asymmetrically high in either the labor or the product market. The question is, however, how well decision-makers with a restricted partial perspective will perform against this benchmark.

B. Partial Decision Makers

In the political sphere, the decisions to deregulate are rarely within one hand. More often than not, product and labor market regulation are implemented and overseen by different entities—for instance, a national competition authority and a government department in charge of social and labor market affairs. And even at the legislative level multiple decision makers may be involved if, as within the EU, product market regulation is subject to both national and international authority. Moreover, different branches of the judiciary may be involved in the regulation of labor and product markets. To capture the essence of the problem, in what follows we will assume that two separate authorities are charged with determining the level of regulatory activity in the labor and the product market.

With more than one decision maker involved, the question of perspective arises. A plausible assumption is that the authorities in charge of, say, labor market regulation will

not fully internalize the full benefit of labor and product market regulation in determining employment growth.[27] In particular, we will assume that the benefits considered are

$$B_i = \overline{\alpha} - \alpha_i R_i + \gamma R_i R_{\neq i},$$

with $i=LM, PM$. That is, while both regulatory authorities take into account the *indirect interaction* term pre-multiplied by γ, they are ignorant of the *direct* repercussions of the other agency's regulatory activity—that is, the term $\alpha_{\neq i} R_{\neq i}$, present in the social planner's benefit function, is missing in partial decision maker *i*'s target function. This may be the case because, from a political economy perspective, partial authorities will only receive public credit for their private efforts or because they lack the expertise or information to precisely gauge the direct effect of the other authority's regulatory activity on the other market.

In what follows, we explore the consequences of the decision maker's partial perspective using two standard environments. The setups differ in the level of information and commitment power available to the two regulators. In one model, decision makers move simultaneously in a Nash game based on only expectations about each other's actions without prior information exchange or the ability to pre-commit on strategies. In the other model, decision makers move sequentially, with one authority acting first as a Stackelberg leader and the second one following suite after having observed the first regulator's actions.

Because both setups may be relevant from a practical perspective, we discuss them in turn, and compare the outcomes with the first-best benchmark developed in the previous section.

Sequential Game

The idea of reform sequencing has at least two dimensions. The first concerns the sequence of decision making as such. Given the multitude of decision makers at the legislative, judicative, and executive level involved, it is probably save to assume that at any given moment deregulation in one market *i* will be determined ahead of market ≠*i*, taking the following authority's action into account. For instance, effective labor market regulation is often influenced by labor courts which may reduce the speed of regulatory change in this sector of the economy. Or, if a reduction in employment protection requires changing labor court behavior itself—through changes in the appointment procedure of judges, say—the process will take relatively long. This could to translate into a first-mover advantage for the authority overseeing (or initiating) labor market regulation vis-à-vis the product market regulation authority. On the other hand, a hard-negotiated product

[27] The objective functions of market regulators can be interpreted as utility functions. Alternatively, one could think also of two bureaucrats maximizing sectoral employment growth functions, that each regulator would consider a production function with the functional form $\Delta E_i = \overline{\alpha} - \alpha_i R_i + \gamma R_i R_{\neq i}$, which adds up to total employment growth $\Delta E = \nu \Delta E_i + (1-\nu)\Delta E_{\neq i}$ where ν is the market *i*'s weight in total employment growth. This setup leads to excessive reform activity beyond what the utility function approach implies. Additional results are available on request.

market deregulation involving multiple national governments (e.g., by way of a trade liberalization or EU action) may have the power to reverse relative commitment power, turning the labor market regulation authority into a Stackelberg follower.

A second dimension of the sequential game concerns the timing of the reform effect: when do the effects of deregulation produce economic effects? Although a core question, there is little knowledge about the relative speed with which reform in the labor and product market influence employment growth. Moreover, these effects will take some time to fully develop. As a consequence, and for the sake of simplicity, we will assume that the effect of reforms occur at the same time. This leaves us with the following sequence of events for *i=LM*, *PM*:

Stage 1:	*i* decides on R_i and credibly commits to its decision
Stage 2:	$\neq i$ decides on $R_{\neq i}$
Stage 3:	simultaneous implementation and payoffs

Under full information and certainty, the equilibrium of the game between the two players, the regulatory authorities in market *i* and $\neq i$, can be found by recursively solving the optimization problems.

Deregulation at Stage 2

Player $\neq i$'s welfare is

$$W_{\neq i} = -\alpha_{\neq i} R_{\neq i} - \gamma R_i R_{\neq i} - C_{\neq i}.$$

Given the sequence of events, player $\neq i$ takes player *i*'s decision as given. If player *i* does not reform, i.e. if $R_i = \overline{R}_i$, player $\neq i$ will reform if

$$-\alpha_{\neq i} \underline{R}_{\neq i} - \gamma \overline{R}_i \underline{R}_{\neq i} - C_{\neq i} \geq -\alpha_{\neq i} \overline{R}_{\neq i} - \gamma \overline{R}_i \overline{R}_{\neq i}$$

or

$$\Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma \overline{R}_i \right) \geq C_{\neq i}.$$

On the other hand, if player *i* does reform, i.e. if $R_i = \underline{R}_i$, player $\neq i$ will reform if

