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Vocational training and industrial relations in France and Germany

Clément Brébion

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École des Hautes Études en Sciences Sociales

Doctoral school n° 465 Économie Panthéon Sorbonne

Paris-Jourdan Sciences Économiques

PhD THESIS

Discipline: Economics

Clément BRÉBION

Vocational training and industrial relations in France and Germany

Thesis supervised by: Philippe ASKENAZY & Christine ERHEL

Date of defense: November 27th, 2019

Referees: Lutz BELLMANN, Professor at the Institute for Employment Research
Héloïse PETIT, Professor at University of Lille

Jury: Andrew CLARK, CNRS Research Director, PSE
Yannick L'HORTY, Professor at University of Paris-Est Marne la Vallée

Supervisors: Philippe ASKENAZY, CNRS Research Director, ENS
Christine ERHEL, Professor at the CNAM

École des Hautes Études en Sciences Sociales

École doctorale n° 465 Économie Panthéon Sorbonne

Paris-Jourdan Sciences Économiques

DOCTORAT

Discipline: Analyse et Politique Économiques

Clément BRÉBION

Formation professionnelle et relations professionnelles en France et en Allemagne

Thèse dirigée par : Philippe ASKENAZY et Christine ERHEL

Date de soutenance : le 27 novembre 2019

Rapporteurs : Lutz BELLMANN, Professeur à l'Institute for Employment Research
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Directeurs : Philippe ASKENAZY, Directeur de Recherche CNRS-ENS
Christine ERHEL, Professeure au CNAM

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Clément Brébion
21 Octobre 2019
Paris

Summary

This PhD thesis is a collection of three essays in labour economics. In a comparative fashion, they analyse key institutions of the French and German political economies. The chapters successively estimate the size of discrimination towards works councilors, the effect of apprenticeship training on labour integration and the impact of subsidies offered to develop this form of training. The main results are analysed from both the perspectives of France and Germany and present conclusions on the recent institutional trajectories of the two countries.

The first chapter of this PhD thesis proposes an analysis of wage trajectories of German works councilors. This outcome, I claim, offers a good way to analyse the functioning of bargaining in the country. I find proofs that some strategic discrimination towards works councilors takes place in Germany. In the manufacturing sector, being elected to the works council causes a rise in labour income. Conversely, in the private service sectors, entering office negatively impacts wages. In both sectors, the size of these impacts on yearly pay rise is of about 1 to 2 pp. I further show that unionized and politically inclined councilors receive most of the (negative or positive) premium in both sectors. For them, the size of the impact is close to 3 pp. These results emphasize a decline in the quality of cooperation in the country

Chapter 2 compares how well apprenticeship training helps open the door to the labour market in France and Germany between 1998 and 2013. It shows that, on average, apprentices do better in both countries than standard students upon completion of secondary or higher education. This is true both on the short- and medium-run. In terms of the unemployment rate in the year after education, the difference between the two countries is equivalent to about 6.75 pp more for France. Turning to causal claims, I find that apprenticeships advantage low school achievers leaving school upon completion of secondary education in France. The opposite applies in Germany. Explanation for this result is twofold. First, standard students (i.e. the control

group) in Germany do much better than their counterparts in France. Second, mobility upon graduation is about double in France but non-retained graduates still benefit from the good signal of their diploma on the external market which is not the case of their German counterparts. I finally find no causal impact of the track on the integration of student's exiting school after higher education.

Chapter 3 evaluates the impact of a large hiring credit – the *Indemnité Compensatrice Forfaitaire* – offered to employers of apprentices in France and which got regionalized between 2005 and 2014. At the time of its regionalization, it accounted for about a quarter of all public money spent on apprenticeships. The analysis shows that the subsidy fosters turnover strategies. Thus, I find a limited but significantly negative elasticity of the number of apprentices hired to training costs. The point estimate is -0.22. The impact however mostly plays at the intensive margin (training firms taking on more apprentices) rather than at the extensive margin (new firms entering the system). This suggests that training firms may respond to subsidies by training over their needs in skills. Confirming this interpretation, I find that the elasticity of mobility upon graduation to training cost is negative and equal to -0.40.

Field: Economics

Keywords: Industrial Relations, Vocational Training, Bargaining, Discrimination, Apprenticeship, France, Germany

Résumé

Cette thèse de doctorat est un recueil de trois essais en économie du travail. Ils analysent de manière comparative des institutions centrales des économies française et allemande. Les chapitres estiment successivement l'ampleur des discriminations à l'égard des représentants du personnel, l'effet de l'apprentissage sur l'insertion professionnelle et l'impact des subventions offertes pour développer ce type de formation. Les principaux résultats sont analysés à la fois du point de vue de la France et de l'Allemagne et offrent des conclusions sur les récentes évolutions institutionnelles des deux pays.

Le premier chapitre de cette thèse analyse les trajectoires salariales des représentants du personnel allemands. Cette étude apporte un nouvel éclairage sur la façon dont fonctionne la négociation dans ce pays. Nous montrons qu'il existe en Allemagne une discrimination stratégique à l'égard des représentants du personnel. Dans le secteur manufacturier, être élu au comité d'entreprise apporte une augmentation des revenus du travail. Inversement, dans le secteur des services, la prise de fonction a un effet négatif sur les salaires. Dans les deux secteurs, l'ampleur de ces impacts sur l'évolution annuelle des salaires est d'environ 1 à 2 points de pourcentage. Nous montrons en outre que ce sont les conseillers syndiqués et politiquement impliqués qui reçoivent la majeure partie de la prime (négative ou positive) dans les deux secteurs. Pour eux, l'ampleur de l'impact est proche de 3 pp. Ces résultats mettent en évidence une détérioration de la qualité de la coopération entre partenaires sociaux dans le pays.

Le chapitre 2 compare l'effet des études en apprentissage sur l'accès au marché du travail, en France et en Allemagne, entre 1998 et 2013. Il montre qu'en moyenne, les apprentis réussissent mieux dans les deux pays en sortie d'études secondaires ou supérieures que les étudiants de la voie scolaire standard. Cela est vrai tant à court qu'à moyen terme. En termes de taux de chômage l'année suivant la sortie d'études, le bénéfice est environ 6.75 p.p. plus important en France qu'en Allemagne. L'analyse causale fournit les résultats principaux. Nous montrons que l'apprentissage favorise les élèves en

difficulté scolaire qui quittent l'école à la fin de leurs études secondaires en France. Ce n'est pas le cas en Allemagne. L'explication de ce résultat est double. Tout d'abord, les étudiants de la voie scolaire standard (i.e. le groupe de contrôle) en Allemagne réussissent beaucoup mieux que leurs homologues français. Ensuite, le départ de l'entreprise de formation suite à l'obtention d'un diplôme en apprentissage est près de deux fois plus forte en France. Les apprentis non conservés par leur firme de formation à la fin de leur cursus bénéficient cependant du bon signal de leur diplôme sur le marché extérieur, ce qui n'est pas le cas de leurs homologues allemands. Enfin, à la sortie du supérieur, dans les deux pays, l'apprentissage n'apporte pas d'avantage sur le marché du travail.

Le chapitre 3 évalue l'impact d'une importante subvention - l'Indemnité Compensatrice Forfaitaire - offerte aux employeurs d'apprentis en France et qui a été régionalisée entre 2005 et 2014. Au moment de sa régionalisation, elle représentait environ un quart de l'ensemble des dépenses publiques consacrées à l'apprentissage. L'analyse montre que la subvention favorise les stratégies de rotation de la main d'œuvre. Ainsi, on mesure une élasticité limitée mais significativement négative du nombre d'apprentis embauchés aux coûts de formation. Sa valeur est de -0,22. Toutefois, l'impact se fait surtout sentir au niveau de la marge intensive (les entreprises formatrices accueillant davantage d'apprentis) plutôt qu'au niveau de la marge extensive (de nouvelles entreprises qui commenceraient à former). Cela suggère qu'en réponse à une hausse de la prime à l'embauche, les entreprises formeraient au-dessus de leurs besoins en compétences. Confirmant cette interprétation, l'élasticité de la mobilité des apprentis en fin de contrat au coût de la formation est négative et égale à -0,40.

Discipline: Économie

Mots-clés: Relations Professionnelles, Formation Professionnelle, Négociation, Discrimination, Apprentissage, France, Allemagne

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General introduction

Industrial relations and vocational education and training (VET) – which apprenticeships constitute the core – are pillars of national institutional models: the two domains are among the five[1] institutional spheres referred to by Hall and Soskice (2001) to define ideal-typical varieties of capitalism. As such, they condition most economic outcomes, and, in particular, employment. In its last Employment Outlook (2019: 4) the OECD states that "social dialogue has a critical role to play in reducing inequalities and in shaping the Future of Work". The organization also launched a new research program on work-based learning and apprenticeships in 2015. The latest document emphasizes their "effectiveness in easing school-to-work transition but also […] their particular capacity to develop skills closely tied to labour market needs" (OECD, 2018: 15).