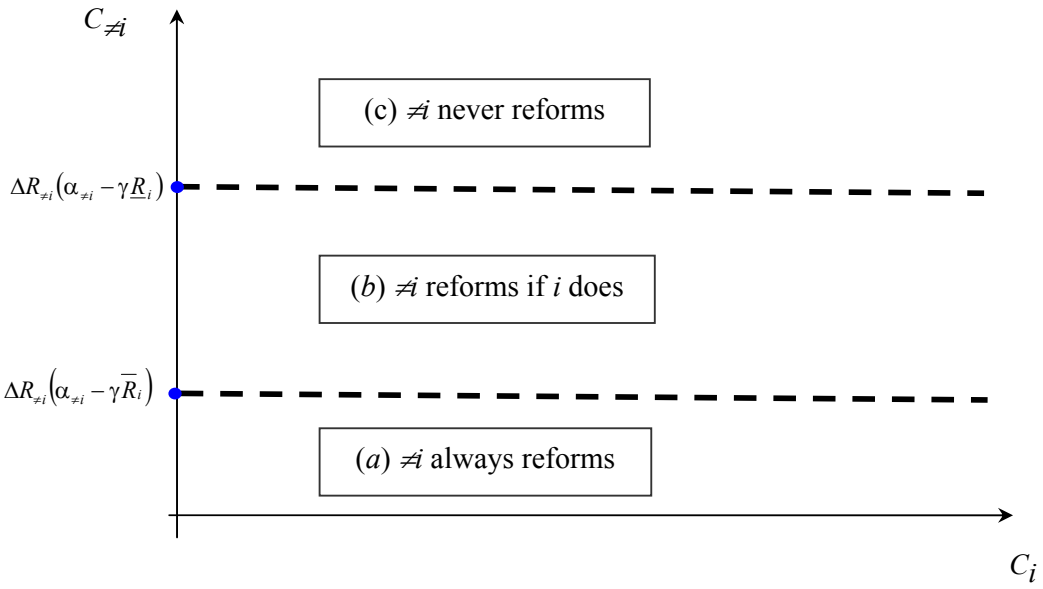
$$\Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma \underline{R}_i \right) \geq C_{\neq i}.$$

Note that the cost threshold in the latter case, $\Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma \underline{R}_i \right)$, is higher than in the former, $\Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma \overline{R}_i \right)$. This implies the following decision rule for player *i*:

$$\begin{aligned} \text{Reform} \quad &\Leftrightarrow W_{\neq i} = \Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma R_i \right) \geq C_{\neq i} \ \ \forall R_i = \overline{R}_i, \underline{R}_i \\ \text{No reform} &\Leftrightarrow W_{\neq i} = \Delta R_{\neq i} \left(\alpha_{\neq i} - \gamma R_i \right) < C_{\neq i} \ \ \forall R_i = \overline{R}_i, \underline{R}_i \end{aligned}.$$

To illustrate, in Figure 3, moving along the $C_{\neq i}$-axis from the origin, $\neq i$ will always reform in area (*a*), that is, even if player *i* chooses not to reform market *i,* reform only if player i reforms in area (*b*), and never reform in area (*c*) independently if player *i*'s decision.

Figure 3. Reform Decision at Stage 2



Deregulation at Stage 1

Player *i* operates under full information, guided by a welfare function symmetrical to $\neq i$'s,

$$W_i = -\alpha_i \underline{R}_i - \gamma R_i R_{\neq i} - C_i ,$$

and taking $\neq i$'s decision rule into account. In particular, player *i's* deregulation decision depends on $\neq i$'s response to the first stage reform decision. We will discuss the three ensuing scenarios in turn.

(*a*) Player $\neq i$ always reforms: In this case, player *i* will reform if

$$-\alpha_i \underline{R}_i - \gamma \underline{R}_i \underline{R}_{\neq i} - C_i \geq -\alpha_i \overline{R}_i - \gamma \overline{R}_i \underline{R}_{\neq i}$$

or

$$\Delta R_i (\alpha_i - \gamma \underline{R}_{\neq i}) \geq C_i .$$

(*b*) Player $\neq i$ reforms only if player *i* reforms: Given players $\neq i$'s decision rule, player *i*'s choice boils down to choosing between a situation in which *both* players reform and a

situation in which *neither* player reforms. Thus, player *i* will reform and chose the former scenario if

$$\Delta R_i \alpha_i - \gamma\left(\overline{R}_{\neq i}\overline{R}_i - \underline{R}_{\neq i}\underline{R}_i\right) \geq C_i .$$

(*c*) Player $\neq i$ never reforms: In this case, player *i* will reform if

$$\Delta R_i\left(\alpha_i - \gamma \overline{R}_{\neq i}\right) \geq C_i .$$

It is straightforward to show that the cost thresholds for the three cases can be ranked

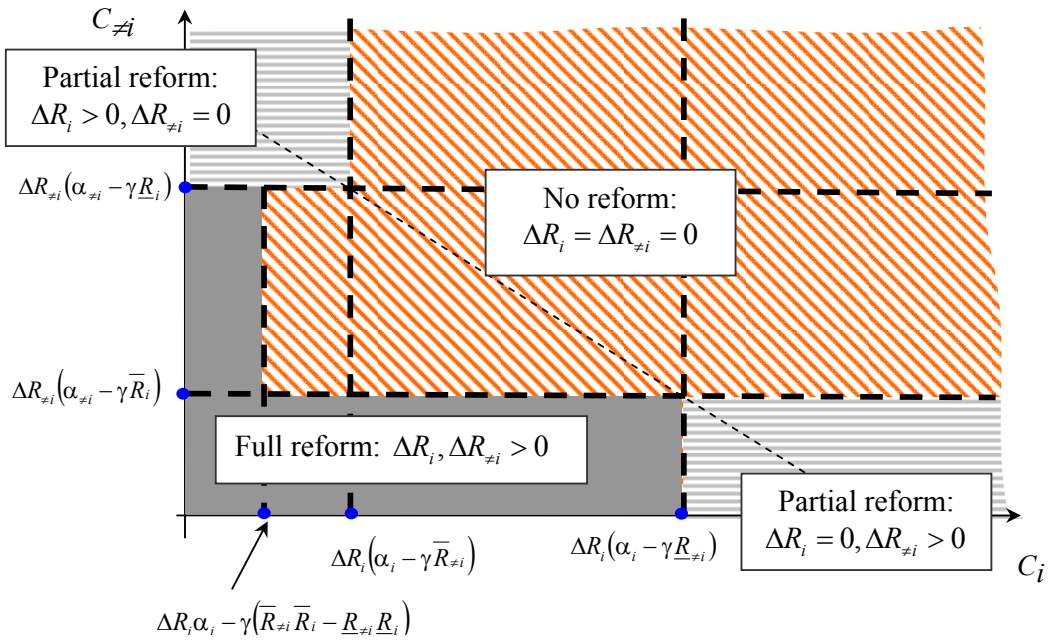
$$\Delta R_i \alpha_i - \gamma\left(\overline{R}_{\neq i}\overline{R}_i - \underline{R}_{\neq i}\underline{R}_i\right) < \Delta R_i\left(\alpha_i - \gamma \overline{R}_{\neq i}\right) < \Delta R_i\left(\alpha_i - \gamma \underline{R}_{\neq i}\right),$$

that is, the cost threshold in scenario (*b*) is smaller than the threshold in (*c*), which is smaller than the one in (*a*). Note that for (*b*) < (*c*) we require $\overline{R}_{\neq i}\overline{R}_i - \underline{R}_{\neq i}\underline{R}_i > \Delta R_i \overline{R}_{\neq i}$ or $\overline{R}_{\neq i}\overline{R}_i - \underline{R}_{\neq i}\underline{R}_i > \overline{R}_i\overline{R}_{\neq i} - \underline{R}_i\overline{R}_{\neq i}$, implying $\underline{R}_{\neq i} <_i \overline{R}_{\neq i}$, which holds by assumption.

Equilibria and Welfare Analysis

Figure 4 illustrates the resulting recursive finite game full information equilibria.

Figure 4. Equilibria of the Sequential Game



Comparing the results with the first-best benchmark (Figure 2), we find that the reform effort in the sequential game falls short at intermediate cost levels.[28] While the limited perspective of the partial authorities comes at no social cost—the partial reform areas marked by horizontal stripes at the top left and bottom right of Figure 4 are similar to the respective areas in Figure 4—the (solid grey) full reform area around the origin is smaller than the relevant area determined by the social planner.

Behind this result is the interaction of the reform efforts and the limited perspective of the partial authority acting as Stackelberg leader. With authority $\neq i$ operating in the intermediate cost range (dubbed scenario (*b*) above), authority *i* realizes that a decision to deregulate its own market will trigger similar efforts in market $\neq i$. Note, however, that a lower level of regulation in market $\neq i$ is not necessarily a good thing from *i*'s perspective because of the empirically derived interaction term linking product and labor market reforms. In other words, triggering deregulation in market $\neq i$ comes at a cost of a smaller marginal gain from deregulation for the leader. The planner follows in principle the same logic when contemplating the full reform option. However, in contrast to the planner, authority *i* takes a partial view on the benefits, ignoring or not being aware of the direct reform effect $\alpha_{\neq i}$ stemming from a lower level of regulation in the other market.

Simultaneous Reform Model

This section deviates from the assumption of sequential decision making, assuming instead that both players decide and implement reform at the same time. Although players lack commitment power and do not exchange information about their strategies, the analysis below shows that this does not necessarily imply "too little" regulation. On the other hand, the simultaneous model can also generate "too much" reform. These two outcomes reflect the coordination problem faced by regulators in a simultaneous setup that the sequential decision-making framework avoids. In all other aspects—preferences, reform costs, and notation—the model is similar to the sequential game.

Payoff Matrix and Equilibrium Concept

In this setup, *i* and $\neq i$ decide and implement R_i and $R_{\neq i}$ simultaneously. As above, we have $R_i = \{\overline{R}_i, \underline{R}_i\}$ and $R_{\neq i} = \{\overline{R}_{\neq i}, \underline{R}_{\neq i}\}$. In this case, the players' welfare resulting from the joint decision can be represented by a 2 x 2 payoff matrix (Table 6).

[28] The diagonal line in Figure 4 replicates the (A,A)-line in Figure 2.

Table 6. Payoff Matrix of the Simultaneous Reform Model

Regulator ≠i \ Regulator i	$\overline{R}_i$	$\underline{R}_i$
$\overline{R}_{\neq i}$	i: $W_i = -\alpha_i \overline{R}_i + \gamma \overline{R}_i \overline{R}_{\neq i}$, ≠i: $W_{\neq i} = -\alpha_{\neq i} \overline{R}_{\neq i} + \gamma \overline{R}_i \overline{R}_{\neq i}$,	i: $W_i = -\alpha_i \underline{R}_i + \gamma \underline{R}_i \overline{R}_{\neq i} - C_i$, ≠i: $W_{\neq i} = -\alpha_{\neq i} \overline{R}_{\neq i} + \gamma \underline{R}_i \overline{R}_{\neq i}$,
$\underline{R}_{\neq i}$	i: $W_i = -\alpha_i \overline{R}_i + \gamma \overline{R}_i \underline{R}_{\neq i}$, ≠i: $W_{\neq i} = -\alpha_{\neq i} \underline{R}_{\neq i} + \gamma \overline{R}_i \underline{R}_{\neq i} - C_{\neq i}$,	i: $W_i = -\alpha_i \underline{R}_i + \gamma \underline{R}_i \underline{R}_{\neq i} - C_i$, ≠i: $W_{\neq i} = -\alpha_{\neq i} \underline{R}_{\neq i} + \gamma \underline{R}_i \underline{R}_{\neq i} - C_{\neq i}$,

A natural equilibrium concept in this setup are (pure strategy) Nash-equilibria, which implies that in equilibrium the regulation-outcome (R_i^*,$R_{\neq i}^*$) has the property that:

$$W_i\ (R_i^*, R_{\neq i}^*) \geq W_i\ (R_i, R_{\neq i}^*)$$
$$W_{\neq i}\ (R_i^*, R_{\neq i}^*) \geq W_{\neq i}\ (R_i^*, R_{\neq i}).$$

An first sub-class of equilibria relevant in this setup involve dominant strategies. A dominant strategy for one player is given when payoffs from playing one particular strategy, say reform, are always at least as high as playing the other strategy (e.g., no-reform), regardless of what the other regulator does. A second class of equilibria is relevant in the absence of dominant strategies. In this case we have to look for mutual compatible best responses, that is, conventional Nash equilibria.