The interest of neo-classical economics into industrial relations and vocational education and training respectively dates back to Dunlop's seminal model of unions (1944) and to Becker's theory of human capital (1962). The former modelled unions' detrimental impact on employment when in situation of monopoly. The latter formalized the view that education and training are an investment – from individuals but also from firms in the case of apprenticeships – expected to bring future returns. They opened the way to a vast literature which main research interests have long been: (i) in the field of industrial relations: the optimal level of collective bargaining and the optimal amount of power for unions; (ii) in the case of VET: reasons why firms train and whether apprenticeships should be privileged over standard vocational schooling.

On these matters, the literature was looking for a universal best set of institutions to achieve growth and employment. Thus, in its 1994 Jobs Strategy, the OECD urged countries to decentralise collective bargaining

[1] The three others are corporate governance, inter-firm relations and cooperation between employers and their employees

towards the firm level, to limit unions' powers and to privilege apprenticeship training to standard vocational tracks. Recommendations were largely inspired by the rising appeal of the WS-PS model (Layard et al., 1991; Chagny, 2018). In short, in real-wage/employment space, this model combines a curve WS (wage setting) which slopes upward and formalizes bargaining between employers and unions and a PS curve (price setting) which slopes downwards and gives account of the labour demand side. In particular, in this model, the larger the bargaining power of unions, the larger the unemployment rate.

This literature was at odds with the institutionalist view which describes institutional returns as specific to each capitalistic model (Hall, P. and Soskice, 2001; Amable, 2005). The development of empirical evaluations triggered by the 1994 Jobs Strategy has rather confirmed this reading by showing that the impacts of labour institutions often depend on national specificities (Garnero, 2015). Nowadays, the OECD acknowledges "the potential flexibility offered by social dialogue and collective bargaining in seeking solutions to issues of common concerns" (OECD, 2019: 194). Similarly, regarding apprenticeships, the organization stated in 2018 that "the country context matters, as do sectoral and firm characteristics, notably the size of the enterprise. The optimal design features (e.g. choices concerning wages, duration and funding) will often vary depending on these factors."

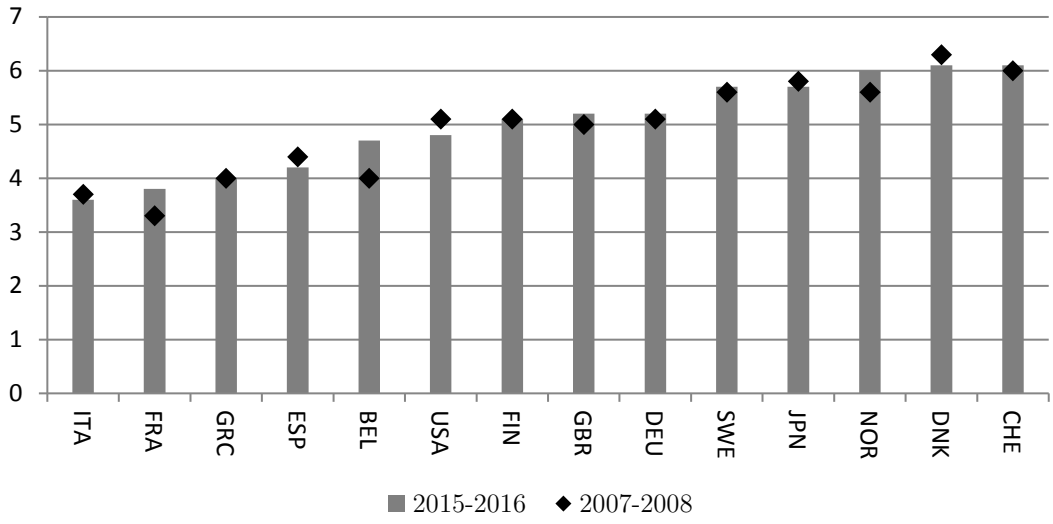
This PhD thesis comes within the scope of this new understanding of economics. It takes sides of using micro-econometric methods at country level to infer causal estimations in the fields of industrial relations and VET training. As such, it does not drop the objective of policy recommendation at the macro level and of country comparison. But it acknowledges the fact that a policy can bring different outcomes if led in different capitalistic models and, conversely, that different models can reach similar outcomes with different policies.

The PhD thesis focuses on the cases of France and Germany, the two largest European economies which have longed been presented as opposed in the domains of industrial relations and vocational education and training. The traditional models of Germany and France are respectively the archetypes of a cooperative market economy and of a State-led economy (Culpepper, 2001). As such, cooperation between economic actors and their involvement in key

institutions are stronger in Germany. There, unions and business associations benefit from much larger prerogatives than their French counterparts which participation is crowded out by a larger involvement of the State. In particular, the French State generally extends branch-level collective agreements to all workers of the branch which is not the case in Germany.

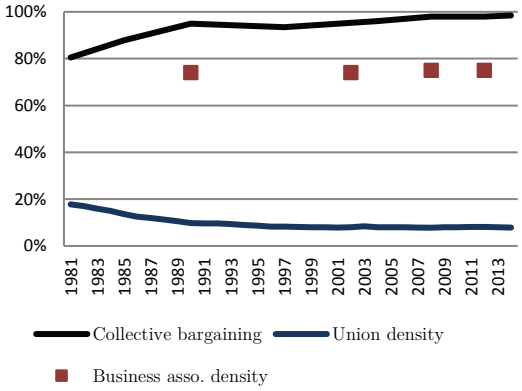
These differences first translate into stronger confidence of employers into labour in Germany (see Figure 1). A second impact is the different relation between the coverage of collective agreements and union and employers' association densities: the correlation is positive in Germany but null in France (see Figures 2 and 3). The incidence of the two institutional models on national systems of vocational education is a larger development of work-based training in Germany. **I**f about half of secondary school students are involved in vocational studies in both France and Germany, only a third of them undertake an apprenticeship in the former compared to more than double in the latter. Overall**,** 4.7% of all German employees were therefore apprentices in 2007 against 1.7% in France in 2008 (Steedman, 2010). Further, the State has a major role in managing the apprenticeship system in France whereas, in Germany, firms are known as the "natural and main operator of initial vocational education" (Lasserre, 2011: 14).

Figure 1 - Cooperation in labor-employer relations in some of the OECD countries



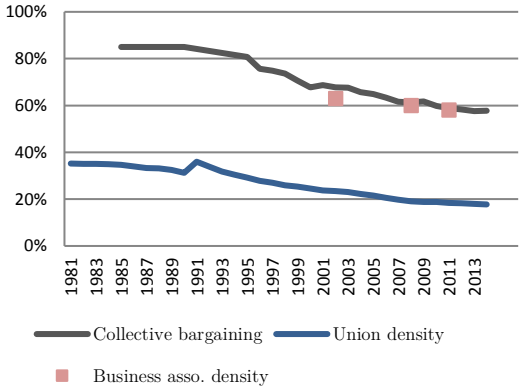
Source: World Economic Forum - The Global Competitiveness Index Historical Dataset
Note: Employers' self-declared estimation based on the question : "In your country, how do you characterize labor-employer relations?" [1 = generally confrontational; 7 = generally cooperative]

Figure 2 - Coverage of collective bargaining and union and business' association densities in France



Source: Data for collective bargaining coverage and union density comes from the OECD. Data for business' association density is taken from Visser's database (2016)

Figure 3 - Coverage of collective bargaining and union and business' association densities in Germany



Source: Data for collective bargaining coverage and union density comes from the OECD. Data for business' association density is taken from Visser's database (2016)

Institutional models are of course not rigid and, despite their differences, the two countries have continuously been inspiring each other[2]. In France, in particular, the German systems of industrial relations and of apprenticeship training are commonly used as models to copy. Most recently[3], E. Macron stated:

> "Why do I believe in the German model, in social dialogue at the firm and the branch levels? Because I want that we find the good compromises at the most local level" E.Macron (2016).
>
> "My hope is to reform apprenticeship training in deep to ease insertion on the workplace for the youth and to transform our economy. […] Whereas apprenticeships favour success at exams, and integration on

[2] The attention of each country towards its neighbour has much to do with the history of wars between the two countries.

[3] F. Hollande and N. Sarkozy were also influenced by the German apprenticeship model.

> F. Hollande (2014a): "the great ambition of the government will be to develop apprenticeship", "in Germany, one young person out of four is taking an apprenticeship […] and only one out of eight in France. This is not the outcome one could hope for" (Hollande, 2014b).
>
> N. Sarkozy (2012): "how can one explain that there are more unemployed young people in France than in Germany? […] The answer is very easy. In Germany, apprentices are three times more numerous than in France. Then, why doesn't the French youth start an apprenticeship more often?"

As for industrial relations, David Chopin (2012) shows that F. Hollande was more leaning towards Germany than N. Sarkozy.

> the labour market, less than one vocational high school student out of five takes his diploma via an apprenticeship. Apprenticeship covers 15% of a cohort in France against 30% in Germany" E. Macron (2017).