Optimal Strategies

Without an opportunity to commit to a strategy in advance, both players are in a situation that resembles, to a degree, the second-mover in the sequential game. Obviously, neither player will conduct a reform if deregulation costs are prohibitively high:

$$\Delta R_i\left(\alpha_i - \gamma \underline{R}_{\neq i}\right) < C_i,$$

for *i=LM*, *PM*, which makes no reform a dominant strategy at these cost levels.

At cost levels below this threshold, each player's optimal reform decision will be a reaction to the assumed or expected reform activity of the other player. Assuming that the other player will not reform, i.e. $R_{\neq i} = \overline{R}_{\neq i}$, player *i* will choose to reform if

$$\Delta R_i\left(\alpha_i - \gamma \overline{R}_{\neq i}\right) \geq C_i.$$

This implies that, because a high level of regulatory activity represents the status, player *i* has a second dominant strategy: for cost levels sufficiently low, *i* will reform no matter player ≠*i*'s reform decision.

On the other hand, expecting that the other player will reform, i.e. $R_{\neq i} = \underline{R}_{\neq i}$, player *i* will choose to reform if

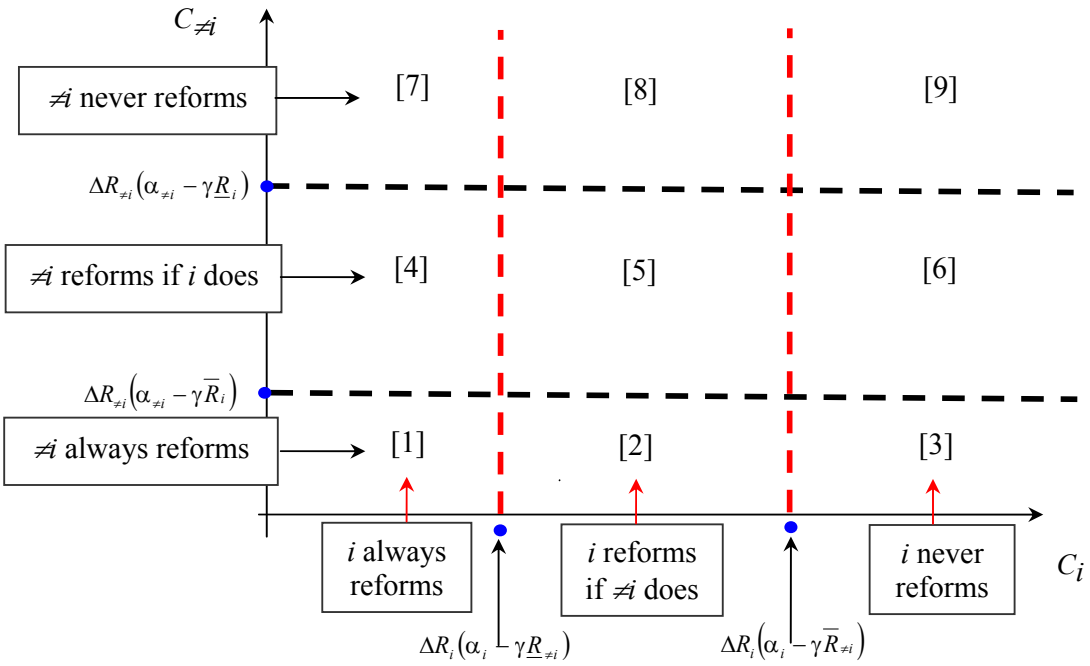
$$\Delta R_i\left(\alpha_i - \gamma \underline{R}_{\neq i}\right) \geq C_i ,$$

which implies that player *i* will reform if player ≠*i* does as well.

Figure 5 summarizes the optimal reform strategies for both players. Referring to the areas marked in the graph, we can distinguish a number of relevant equilibrium constellations involving dominant strategies:

[1]	reform dominating for *i* and ≠*i*:	full reform
[2] & [4]	reform dominating for *i* and ≠*i* follows & vice versa:	full reform
[3] & [7]	reform (no reform) dominating for ≠*i* (for *i*) & vice versa:	partial reform
[6] & [8]	no reform dominating for *i* and ≠*i* follows & vice versa:	no reform
[9]	no reform dominating for *i* and ≠*i*:	no reform

Figure 5. Reform Decisions in the Simultaneous Game



The coordination game

Before we turn to a fuller description of the implied equilibria, we discuss area [5], the one region identified in Figure 5 where neither player follows a dominating strategy. This area has the feature of a classical coordination game. The combination of deregulation costs is such that positive net-benefits from reform occur only if the other player also reforms, that is, we have:

$$\text{Player } i\text{: } \Delta R_i(\alpha_i - \gamma \overline{R}_{\neq i}) < C_i \leq \Delta R_i(\alpha_i - \gamma \underline{R}_{\neq i}),$$
$$\text{Player } \neq i\text{: } \Delta R_{\neq i}(\alpha_{\neq i} - \gamma \overline{R}_i) < C_{\neq i} \leq \Delta R_{\neq i}(\alpha_{\neq i} - \gamma \underline{R}_i).$$

Note the crucial difference between the simultaneous framework and the sequential setup discussed earlier in this reform-cost region. The player moving second in the sequential game took the first mover's action as given, which allowed the first mover to determine both players' choices. Consequently, under full information, the stage-one decision reduced to a choice of full or no reform for both players. In the simultaneous framework, however, neither player has certainty about other player's move, forcing each player to work out best responses to a given (or expected) move by the other. In other words, now both players operate similar to the "follower" in the sequential framework except that the action of the counterpart player is not known at the point of decision and the Nash equilibrium concept of compatible best responses is required to pinpoint the outcome of their interaction.

It can be shown that in this cost region two pure-strategy Nash equilibria exist: no reform and full reform.

No reform equilibrium: Assume that player *i* chooses no reform, $\overline{R}_i$, in equilibrium, then it does not pay for $\neq i$ to deviate from no-reform if:

$$\Delta R_{\neq i}(\alpha_{\neq i} - \gamma \overline{R}_i) < C_{\neq i}$$

In the relevant cost region this condition always holds. A similar condition holds for player *i*. Thus no-reform is an equilibrium strategy.

Full reform equilibrium: Assume that player *i* chooses reform, $\underline{R}_i$, in equilibrium, then it would pay for $\neq i$ to reform as well if

$$\Delta R_{\neq i}(\alpha_{\neq i} - \gamma \underline{R}_i) \geq C_{\neq i},$$

and a similar condition holds for *i*, and both are fulfilled in the relevant cost region. Thus, full-reform is also an equilibrium strategy as well. In other words, if neither player has a dominant strategy, we are faced with a Nash coordination game with two equilibria, full reform or no reform.

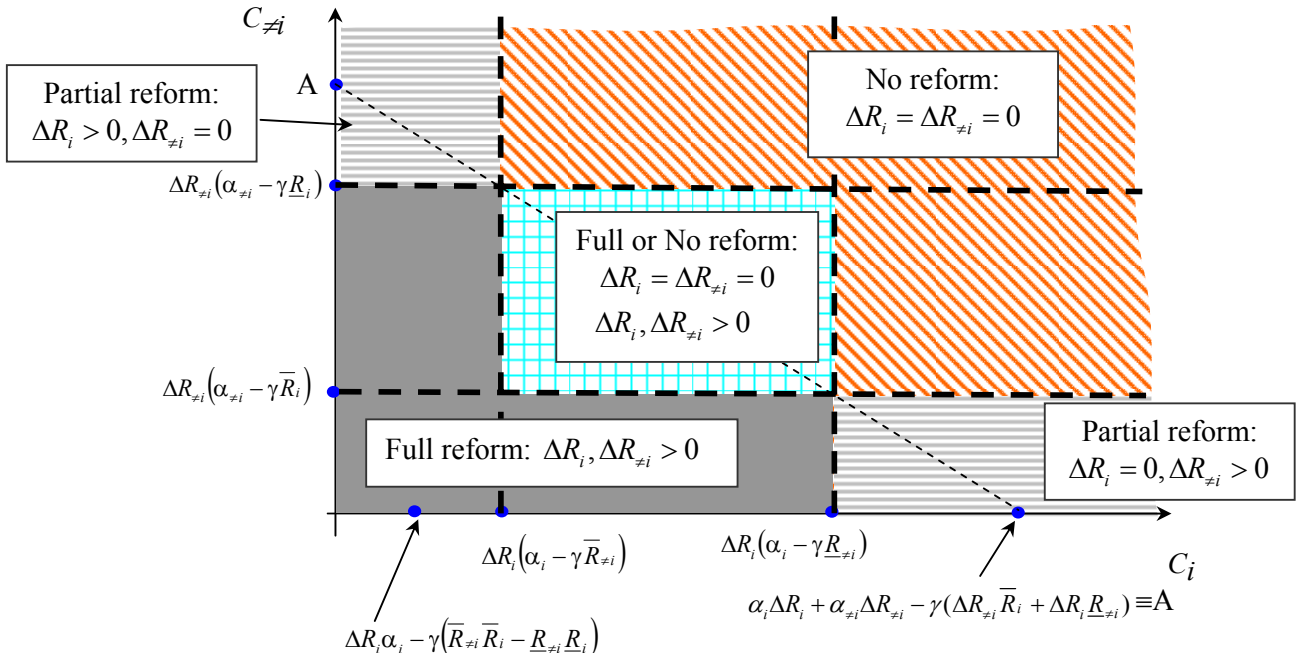
Other Equilibria and Welfare Analysis

Figure 6 sums up the results. In a number of cases, the equilibria outcomes are similar to the outcomes in the sequential game (compare Figure 4). This holds true for the full reform and the no reform equilibria at symmetrically low and symmetrically high levels of deregulation costs, where both players implement dominant strategies (i.e., areas [1] & [9] in Figure 5). Familiar from the sequential setup, too, are the partial reform equilibria with highly asymmetrical deregulation costs, where the dominant strategy for one player is to reform and for the other not to reform (areas [3] & [7]). Comparable results also occur in the no-reform equilibria, where one player faces high deregulation costs and follows a dominant no reform strategy and the other is in the intermediate range choosing to do the same (areas [6] & [8]), as well as the full reform equilibrium where player $\neq i$ enjoys low deregulation costs and always reforms and i, being in an intermediate cost range, chooses to follow (area [2]).