The last decades have seen many reforms in France affecting both industrial relations and apprenticeship training. They share the aim of fostering coordination between social partners. The Auroux laws of 1982 are the first reform of importance on these lines in the domain of industrial relations. They enact mandatory yearly bargaining rounds between employers and workers' representatives on wages, working time and working conditions. Since then, the main trend has been to favour branch-level and firm-level bargaining over legislations. Reforms include (i) the Aubry laws of 1998 and 2000 which constrained employers to reach working time reduction agreements with workers' representatives; (ii) two laws voted to favour branch- and firm-level bargaining between employers and labour in 2004 and 2008; (iii) the 2016 El Khomry law and the 2017 Macron "ordonnances" (government decrees) which deeply reformed labour law and allowed branch- and firm-level agreements to be worse off than superseding rules in some domains. Discussions have now started on the potential gains of a repeal in administrative extensions of branch-level agreements (Labour law, Article L2261-27-1; OECD, 2017).

As for apprenticeship training, the last reform of 2018 also makes a step to bring social partners to the core of the system. In particular, the State who used to rule over the content of vocational diploma on its own will share the prerogative with social partners from now on. This is a clear step towards the German model where business associations and unions have full power on the matter.

As for Germany, in the last decades, both the apprenticeship training system and the model of industrial relations have evolved against strong pressure of employers to leave both systems (Kinderman, 2005; Busemeyer, 2012). As for the former, three main evolutions should be mentioned. First, Busemeyer and Thelen (2011) have highlighted a gradual change in the German apprenticeship system from a "collective training system" in which employers' associations compel large firms to train above their needs, for the benefit of smaller firms, towards a "segmented training system" in which large

companies leave these organizations or obtain less restrictive clauses. Second, apprenticeship tracks have developed in higher education under the direction of the State. In the shadow of these trends, some authors have seen the start of a convergence between the French and German vocational systems (Powell et al., 2012).

The path of reforms in the domain of industrial relations in Germany has been even stronger since the 1990s. This will be developed in more details a bit further, but the main lines of change should be mentioned here. Employers have seen their bargaining power rise in the 1990s with the German reunification. Their attempts to "subvert[t] existing institutions from without (politically) and from within (in the industrial relations realm)" (Kinderman, 2005: 432) materialized through a strong decentralization of collective bargaining. Here as well, a large literature has debated on whether the German institutional model was evolving towards a liberal market economy or whether its adaptation to new obstacles proved the resilience of its cooperative feature (Hassel, 1999; Streeck, 2009; Thelen, 2009; Baccaro and Howell, 2011).

The quality of cooperation between employers and workers' representatives

The first chapter analyses the career trajectory of works council representatives in Germany. It builds on a literature which is rather thin. For long, most of the economic literature in industrial relations has indeed focused on unionized forms of representation. Unions are entitled to sign collective agreements and, as such, are the most important labour partner to employers. They have the power to organise strikes and, in most institutional cases, are also headed by an organisation at the branch or national level – which sometimes constitutes a monopoly of labour representation at these scales. If well organized, these organisations are therefore able to impose common economic conditions on large sections of the economy.

For these reasons, unions have long been analysed per the monopoly model of Dunlop (1944). According to it, unions would negotiate higher wages than in the frictionless equilibrium, thereby leading firms to respond by a decrease in employment. The revival of interest into other forms of labour representation has taken place in the waves of Freeman's paper (1976).

Freeman shows that coordination between employers and unions can also generate surplus by avoiding some market failures. The paper led to a large amount of empirical research trying to disentangle which of the rent-seeking or rent-generating sides of unions dominate (for a review, see Guyot and Ferracci, 2015).

By bringing back attention on the possible gains of labour-employer cooperation in the context of a generalized decrease of union coverage, Freeman's paper also oriented the literature towards works councils. In most countries, their entitlements to negotiate on most conflicting issues (wage scales, job classification, working time, …) are indeed limited. Works councils are generally confined to issues related to the organisation of production and their ability to seek rents is therefore thought to be more limited than unions. A vast number of papers have therefore estimated the impact of works councils on firms' productivity and wages (FitzRoy & Kraft, 1990, 1987, 1985; Hübler & Jirjahn 2003; Ellguth et al. 2014; Brändle, 2017).

As important as they are, we know however little on how the actors leading the negotiations themselves fare in the firm. Yet their career evolution brings a lot of information on the quality of labour-employer cooperation. To my knowledge, only Breda (2014) and Breda and Bourdieu (2016) have raised the issue. They explain that firm-level representatives play two bargaining games with their employer: one for their own account like any other employee negotiating her wage, another in the name of their colleagues. Breda and Bourdieu further show that the two games are not independent. A rational employer has incentives to discriminate against (respectively buy) most vehement (resp. collaborative) representatives in the first game to maximise its rent in the second game. Turning to empirics, the authors find proof of such 'strategic discrimination'. Exerting the main representative mandate at the firm level in France is associated with a drop of 10% in wage. Delegates of the most vehement union would lose up to 20% of wage.

If we are to believe public discourse as well as employers' estimation of the quality of employer-labour relations in France and Germany (see figure 1), discrimination against workers' representatives is expected to be null, or at least much lighter, in Germany. The question takes particular importance given the recent evolutions of the German economy. It is interesting to take a detour to explain why, before presenting the main results of the chapter.

Once qualified "the Sick man of Europe" in the late 1990s to early 2000s, (The Economist, 2004) Germany has become the "Economic Superstar" of the continent (Dustmann et al., 2014a). The Great Recession was indeed short lived in the country and Germany is now experiencing full employment (3.4% of unemployment in 2018). Three competitive explanations have mostly been evoked to explain the German success: (i) the impact of the Hartz reforms on the Labour market (ii) the fact that the Euro would benefit Germany thanks to its export-led economy able to produce high-quality manufactured products (iii) the specific features of the German industrial relations. Of the three, the recent literature has tended to privilege the last one.

In their 2014 article, Dustmann et al. show how the German system of industrial relations has opened the way to competitiveness gains since the 1990s. The traditional model of collective bargaining in Germany is based on two legs. At the branch level, strong unions bargain with employers on most strategic issues such as wage growth, job classification or working time. At the firm level, works councils are entitled with the strongest power in the West. Power sharing within companies can take the form of joint-management or co-determination (Crifo and Rebérioux, 2019)[4]. In Germany, both are well developed: works councilors are very well represented in supervisory boards and have co-determination rights on some individual staff movements as well as on overtime or on plans of reduced working time. Branch-level bargaining however dominates: hierarchy of norms[5] applies and the power to call for strikes is limited to branch-level unions who may use it to flex their muscles when the 4-year bargaining rounds take place. The system relies on contracts and mutual agreements between unions, employers' associations and works councils rather than on legislations. According to Dustmann et al (2014a), it is this contractual feature that has put the country in good position to recover from both its economic crisis of the early 2000s and the Great Recession.

[4] I use the terminology proposed by Crifo and Revérioux (2019). Joint-management is defined by a large share of workers' representatives in the firm board. Co-determination applies when representatives benefit from veto power on the consequences of strategic decisions (lay-offs, …), thereby constraining employers to find agreements beforehand.

[5] Hierarchy of norms in this case means that a works council cannot strike deals on issues that "have been fixed or are normally fixed by collective agreement" (Works Council Act, Section 77-3).

In the late 1980s, coverage of employers' associations began to fall and, partially in response to this phenomenon, opening clauses to branch agreements have multiplied. If their content strongly varies, overall, these clauses have allowed employers to implement wage restraints at the periphery of the economy from as early as the 1990s. From 1990 to 2002, pay rises are therefore very limited for the whole wage distribution in the sectors of non-tradable goods and for the first deciles of the distribution in the sector of tradable services. At the same time, strong productivity gains were observed in the manufacturing sector and reliance on low-cost imports of intermediate goods from Eastern Europe increased. As a result, the unit labour cost in terms of end product[6] has fallen by 10% from 1995 to 2002 despite the robust pay rise for all the wage distribution in the manufacturing core. When the Hartz reforms are passed and the Eurozone is implemented, Germany has already broken away from its competitors in terms of unit labor costs in the manufacturing export sector. If a deepening of wage moderation with negative growth rates at the bottom of the income distribution can be seen after 2003, no break can be clearly identified. Overall, in Germany, the unit labour cost has continuously dropped between 1995 and 2012 (-30%) to the contrary of its main economic competitors.

The flexibility brought by the contractual nature of industrial relations in Germany has been widely considered as an important source of explanation for its quick recovery from the Great Recession (Bellmann et al, 2016; Amossé et al., 2018). In 2007, at a time when the economic crisis was triggering, the manufacturing core of the German economy benefited from a competitiveness reinforced by 15 years of wage moderation at its periphery. Furthermore, job-retention agreements have accelerated the exit of the crisis.