The simultaneous result deviates from the sequential results, however, in the areas [5] and [4] of Figure 5.[29] As discussed, if neither player has a dominant strategy, there are two Nash equilibria, with both players choosing either full or no reform (area [5]). In the same area no reform occurred in the sequential game. Moreover, there is full reform in the simultaneous game, when i enjoys low levels of deregulation costs and always reforms and $\neq i$ chooses to follow (area [4]). In this cost range, sequential player i applied a lower cost threshold and reformed less. The underlying reason in both cases is that, in the simultaneous game, i looses the means to predetermine $\neq i$'s reaction in the intermediate cost range. Rather than comparing and selecting one of two feasible outcomes (i.e., no reform and full reform in both markets), player i is confined to determine a best reaction to $\neq i$'s expected strategy choice. This makes it optimal for i to (always) reform as long as the net-benefits of deregulation exceed the benefits of no reform no matter $\neq i$'s decision in area [4] and lets i enter into a coordination game with $\neq i$ in area [5]. As a consequence, the full reform area in the simultaneous setup is strictly larger than in the sequential setup.

[29] Here player i enjoys deregulation costs lower than the no-reform threshold ($\Delta R_i\left(\alpha_i - \gamma \overline{R}_{\neq i}\right) \geq C_i$) and player $\neq i$ is in the intermediate cost range ($\Delta R_{\neq i}(\alpha_{\neq i} - \gamma \overline{R}_i) < C_{\neq i} \leq \Delta R_{\neq i}(\alpha_{\neq i} - \gamma \underline{R}_i)$).

Figure 6. Simultaneous Model Equilibria



More reform does not necessarily mean optimal reform, however. In fact, like the sequential setup, the reform efforts in the simultaneous game are suboptimal from the social planner's perspective—albeit for different reasons. Whereas the sequential setup led to a too low reform effort, the simultaneous game could trigger excessive reform. A comparison of Figure 6 with Figure 2 reveals that the partial authorities will implement first-best full reform and partial reform in areas where either both or one of the authorities has a dominant strategy. However, where the interaction between both authorities reduces to a pure Nash coordination game, (i.e., when $\Delta R_i(\alpha_i - \gamma \overline{R}_{\neq i}) < C_i \leq \Delta R_i(\alpha_i - \gamma \underline{R}_{\neq i})$ for *i=LM*, *PM*) their reform effort will be inefficient in the sense that they will be either insufficient (the no reform equilibrium) or excessive (the full reform equilibrium).

The deeper reason for the inefficiency in the coordination game cost range is the interaction term combined with a partial perspective. The interaction term creates the interdependence between both reforming authorities. However, other than the planner, the partial authorities ignore the direct and indirect repercussions of their actions on the other market. The planner would take into account the direct effects of reform efforts in either market as well as their interaction effects. Taking into account all direct effects leads the planner to opt for a full reform effort in excess of the full reform result secured by dominating strategies for partial authorities: the planner will always reform both markets if reform costs are within the checkered area but below the (A,A)-line. Taking full account of the interaction effect induces the planner to refrain from reform in cost constellations within the checkered area but above the (A,A)-line. Such excessive reform effort by partial authorities was avoided in the sequential setup, where the Stackelberg leader—like the planner—internalized the interaction effect. However, in this case the lack of an overall perspective leads to too much reform restraint.[30]

C. Summary

A first message stemming from the analysis of the social planner is that first-best deregulation can take a number of forms (Figure 2). The model illustrates that both partial or full reform can be optimal depending on circumstances. That said, however, it is worthwhile pointing out that optimal deregulation will often take the form of a comprehensive reform package. Unless deregulation costs are (very) asymmetric across markets, optimal deregulation is likely to involve both the labor and the product markets and require some form of coordination.

The main message from the decentralized models is that deregulation choices are not always optimal if left to decision makers with a partial, market-by-market perspective. If decision makers interact in a simultaneous setup, reform efforts can either be too small or be excessive. The inefficiency has its roots in the interaction of reform efforts on the benefit side combined with the deregulators' partial view: while the social planner considers the benefits from reform efforts in both markets, the players only take into account the benefits from their own reform effort and ignore the repercussions created by the interaction term in the benefit function. Ignoring the interaction effect in a cost range where the planner would have refrained from reform can lead to excessive deregulation, when regulators give in to a "climate of reform" and coordinate accordingly. On the other hand, not taking into account the direct benefits of the other regulator's efforts may lead to too little deregulation in a cost range where the social planner would have deregulated both markets.

Because the sequential setup allows one player to step into the social planner's shoes in anticipating the consequences of a coordinated reform effort, the excessive deregulation result can be avoided. However, the sequential outcome still suffers from the partial perspective of the players. As a consequence, deregulation efforts in the sequential game

[30] Refining the Nash equilibrium concept could help to eliminate one of the two equilbria in the coordination cost range.

will fall short even compared to the "no reform" equilibrium in the simultaneous setup, since the regulator moving first fails to take into account the direct reform benefits that would be created by deregulation in the other market.

So would coordination help to overcome the inefficiencies? The answer depends on the type of coordination being offered. Allowing one regulator to lead the reform process helps to avoid excessive regulation but at the price of too little reform. On the other hand, if reform decisions are made in a simultaneous fashion (e.g. by defining a multi-year government program), then coordination may be a helpful tool for equilibrium selection. In principle, however, any coordination effort aimed at the first best will have to allow for some sort of side-payment between regulatory authorities (to overcome the partial perspective problem) and also coordination of activities (to allow taking account of the interaction effects). An added advantage of coordinating reform efforts across markets is that they might help to reduce the probability of "capture" through special interests at the partial market level—an issue we turn to next.