Importantly however, the cooperative feature of the German model of industrial relations played an ambiguous role in the 'German miracle'. In the early 1990s, coverage rates of unions and employers' associations were decreasing and both institutions were struggling to limit their loss. At the same time West German employers were gaining in bargaining power due to the credible threat of outsourcing production towards East Germany and Eastern Europe. Unions and employers' associations were therefore constrained

[6] The unit labour cost accounts for labor costs relative to productivity.

to accommodate employers' will for flexibility in order to prevent firms from massively leaving their business association which would cause the system to dismantle. The extent to which the decentralization of collective bargaining is the result of labour-employer cooperation at the branch level should therefore be nuanced. At the firm level, the strength of cooperation between works councilors and employers is not clear-cut either. Pallier and Thelen (2010: 126) have noted that the process of decentralization "involved an intensification of cooperation between managers and workers in leading firms (in Germany's manufacturing sector)". In the service sectors however, where wage restraints proved the strongest, it is unclear how cooperation evolved. In particular, in the absence of a national minimum wage before 2015, the development of atypical work in the 2000s – in part fostered by the Hartz reform on mini jobs – has put downward pressure on the bargaining power of labour representatives.

The first chapter of this PhD aims at bringing a new light on the quality of cooperation between employers and labour at the level of the firm. It is entitled *The impact of works council membership on wages in Germany: a case of strategic discrimination?* In this chapter, I measure the causal impact of works council mandates on wages, separately in the manufacturing sector and in the service sector in Germany. The data comes from the German Socio-Economic Panel, which is a general representative survey at both the household and the individual levels. To my knowledge, it is the only source of data providing information on both works council membership and wages in Germany. I use waves 2001, 2003, 2006, 2007, 2011 and 2015 when respondents are asked whether they are members of a works council.

The main method of identification of Chapter 1 is an OLS regression with individual fixed effects of the hourly gross wage on works council membership. I control for union membership: about two thirds of works councilors are unionized in Germany and it therefore matters to disentangle the effects of the two institutions. The regression sample is composed of full-time workers aged between 20 and 64 and employed on open-ended contracts in firms with more than 5 employees. Civil servants are further dropped. To ensure that results are not driven by agents changing firm or by firms' unobservable characteristics, for each individual, I restrict the sample to the longest of her working spells within a firm. The identifying observations are therefore

workers who change status (i.e. are voted in or out of the works council) while remaining in the same firm.

Overall, works council membership has no significant impact on wages. Yet, it appears that the relation goes in fact in diverging directions according to the sector. In the manufacturing sector, all other things being equal, individuals observed both in and out of office (switchers) earn about 4.5% more in office than out of office. In the private service sector – from which I excluded banking and insurance which display very particular patterns of industrial relations – representatives suffer a penalty of 4%. The results are mostly driven by a particular evolution in 'pure wage' rather than in the number of working hours declared. As for union membership, I find a slight negative impact on wages overall, which is fully driven by the private service sectors. In these sectors, union membership is associated with a drop of around 6.5% in hourly gross wage.

The second result of this chapter is that, in the manufacturing sector, workers running for professional elections are not comparable to their colleagues. Their wage trajectory before elections is indeed worse than the one of their colleagues. Taking this into account inflates the final premium to +7% in the sector. I cannot lead a similar procedure in the case of the service sector because of data limitation. I nevertheless bring elements showing that, in this sector as well, the association between works council membership and wages should be understood as a deliberate firm policy targeting elected representatives.

This is the third result of this paper. I find that the impact of mandates on wages is driven by politically involved works councilors in both sectors. In the chapter, political involvement is successively measured via two different channels: (i) unionization; (ii) whether the respondent leans towards one party in the long term. The latter result is put into perspective by building on the context and on the literature of political science.

The first chapter of the thesis therefore brings elements suggesting that the strategic discrimination against workers' representatives evidenced by Breda and Bourdieu in the case of France is also taking place in Germany. Despite the two countries exhibiting very different models of industrial relations, the level of negative discrimination against works councilors found in the service sector in Germany is closed to the one found overall in France. The main difference relates to the positive impact of mandates on wages in the

manufacturing sector. The intensified cooperation noted by Pallier and Thelen (2010) between representatives and employers in the sector could have brought flexibility gains against pay rises.

Apprenticeship training in France and Germany

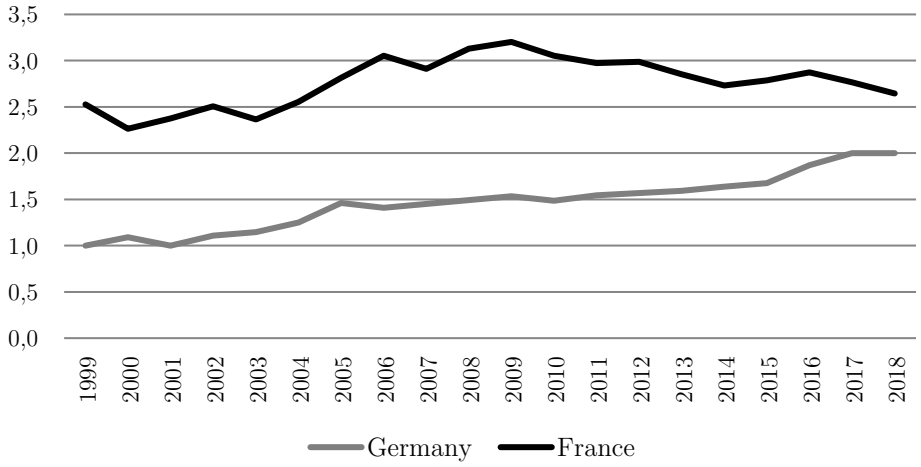
The economic literature has shown that apprenticeships explain a large part of the cross-country variance in youth unemployment (Van der Velben and Wolbers, 2003). As such, they "have been in the spotlight in many OECD countries, not only in the aftermath of the Great Recession, but also following recovery" (OECD, 2018: 15).

The cases of France and Germany exemplify these statements. Figure 4 shows that the youth-to-adult unemployment rate is much larger in the former while, as previously mentioned, apprenticeship training involves vocational students twice more often in the latter. The public discourse in France urging to copy the German model of apprenticeship training is therefore largely shared. To the exception of the radical left and of some unions[7], this policy constitutes a wide consensus. Yet it does not fully rely on scientific research. Before turning to the economic literature to show why, it is interesting to take a detour to briefly explain why work-based training is much more developed among vocational tracks in Germany than in France.

The explanation goes back to the unequal fate of collective organisations in the 18th and 19th centuries. In France, the Allarde decree and the Le Chapelier law abolished corporations in 1791 and outlawed any training for the youth if collectively set up. Rooted in a liberal political philosophy, this legislation clamped down on the main producers of norms in VET matters (Lemercier, 2007). The result was a rise in unregulated on-the-job training offering no contract or diploma (Lequin, 1989; Troger, 1993). Conversely, in Germany, laws hostile to corporations in the mid-19th century had little effect

[7] Interviewed by the newspaper Le Point (2002), J.L. Mélenchon, one of the leaders from the radical left stated: "apprenticeship is a very bad idea". As for unions, the Fédération Syndicale Unitaire organized in 2018 a seminar to promote vocational tracks via public standard schooling against the government's pledge to develop apprenticeships.

Figure 4 - Youth-to-adult unemployment rates



Note: the graph displays the ratio between the unemployment rate of the 15-24 y.o. and the 25 y.o. and more in France and Germany.
Source: Eurostat (2016), own calculations.

and only applied for a short period. Indeed, at that time, the growing social democratic claims of the working class on one hand and the promotion of liberal reforms by the elite on the other hand were weakening the Conservatives and Centre parties (Thelen, 2004). They found support in the independent craft sector to back the Establishment against some clientelist privileges. These included the institutionalisation of craft chambers. In 1897, handcraft firms were required to register to them and, in 1908, they were granted a monopoly for apprenticeship training (ibid).

Facing a common need in skilled workers at the time of industrial revolutions but surrounded by a different institutional context, firms of strategic sectors (engineering industries in particular) therefore lobbied their respective State for different policy changes regarding vocational training from the early 20th century to the 1960s. In France, in the absence of branch agreement, skills learnt in factory schools were of disparate quality and barely portable. Moreover, investment costs that firms endured for these schools were not always bringing the expected returns. Numerous smaller firms not engaged in training were indeed able to offer higher wages thereby 'poaching' graduates (Rojot, 2014). Despite its liberal aspirations, the 'Association Française pour le Développement de l'Enseignement Technique' (AFDET) – set up in 1902 and mostly funded by the metal industry – therefore called for stronger State

intervention to better standardize diploma and to limit 'poaching' behaviors. Lobbying pressure was successful since a national CAP diploma, the requirement to train apprentices out of the workplace and an 'apprenticeship tax' were set up at the national level in the inter-war period (Brucy and Troger, 2000; Dayan, 2013).

In Germany at the same time, modern firms were mostly struggling to attract the brightest students to their in-house schools (Thelen, 2004). For students and their parents, obtaining a diploma after graduation that is valuable outside of the training firm is generally a precondition to start an apprenticeship (Webb and Webb, 1897). Yet, as previously mentioned, craft chambers then benefited from a monopoly to sanction apprenticeship diplomas. As a result, the lobbying group DATSCH – set up in 1908 by the Verein Deutscher Ingenieure (VDI) and the Verband Deutscher Maschinen und Anlagenbau (VDMA) – pressured the State to recognize the right for business and trade chambers to collectively organize and sanction apprenticeships (Thelen, 2004). The claim turned into law in 1935. The choice of imperial Germany to provide craft chambers the monopoly to train apprentices therefore initiated the path towards strong levels of subsidiarity in VET matters.

In France, State intervention in vocational training deepened after WWII. Against the influential French Communist Party (PCF), the anti-communists unions F.O. and F.E.N became natural allies to the Socialists who were then heading the General Directorate of Vocational Education (DGET) (Troger, 1989, 1993). These unions were opposed to the working-class ethos of the PCF. They therefore urged the DGET to privilege full-time vocational tracks in public schools over apprenticeships (ibid). This process resulted in the integration of the colleges for apprenticeships under the management of public high schools in the early 1960s as well as in the development of vocational training via standard schooling. Large industrial firms did not oppose this trend (Charlot and Figeat, 1985). Net training costs were indeed growing because of both the costs of technological innovations and the low returns on investments stemming from poaching behaviours (Niell, 1954). Factory schools were also increasingly struggling to attract good students and proved not to be as flexible as expected relatively to public schools (Hatzfeld, 1996; Quenson, 1996 ; Gallet, 1996). The major role of the State in vocational training and the predominance of full-time vocational training over apprenticeships in France

therefore take root in the post-war era. It benefited from the tacit support from strategic firms who had been unable to organise training collectively since the 1791 anti-corporatist laws.

This historical path has led to a larger importance of apprenticeship training among vocational tracks and a stronger involvement of social partners in its management in Germany than in France. The second chapter of this PhD thesis analyses where the track is the most efficient in terms of insertion on the labour market and job quality.

The economic literature has been prolix on the positive impact of apprenticeship training in French secondary education (Sollogoub and Ulrich, 1999; Simonnet and Ulrich, 2000; Issehnane, 2011) and, to a lower extent on its absence of impact in French higher education (Issehnane, 2011). But we know much less on the effect of apprenticehip training in Germany. Estimates of the overall effect on employment are positive but most research has used data from West Germany before 2000 (Winkelmann, 1996; Franz et al., 1997; Parey, 2012). To my knowledge, only Riphahn & Zibrowius (2016) have worked nationwide and over a more recent period. They focus on the difference between vocational and general studies, but one of their secondary outcomes refers to apprenticeships and they do not observe any effect on access to employment.

Chapter 2 is entitled *Apprenticeship training, better labour market outcomes in France than in Germany.* It mobilises data from the German Socio-Economic Panel and the French survey Génération to compare the impact of apprenticeship training on job market outcomes in the two countries between 1998 and 2013. The former data source has already been presented above. The latter is a representative survey of students exiting school for the first time for more than a year in France. The impact of apprenticeships is measured as the difference in outcomes between graduates from apprenticeship tracks and the other students. The independent variables exploited are the following: number of months unemployed the year after leaving school, time spent in full-time compared to part-time work during that twelve-month period, first observable full-time salary. The middle-run outcomes are the following: the likelihood to experience a continuous period of employment longer than 18 months in the three years after leaving school, the waiting time before this period, and the wage at its end.

The analysis is separately led on two cells in each country. They gather respondents according to their level of education before exiting school: (i) vocational secondary education; (ii) higher education. In France, definition of the control and the treatment groups are straightforward given that most diplomas can be taken via an apprenticeship track. In each cell, the treated group includes students which received their last diploma via apprenticeship training. In Germany however, apprenticeships in higher education remain marginal and chapter 2 therefore focuses on the traditional apprenticeship track at the upper secondary level. In the higher education cell, the treated group therefore includes students who obtained an apprenticeship diploma before graduating from higher education while the control group gathers all other graduates from higher education.

The first main result stems from an OLS regression. It shows that apprentices do better than school leavers in both countries. The advantage is however stronger in France. In terms of the unemployment rate in the year after leaving secondary school or higher education, the difference between the two countries is equivalent to about 6.75 pp more for France. On the longer run, apprenticeship is associated with greater stability in employment in both countries. The gain in speed to access stability is however stronger in France. Interestingly, the channel explaining the good outcomes of apprentices differ according to the country. Apprentices are less often hired by their training company upon graduation in France than in Germany. However, contrary to Germany, non-retained French graduates still benefit from the good signal apprenticeships have on the external labour market. Value of the control variables given, they indeed spend less time unemployed than school leavers which is not the case in Germany.

Causality is ensured via an instrumental variable strategy where the instrument is the proportion of apprentices in the total number of pupils or students at the relevant level prevailing in the year preceding the choice of stream. Upon graduation of secondary education, I find that apprenticeship training benefit students in difficulty (the compliers) in terms of avoiding unemployment in France but not in Germany. As for wages, the impact is null in both countries. Finally, for graduates from higher education, the transition via an apprenticeship does not help integration, in both France and Germany.

To increase its stock of apprentices per the German model, French governments have taken three main avenues: (i) they opened the track to higher education in the late 1980s; (ii) they launched advertising campaigns oriented towards employers, families and the youth; (iii) they decreased the labour cost of apprentices.

The third chapter, entitled *The impact of apprenticeship cost on firms' propensity to train and on mobility upon graduation*, focuses on the latter avenue. It analyses the impact of subsidies offered to employers of apprentices on firms' likelihood to train and on retention rates in the training firms upon graduation. The identification strategy is based on the regionalization of a large subsidy offered to employers of apprentices, the *indemnité compensatrice forfaitaire* (ICF). The law was put into force in 2005. At the time, the ICF accounted for about a quarter of all public money spent on apprenticeship training. By then, regions could decide upon the criteria of the ICF and the amounts associated, which generated large exploitable variations in the cost of apprenticeships. These variations are used to explain: (i) the average regional dynamic of the number of apprentices taken on in each firm over time; (ii) the regional retention rates.

Data comes from four different sources. First, information on all ICF reforms in 16 of the 22 French metropolitan regions was gathered from the regional services for apprenticeship. This new database necessitated many inquiries and took about a year to be constituted. Second, the administrative database Ari@ne brings information on more than 80% of all apprenticeship contracts signed in France on the period of interest. It provides knowledge on both firms and apprentices at the time when contracts are signed. Third, the administrative database DADS gives account of working contracts of all wage earners employed in the private sector, to the exception of private individuals' employees before 2009. Fourth, the administrative database FICUS-FARE brings yearly information on active firms in the country. Combining these sources of data makes it possible to compute the average hourly cost for about 145 000 contracts signed each year between 2000 and 2012.

Using linear regressions with firm fixed effects, I show that subsidies foster turnover strategies. Thus, I find a limited but significantly negative elasticity of the number of apprentices hired to training costs. The point estimate is -0.22. The impact however mostly plays at the intensive margin (training firms taking on more apprentices) rather than at the extensive margin (new

firms entering the system). This suggests that training firms may respond to subsidies by training over their needs in skills. Confirming this interpretation, I find that the elasticity of mobility upon graduation to training cost is negative and equal to -0.40.

The literature in education research has shown that the least academically inclined students are the ones benefitting the most from work-based learning methods. A positive impact of the development of apprenticeship training on the labour market outcomes of this population should therefore be a prior to foster apprenticeships. The second chapter has shown that, on the massive market of apprenticeships in Germany, the track does not benefit least achievers because of both their low likelihood to be retained upon graduation and the low value of their training on the external labour market. On the smaller market of apprenticeship training in France, the track eases the integration of the population of interest which urges to increase the stock of apprentices. Yet, the low level of employers' coordination inherited from the liberal laws following the 1789 Revolution has made it difficult for economic actors to head this development. The State therefore steps in via subsidies addressed to employers which, the third chapter has shown, has a slightly positive impact on the number of contracts signed with a detrimental effect on retention rates.

Put together, and bringing generality to the results, these conclusions suggest that there is a tipping point after which the development of apprenticeship training brings too much competition at entrance and exit of the system for the least achievers. In particular, their likelihood to be retained in their training firm upon graduation becomes too small. As a result, development of apprenticeship training via subsidies on the small apprenticeship markets may gain to be led in combination with policies ensuring strong retention rates. A good way to achieve this could be to give works councils large information and co-determination rights on the matter. Kriechel, Muehlemann, Pfeifer, & Schütte (2014) indeed showed that such policy has a positive impact on retention rates in the German case.