D. Political Costs of Regulation

There can be little doubt that political costs also influence decision-making when it comes to regulatory reform. Or, as the OECD (2004b, p. 17) puts it matter-of-factly for the example of German reforms in recent years: "Organized interest groups take part in consensus-driven decision-making. Over time this has led to a situation in which many players at different levels of the system [...] can block or stall progress in taking a decision." In the framework developed above, this kind of activity translates into reforms becoming more costly.[31] We find that the need for coordination prevails even when political economy considerations are added to the model.

To facilitate the analysis, we assume that political economy factors are *separable* from economic cost and benefit considerations and that decision-makers take them into account in *addition* to the economic arguments considered by the social planner.[32] On the cost side, additional political costs of reform could entail, for instance, business interests

[31] Among the more influential papers on the political economy behind (de)regulation are Stigler (1971), Becker (1983), and Peltzman (1976, 1989), who stress the role of powerful interest groups. In a voting framework, Fernandez and Rodrik (1991) argue that uncertainty about individual winners and losers can lead to a bias against reforms. Coate and Morris (1999) point out that adjustment to political action might inherently produce political pressures against (further) changes. Dewatripont and Roland (1995) show that, in a more complex political-economic setup, policy complementarities might be compatible with a gradual (or partial) reform approach, if this helps to build support for the overall policy program and "big bang" reforms are more costly to reverse.

[32] In practice differentiating between economic and political costs may be difficult. Modern interest group theory (e.g., Potters and van Winden 1996) stresses the potentially beneficial role that lobbies play in guiding government decisions in environments with private information. Broadly speaking, interest groups might provide helpful information on the costs of deregulation, but their role in the policy process might give them an opportunity to blur the line between economic and private costs. The political costs of deregulation could also be endogenous with regard to the reform effort. For instance, as pointed out by Saint Paul (1997) and Koeniger and Vindigni (2003), product market reforms may reduce the incentive for labor to protect insiders by means of restrictive labor market policies. Similarly, firms in competitive markets may find it more difficult to bear the cost of restrictive labor market regulation. Winston (1993) argues that a lack of enthusiasm for certain deregulation might also reflect intra-household benefit dispersion, as not all consumers benefit equally from the effort.

fighting to keep up barriers to entry or organized union protest. On the benefit side, a relevant political economic consideration is the time preference of decision makers. While reform costs (as a rule) occur up front, benefits are often spread out over time (see, e.g., Australian Competition Commission, 2004). For instance, opening a market to competition will immediately be resisted by incumbents, while the implied benefit on the consumer side takes the form of a discounted flow of future rent increases. If decision makers have a time horizon shorter than the social planner's, perhaps because of re-election constraints or other forms of myopia, they will underestimate benefits. Moreover, benefits tend to be less visible than costs—not least because the interest groups negatively affected by deregulation tend to be smaller in number, less dispersed, and better organized than the groups set to profit from these reforms.

Figure 7. Policy Implications of Political Costs

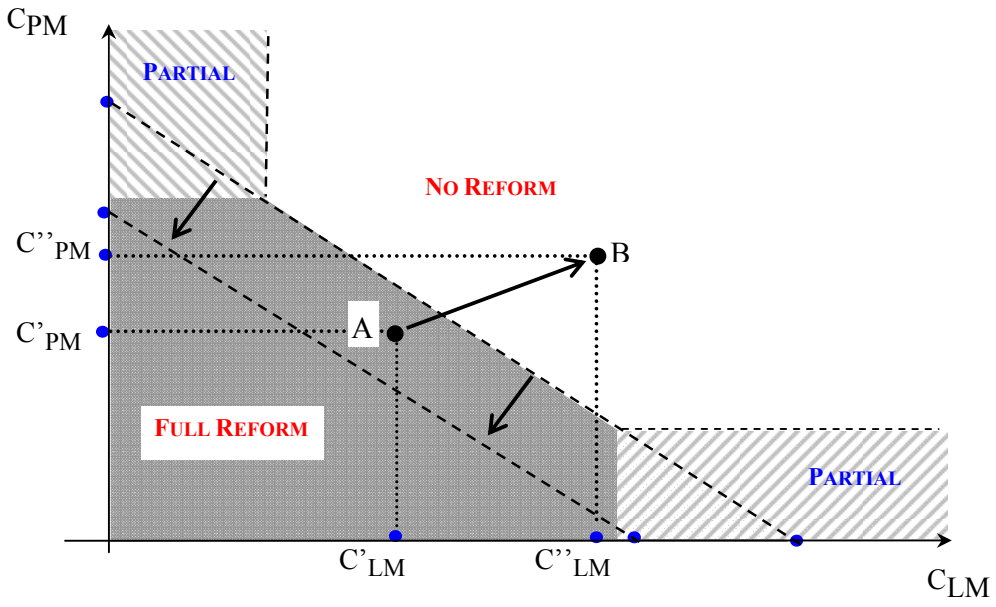


Figure 7 demonstrates how the presence of political costs could affect the reform decision. By adding political cost to the decision maker's menu, the location describing marginal benefits and costs might shift from point such as A (C'_{LM}, C'_{PM}) to a point further northeast such as B (C''_{LM}, C'_{PM}). If these additional costs are large enough, as shown in Figure 3, then the policymaker would find him- or herself in the NO REFORM area while a social planner, ignorant of the political costs and still focused on point A, would pursue reforms.

Myopia or short political tenure affects the reform decision in a similar manner. A high discount rate of anticipated benefits may lead to an inward shift of the boundary between the reform and no-reform areas—at a reduced level of perceived benefits of deregulation, lower reform costs are required to make deregulation worthwhile. Again, if the shift is large enough relative to the actual level of reform costs in both markets, it may cause policymakers to forgo reforms even though deregulation would be socially optimal. In Figure 3, this would be the case for the combination of reform costs depicted by point A.