Introduction générale

Les relations professionnelles et la formation professionnelle - dont les études en apprentissage constituent le cœur - sont les piliers des modèles institutionnels nationaux : les deux domaines font partie des cinq sphères institutionnelles utilisées par Hall et Soskice (2001) pour définir des idéaux-types de variétés du capitalisme. A ce titre, ils conditionnent la plupart des paramètres économiques et, en particulier, l'emploi. Dans ses dernières Perspectives de l'Emploi (2019 : 4), l'OCDE déclare que « le dialogue social a un rôle crucial à jouer dans la réduction des inégalités et dans la construction de l'Avenir du Travail ». L'organisme a également lancé un nouveau programme de recherche sur la formation en alternance et les études en apprentissage en 2015. Le dernier document publié souligne leur « efficacité à fluidifier la transition école-emploi mais aussi leur capacité à développer des compétences étroitement liées aux besoins du marché du travail » (OCDE, 2018 : 15).

L'intérêt de l'économie néoclassique pour les relations professionnelles et la formation professionnelle remonte respectivement au modèle syndical de Dunlop (1944) et à la théorie du capital humain de Becker (1962). Le premier a modélisé l'impact négatif des syndicats sur l'emploi du fait de leur pouvoir de monopole. Le second a formalisé l'idée que l'éducation et la formation sont un investissement – de la part des individus mais aussi des entreprises dans le cas de l'apprentissage – dont les acteurs espèrent retirer un gain. Ces travaux ont ouvert la voie à une vaste littérature dont les principales problématiques ont longtemps été : (i) dans le domaine des relations professionnelles : le niveau optimal de négociation collective et le pouvoir optimal à octroyer aux syndicats ; (ii) dans le cas de la formation professionnelle : les raisons pour lesquelles les entreprises forment et si l'apprentissage devrait être privilégié par rapport à la formation professionnelle par voie scolaire.

Sur ces questions, la littérature recherchait un ensemble universel et optimal d'institutions générant croissance et emploi. Ainsi, dans sa Stratégie pour l'Emploi de 1994, l'OCDE a encouragé les pays à décentraliser la

négociation collective au niveau des entreprises, à limiter les pouvoirs des syndicats et à privilégier l'apprentissage aux filières professionnelles classiques. Les recommandations étaient largement inspirées du modèle WS-PS qui suscitait un attrait croissant (Layard et al., 1991 ; Chagny, 2018). Pour le résumer brièvement, dans l'espace salaire réel/emploi, ce modèle combine une courbe WS (fixation des salaires) de pente positive qui formalise la négociation entre employeurs et syndicats et une courbe PS (fixation des prix) de pente négative qui tient compte de la demande de travail. En particulier, dans ce modèle, plus le pouvoir de négociation des syndicats est grand, plus le taux de chômage est élevé.

Cette littérature était en opposition avec la vision institutionnaliste qui décrit les rendements institutionnels comme spécifiques à chaque modèle capitaliste (Hall, P. et Soskice, 2001 ; Amable, 2005). Le développement des évaluations empiriques déclenchées par la Stratégie pour l'Emploi de 1994 a plutôt confirmé cette lecture en montrant que les impacts des institutions du travail dépendent souvent des spécificités nationales (Garnero, 2015). Aujourd'hui, l'OCDE reconnaît « la flexibilité potentielle que le dialogue social et la négociation collective offrent pour trouver des solutions à des questions d'intérêt commun » (OCDE, 2019 : 194). De même, en ce qui concerne l'apprentissage, l'organisation a déclaré en 2018 que « le contexte du pays est important, tout comme les caractéristiques du secteur et de l'entreprise, dont notamment sa taille. Les caractéristiques de l'organisation optimale [de l'apprentissage] (par exemple, les choix concernant les salaires, la durée et le financement) varient souvent en fonction de ces facteurs ».

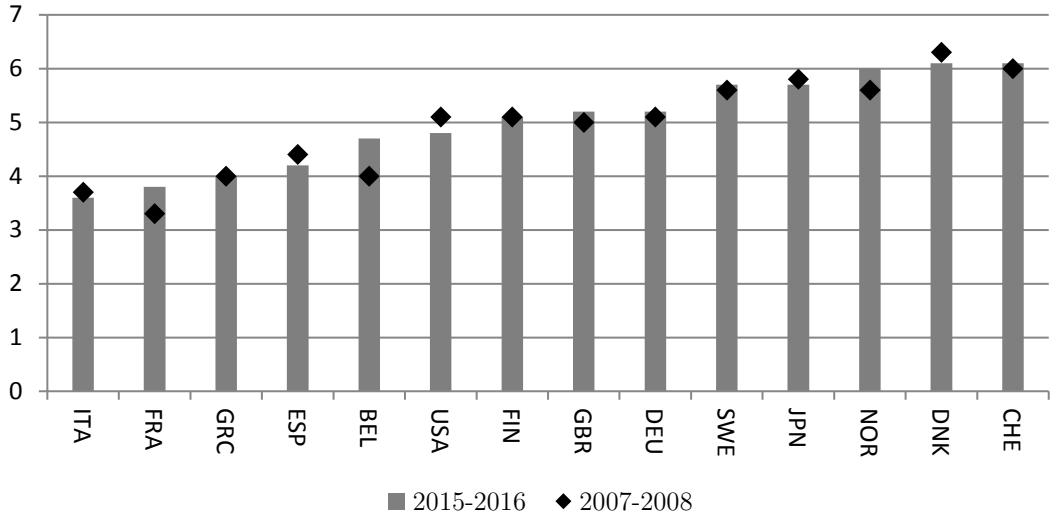
Cette thèse de doctorat s'inscrit dans le cadre de cette nouvelle conception de l'économie. Elle utilise des méthodes micro-économétriques au niveau intra-pays pour produire des estimations causales dans le domaine des relations professionnelles et de la formation professionnelle. En tant que tel, elle n'abandonne pas l'objectif de recommandation de politique publique au niveau macroéconomique et de comparaison entre les pays. Mais elle admet le fait qu'une politique peut donner des résultats différents si elle est menée dans différents modèles capitalistes et, inversement, que différents modèles peuvent arriver à des résultats similaires avec différentes politiques.

Cette thèse de doctorat se concentre sur les cas de la France et de l'Allemagne, les deux plus grandes économies européennes, qui ont été

présentées depuis longtemps comme opposées dans les domaines des relations professionnelles et de la formation professionnelle. Les modèles traditionnels de l'Allemagne et de la France sont respectivement les archétypes d'une économie de marché coopérative et d'une économie étatique (Culpepper, 2001). Ainsi, la coopération entre les acteurs économiques et leur implication dans les institutions clés sont plus fortes en Allemagne. Les syndicats et les associations d'entreprises y bénéficient de prérogatives beaucoup plus importantes que leurs homologues français dont la participation est évincée par une plus grande implication de l'Etat. En particulier, l'État français étend généralement les conventions collectives de branche à l'ensemble des travailleurs de la branche, ce qui est beaucoup plus rare en Allemagne.

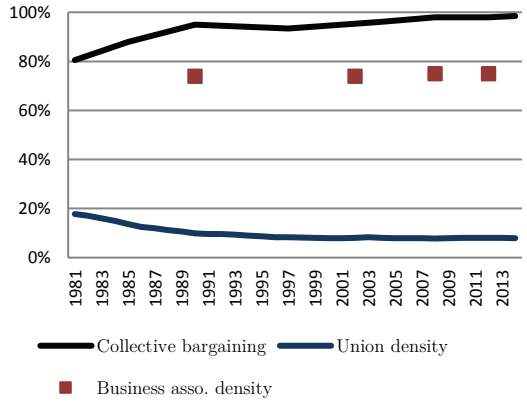
Ces différences se traduisent d'abord par une plus grande confiance des employeurs dans la main-d'œuvre en Allemagne (voir figure 1). Le lien entre couverture des conventions collectives et densités syndicales et patronales diffère ensuite entre les deux pays : la corrélation est positive en Allemagne mais nulle en France (voir figures 2 et 3). La plus forte coopération entre acteurs économiques en Allemagne et l'importance de l'Etat en France expliquent ensuite le développement plus marqué des études en alternance en Allemagne. Ainsi, si environ la moitié des élèves du secondaire suivent des études professionnelles en France et en Allemagne, seul un tiers d'entre eux entreprend un apprentissage en France, contre plus du double en Allemagne. Au total, 4,7 % de l'ensemble des salariés allemands étaient donc apprentis en 2007 contre 1,7 % en France en 2008 (Steedman, 2010). Par ailleurs, l'État joue un rôle majeur dans la gestion du système d'apprentissage en France alors qu'en Allemagne, les entreprises sont considérées comme « l'opérateur naturel et principal de la formation professionnelle initiale » (Lasserre, 2011 : 14).

Figure 1 - Qualité de la coopération employeurs-salariés dans certains pays de l'OCDE



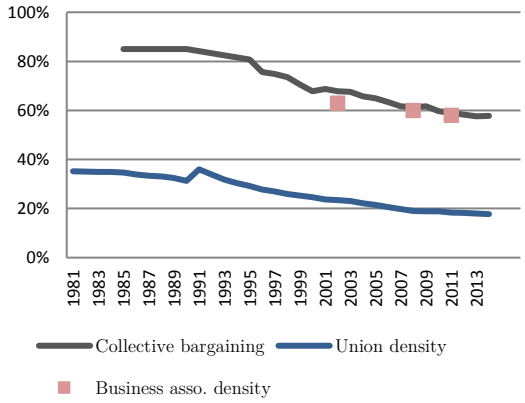
Source: Forum Economique Mondial - The Global Competitiveness Index Historical Dataset
Note: Réponse des employeurs à la question : "Dans votre pays, comment caractériseriez-vous les relations employeurs-salariés ?" [1 = généralement conflictuelles; 7 = généralement coopératives].

Figure 2 - Couverture des accords de branche, taux de syndicalisation et d'appartenance aux associations d'employeurs en France



Source: Les données de couverture des accords de branche et des taux de syndicalisation viennent de l'OCDE. Les données sur les associations d'employeurs sont tirées de la base de données de Visser (2016).

Figure 3 - Couverture des accords de branche, taux de syndicalisation et d'appartenance aux associations d'employeurs en Allemagne



Source: Les données de couverture des accords de branche et des taux de syndicalisation viennent de l'OCDE. Les données sur les associations d'employeurs sont tirées de la base de données de Visser (2016).

Les modèles institutionnels ne sont évidemment pas rigides et, malgré leurs différences, les deux pays n'ont cessé de s'inspirer l'un l'autre[8]. En France, en particulier, les systèmes allemands de relations professionnelles et de formation en apprentissage sont couramment considérés comme des modèles à imiter. Récemment[9], E. Macron a déclaré :

> « Pourquoi est-ce que je crois au modèle allemand, au dialogue social au niveau de l'entreprise et de la branche ? Parce que je veux que nous trouvions les bons compromis au niveau le plus local » E.Macron (2016).
>
> « Je souhaite réformer en profondeur l'apprentissage pour faciliter l'insertion professionnelle des jeunes et transformer notre économie. […] Alors que l'apprentissage favorise la réussite aux examens, et l'intégration sur le marché du travail, moins d'un lycéen professionnel sur 5 obtient son diplôme en apprentissage. L'apprentissage concerne 15% d'une classe d'âge en France contre 30% en Allemagne » E. Macron (2017).

Au cours des dernières décennies, la France a connu de nombreuses réformes en matière de relations professionnelles et de formation en apprentissage. Elles partagent l'objectif de favoriser la coordination entre les partenaires sociaux. Les lois Auroux de 1982 sont la première réforme d'ampleur en ce sens dans le domaine des relations professionnelles. Elles instaurent des cycles de négociations annuelles obligatoires entre employeurs et représentants des travailleurs sur les salaires, le temps de travail et les conditions de travail. Depuis lors, la principale tendance a été de favoriser la négociation au niveau des branches et des entreprises plutôt qu'au niveau

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[8] L'intérêt de chaque pays envers son voisin a beaucoup à voir avec l'histoire des guerres entre les deux pays.

[9] F. Hollande et N. Sarkozy ont également été influencés par le modèle d'apprentissage allemand.

> F. Hollande (2014a) : « La grande ambition du gouvernement sera de développer l'apprentissage », « un jeune sur quatre est en apprentissage en Allemagne […] et seulement un sur huit en France. Ce n'est pas le résultat que l'on peut espérer » (Hollande, 2014b).
>
> N. Sarkozy (2012) : « Comment se fait-il qu'en France, il y a plus de jeunes au chômage qu'en Allemagne. […] La réponse elle est très simple. En Allemagne, il y a trois fois plus de jeunes en apprentissage qu'en France. Alors pourquoi les jeunes ne vont pas en apprentissage en France suffisamment ? »

En ce qui concerne les relations industrielles, David Chopin (2012) montre que F. Hollande était plus attiré par le modèle allemand que N. Sarkozy.

interprofessionnel. Parmi l'ensemble de ces réformes, on trouve (i) les lois Aubry de 1998 et 2000 qui ont contraint les employeurs à conclure des accords de réduction du temps de travail avec les représentants des travailleurs ; (ii) deux lois votées en 2004 et 2008 pour favoriser la négociation au niveau des branches et des entreprises entre employeurs et travailleurs ; (iii) la loi El Khomry de 2016 et les ordonnances Macron de 2017 qui ont remis en cause la hiérarchie des normes. La discussion s'oriente maintenant sur une éventuelle abrogation des extensions administratives des accords de branches (article L2261-27-1 du Code du travail ; OCDE, 2017).

En ce qui concerne la formation en apprentissage, la dernière réforme de 2018 fait également un pas en avant pour ramener les partenaires sociaux au cœur du système. En particulier, l'Etat, qui régissait seul le contenu du diplôme professionnel, partagera désormais cette prérogative avec eux. Il s'agit d'une progression claire vers le modèle allemand où les associations d'entreprises et les syndicats ont les pleins pouvoirs en la matière.

En Allemagne, au cours des dernières décennies, tant le système d'apprentissage que le modèle de relations professionnelles ont évolué face à la pression exercée par les employeurs qui menacent de quitter en nombre les deux systèmes (Kinderman, 2005 ; Busemeyer, 2012). En ce qui concerne l'alternance, trois grandes évolutions méritent d'être mentionnées. Tout d'abord, Busemeyer et Thelen (2011) ont mis en évidence une transformation progressive du système d'apprentissage allemand, depuis un « système de formation collective » dans lequel les organisations patronales obligent les grandes entreprises à former au-dessus de leurs besoins, au profit des petites entreprises, à un « système de formation segmenté » dans lequel les grandes entreprises quittent ces organisations ou obtiennent des clauses moins contraignantes. Ensuite, des filières d'apprentissage se sont développées dans l'enseignement supérieur sous la direction de l'Etat. Derrière ces tendances, certains auteurs ont vu le début d'une convergence entre les systèmes de formation professionnelle français et allemand (Powell et al., 2012).

Le rythme des réformes dans le domaine des relations professionnelles en Allemagne a été encore plus marqué depuis les années 1990. Ce point sera développé plus en détail un peu plus loin, mais il convient d'en mentionner ici les principales lignes d'évolution. Les employeurs ont vu leur pouvoir de négociation augmenter dans les années 1990 avec la réunification allemande.

Leurs tentatives de « subvertir les institutions existantes de l'extérieur (politiquement) et de l'intérieur (dans le domaine des relations professionnelles) » (Kinderman, 2005 : 432) se sont matérialisées par une forte décentralisation de la négociation collective. Sur ces questions aussi, une vaste littérature a étudié si le modèle institutionnel allemand évoluait vers une économie de marché libérale ou si ces évolutions démontraient au contraire sa plasticité et la persévérance de sa caractéristique coopérative (Hassel, 1999 ; Streeck, 2009 ; Thelen, 2009 ; Baccaro et Howell, 2011).

La qualité de la coopération entre employeurs et représentants des travailleurs

Le premier chapitre analyse la trajectoire salariale des représentants du personnel en Allemagne. Il s'appuie sur une littérature plutôt mince. Pendant longtemps, la majorité de la littérature économique sur les relations professionnelles s'est en effet concentrée sur les formes de représentations syndiquées. Les syndicats peuvent signer des accords collectifs et, à ce titre, sont le principal interlocuteur des employeurs. Ils ont le pouvoir d'organiser des grèves et, dans la plupart des contextes institutionnels, sont également rattachés à une organisation au niveau sectoriel ou au niveau interprofessionnel - qui constitue parfois un monopole de la représentation syndicale à ces niveaux. Lorsqu'elles sont bien organisées, ces instances sont donc en mesure d'imposer des conditions économiques communes à de larges pans de l'économie.

Pour ces raisons, les syndicats ont longtemps été analysés selon le modèle monopolistique de Dunlop (1944). Selon lui, les syndicats négocieraient des salaires plus élevés qu'à l'équilibre de concurrence pure et parfaite, ce qui amènerait les entreprises à réagir en diminuant l'emploi. Le regain d'intérêt pour d'autres formes de représentation syndicale s'est manifesté à la suite de l'article de Freeman (1976). Freeman montre que la coordination entre employeurs et syndicats peut également générer des surplus en permettant d'éviter certaines défaillances du marché. Cet article a donné lieu à un grand nombre de recherches empiriques visant à démêler l'effet global des syndicats (pour une revue de littérature, voir Guyot et Ferracci, 2015).

En attirant de nouveau l'attention sur les gains à espérer de la coopération entre employeurs et travailleurs dans un contexte de désyndicalisation, l'article de Freeman a également orienté la littérature vers l'étude des comités d'entreprise. Dans la plupart des pays, leurs droits de négociation sur les questions conflictuelles (grilles de salaires, classification des emplois, temps de travail,...) sont faibles. Les attributions des comités d'entreprise sont généralement limitées aux questions liées à l'organisation de la production et leur capacité à disputer le partage de la rente est donc réduite par rapport à celle des syndicats. Un grand nombre d'articles a donc étudié l'impact des comités d'entreprise sur la productivité et les salaires (FitzRoy & Kraft, 1990, 1987, 1985 ; Hübler & Jirjahn 2003 ; Ellguth et al. 2014 ; Brändle, 2017).