V. CONCLUDING REMARKS

In this paper we provide new evidence on the economic benefits of labor and product market reform. We show for a sample of OECD member countries that market deregulation is associated with a significant increase in aggregate employment growth. The effect relies in part on sizable interactions between labor and product market reforms linking the effectiveness of deregulation in one market to the level of regulation in the other market. Intuitively, liberalizing the labor market generates higher employment growth when the product market is more competitive, and vice versa. Comparable interaction effects have been reported in other studies, and their presence may help explain why the benefits of structural reforms have differed so much among industrial countries (e.g., Estevao, 2005; Kugler and Pica, 2004).

We find that the employment effects are the largest when deregulation includes both labor and product markets, and the estimated employment gains can be sizable. A country moving from median levels of regulation to the lowest decile stands to gain about 1 percentage point in annual employment growth, partially due to sizable spillover effects. A caveat is that these findings—while rather robust along many dimensions—are based on a panel with only limited time variation in regulatory indicators. However, key results can be replicated in an alternative data set using regulatory indicators with more time variation but smaller coverage of the economy.

The analysis of reform decisions shows deregulation choices are not always optimal if left to decision makers with a partial, market-by-market perspective. For instance, if regulators lack information about the direct effects of deregulation activities in other (yet connected) markets, "too much" or "too little" reform compared to the fist best outcome is possible. Adding the possibility for one regulator to commit ex ante to a regulation policy eliminates the case of excessive reform. Sequential decision making can however not prevent the possibility of suboptimal reform abstinence. Guaranteeing a first best outcome under decentralized decision making demands both the coordination of deregulation activities across markets and overcoming the partial perspective of regulators. If information deficits are behind the partial perspective—for instance, because of a lack of expertise in gauging the effects of the other authority's regulatory activity—a organized information exchange between regulatory authorities might suffice. Another potential problem in this respect are political costs. A shorter-time horizon of policymakers or the need to appease organized interest groups can reduce net benefits and lead to reform abstinence, despite available welfare gains.

Uncovering the underlying reasons for opposition to welfare-enhancing reform packages is crucial in this respect. If reforms are sidestepped because of a limited understanding of how benefits are distributed across labor and product markets, education of voters and policymakers can make a difference. For instance, unions might view labor market liberalization in a different light if they were undertaken simultaneously with competition-enhancing product market reforms and the beneficial interactions between both efforts were sufficiently communicated. The goal would then be to augment the partial objective functions or views of the regulation authorities. A different approach may need to be taken if benefit spillovers are not recognized because of political reasons.

Here, transferring reform responsibilities to technical experts or other non partisan groups and insulating them from political pressures may work well.. For sure, there is no simple policy solution and improving our understanding of reform effects and policy environments should be a priority for further research.

Appendix: Illustrating the Interaction Effect

The exercise shows that "synergies" between labor and product market reform depend on the influence of regulation on labor demand and supply elasticities. The model assumes that firms operate without excess labor capacity and monopolistic competition in product markets. A (representative) profit-maximizing firm with market power on the product market solves

$$\max_{L} \pi = p(x(L))x(L) - wL$$

where p is the price of output x, L is labor, and w the nominal wage level. The production function follows standard assumptions, including $x_L > 0$, $x_{LL} < 0$, and $x_L \to 0$ as $L \to \infty$. The first order condition of this problem can be written

$$x_L\left(1 + \frac{1}{\eta}\right) = \frac{w}{p},$$

where $\eta \equiv x_p p / x < 0$ is the demand elasticity the firm is facing on the product market. In a monopolistic competition framework, the demand elasticity measures the firm's price-setting abilities, with higher values of η (or lower *absolute* values $|\eta|$) indicating higher market power.

A plausible assumption is that tighter product market regulation will augment the firm's grip on the market, while lower product market regulation will weaken it. More formally,

$$\eta = \eta(R_{PM});\ \eta_{R_{PM}} < 0,$$

where higher levels of R_{PM} indicate tighter product market regulation. The only further restriction required for the functional form of $\eta(R_{PM})$ is that, since for any price-setting firm $-\infty < \eta \leq -1$, it must also hold that $\eta \to -\infty$ as $R_{PM} \to 0$ and $\eta \to -1$ as $R_{PM} \to \infty$.

How do changes in product market regulation influence the firm's labor demand? The concavity of the production function ensures that labor demand is falling in w/p. Under perfect competition on the product market, η becomes infinitely small and labor demand converges to the inverse of the marginal product of labor, x_L. As the firm acquires market power, labor demand at a given level of real wages will shift to the left, and the curve will become steeper. The shift is obvious from the first order condition, $x_L\left(1 + \frac{1}{\eta}\right) = \frac{w}{p}$: as η increases, the bracket multiplying x_L becomes smaller than unity. At a given level of w/p this requires an *increase* in the marginal product of labor, which can only be achieved by *reducing* labor demand. Because larger shifts in labor demand are required at higher levels of production and labor input to achieve a given reduction in the marginal product of labor, the left-shift of labor demand is more pronounced at lower levels of w/p and higher levels of

L. In other words, increasing product market regulation leads to lower and less elastic labor demand.

To complete the argument, assume that labor supply depends not only on the real wage, but also on labor market regulation (R_{LM}). This would imply

$$L^S = L^S\left(\frac{w}{p}, R_{LM}\right); L^S_{w/p} > 0, L^S_{R_{LM}} < 0.$$

This formulation leaves open the form of the labor supply reaction to changes in labor market regulation. An increase in R_{LM} might simply right-shift the curve, leaving its slope unchanged ($L^S_{w/p,R_{LM}} = 0$). However, it might quite plausibly also contribute to a less wage elastic labor supply ($L^S_{w/p.R_{LM}} < 0$), which will influence the employment impact of shifts in the labor demand curve.

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