Aussi importants qu'ils soient, nous ne savons cependant pas grand-chose de l'évolution des carrières des acteurs qui mènent les négociations d'entreprise. Pourtant, ces trajectoires sont susceptibles d'apporter une information importante sur la qualité de la coopération entre employeurs et travailleurs. A notre connaissance, seuls Breda (2014) et Breda et Bourdieu (2016) ont soulevé la question. Ils expliquent que les représentants du personnel jouent deux jeux de Nash avec leur employeur : l'un pour leur propre compte comme tout autre employé négociant son salaire, l'autre au nom de leurs collègues. Breda et Bourdieu montrent en outre que les deux jeux ne sont pas indépendants. Un employeur rationnel a des incitations à pénaliser (respectivement récompenser) les représentants les plus véhéments (respectivement collaboratifs) dans le premier jeu pour maximiser son revenu dans le second. Les analyses empiriques des auteurs montrent l'existence de telles « discriminations stratégiques ». L'exercice de la principale fonction de représentation en France est associé à une baisse de 10% du salaire. Les délégués syndicaux les plus véhéments perdraient jusqu'à 20% de leur salaire.

Si l'on en croit le discours public et l'évaluation par les employeurs de la qualité des relations entre employeurs et travailleurs en France et en Allemagne (voir figure 1), la discrimination à l'encontre des représentants des travailleurs devrait être nulle, ou du moins beaucoup moins marquée, outre-Rhin. La question revêt une importance particulière compte tenu des évolutions récentes de l'économie allemande. Il est intéressant de faire un détour pour le montrer avant de présenter les principaux résultats du chapitre.

L'Allemagne est devenue la « superstar économique » du continent (Dustmann et al., 2014a), après avoir été qualifiée d' « homme malade de l'Europe » à la fin des années 1990 et au début des années 2000 (The Economist, 2004). La Grande Récession a en effet été de courte durée dans le pays et l'Allemagne connaît actuellement le plein emploi (3,4% du chômage en 2018). Trois explications concurrentes ont été majoritairement exposées pour expliquer le succès allemand : (i) l'impact des réformes Hartz sur le marché du travail ; (ii) le fait que l'euro bénéficierait à l'Allemagne grâce à son économie axée sur les exportations, capable de produire des produits manufacturés de haute qualité ; (iii) les caractéristiques spécifiques des relations professionnelles allemandes. Des trois, la littérature récente a eu tendance à privilégier la dernière.

Dans leur article de 2014, Dustmann et al. montrent comment le système allemand de relations professionnelles a permis des gains de compétitivité depuis les années 1990. Le modèle traditionnel de négociation collective en Allemagne repose sur deux piliers. Au niveau des branches, des syndicats forts négocient avec les associations d'employeurs sur la plupart des questions stratégiques telles que la croissance des salaires, la classification des emplois ou le temps de travail. Au niveau de l'entreprise, les comités d'entreprise allemands sont parmi ceux aux pouvoirs les plus étendus dans le monde occidental. De manière générale, le partage du pouvoir au sein des entreprises peut prendre la forme de la cogestion ou de la codétermination (Crifo et Rebérioux, 2019)[10]. En Allemagne, les deux sont fortement développées : les comités d'entreprise sont très bien représentés dans les conseils d'administration et ont des droits de codétermination sur certains mouvements de personnel ainsi que sur les heures supplémentaires ou les plans de réduction du temps de travail. La négociation au niveau de la branche domine cependant : d'une part, la hiérarchie des normes s'applique et, d'autre part, seuls les syndicats de branche peuvent appeler à la grève pour créer un rapport de force lors des cycles de négociations quadriennaux. Le système repose sur des

[10] Nous reprenons la terminologie proposée par Crifo et Revérioux (2019). La cogestion est définie par une forte proportion de représentants des travailleurs au sein du conseil d'administration de l'entreprise. La codétermination s'applique lorsque les représentants bénéficient d'un droit de veto sur les conséquences des décisions stratégiques (licenciements, etc.), contraignant ainsi les employeurs à trouver des accords préalables.

contrats et des accords mutuels entre syndicats, associations d'employeurs et comités d'entreprise plutôt que sur la législation. Selon Dustmann et al (2014a), c'est cette caractéristique qui a facilité la sortie de crise du pays.

Vers la fin des années 1980, la couverture des associations d'employeurs a commencé à diminuer et, en partie en réponse à ce phénomène, les clauses d'ouverture aux accords de branche se sont multipliées. Si leur contenu varie fortement, dans l'ensemble, ces clauses ont permis aux employeurs de mettre en œuvre des restrictions salariales à la périphérie de l'économie dès les années 1990. De 1990 à 2002, les augmentations salariales sont donc très limitées pour l'ensemble de la distribution des salaires dans les secteurs des biens non exportables et pour les premiers déciles de la distribution dans le secteur des services exportables. Dans le même temps, de forts gains de productivité ont été observés dans le secteur manufacturier et la dépendance à l'égard des importations de biens intermédiaires à bas prix en provenance d'Europe centrale et orientale a augmenté. En conséquence, le coût unitaire de la main-d'œuvre en termes de produit fini a chuté de 10 % entre 1995 et 2002, malgré la forte hausse des salaires pour l'ensemble de la distribution des salaires dans le coeur manufacturier. Lorsque les réformes Hartz sont adoptées et que la zone euro est mise en œuvre, l'Allemagne s'est donc déjà démarquée de ses concurrents en termes de coûts unitaires de main-d'œuvre dans le secteur des exportations manufacturières. Si un renforcement de la modération salariale avec des taux de croissance négatifs dans le bas de la distribution des revenus peut être observé après 2003, aucune rupture ne peut être clairement identifiée. Globalement, en Allemagne, le coût unitaire de la main-d'œuvre n'a cessé de baisser entre 1995 et 2012 (-30 %), contrairement au cas de ses principaux concurrents économiques.

Beaucoup ont donc considéré que le redressement rapide de l'Allemagne après la Grande Récession devait beaucoup à la nature contractuelle des relations professionnelles dans le pays (Bellmann et al, 2016 ; Amossé et al., 2018). En 2007, au moment où la crise économique se déclenchait, le cœur manufacturier allemand bénéficiait ainsi déjà d'une compétitivité renforcée par 15 années de modération salariale à sa périphérie. En outre, les accords de maintien dans l'emploi ont accéléré la sortie de crise.

Il est toutefois important de noter que la coopération entre partenaires sociaux, traditionnellement pivot du modèle allemand de relations professionnelles, a eu un rôle ambigu dans le « miracle allemand ». Au début

des années 1990, les taux de couverture des syndicats et des associations d'employeurs étaient en baisse et les deux institutions luttaient pour limiter la chute des effectifs. Dans le même temps, le pouvoir de négociation des employeurs ouest-allemands augmentait car la menace d'externalisation de la production vers l'Allemagne de l'Est et l'Europe orientale gagnait en crédibilité. Les syndicats et les associations d'employeurs ont donc été contraints d'accéder à certaines des demandes de flexibilité des employeurs afin de prévenir une accélération de la chute des effectifs de ces dernières qui aurait eu pour conséquence le démantèlement du système. Il convient donc de nuancer le constat selon lequel la décentralisation de la négociation collective est le résultat de la coopération entre employeurs et travailleurs au niveau des branches. Au niveau de l'entreprise, nous pouvons également nous interroger sur le degré de coopération entre les comités d'entreprise et les employeurs. Pallier et Thelen (2010 : 126) ont noté que le processus de décentralisation « impliquait une intensification de la coopération entre les manageurs et les ouvriers des grandes entreprises (dans le secteur manufacturier allemand) ». Toutefois, dans les secteurs des services, où les restrictions salariales se sont avérées les plus fortes, l'évolution de la coopération n'est pas claire. En particulier, en l'absence d'un salaire minimum national avant 2015, le développement du travail atypique dans les années 2000 - en partie favorisé par la réforme Hartz sur les contrats très courts (mini-jobs) - a exercé une pression à la baisse sur le pouvoir de négociation des représentants du personnel.

Le premier chapitre de cette thèse vise à apporter un éclairage nouveau sur la qualité de la coopération entre employeurs et travailleurs au niveau de l'entreprise. Il s'intitule : « L'impact du mandat de représentant du personnel sur les salaires en Allemagne : un cas de discrimination stratégique ? ». Dans ce chapitre, nous mesurons l'impact causal d'être élu au comité d'entreprise sur les salaires, séparément dans le secteur manufacturier et dans le secteur des services en Allemagne. Les données proviennent du Panel Socio-Economique Allemand (GSOEP), qui est une enquête générale représentative au niveau ménages et individus. A notre connaissance, il s'agit de la seule source de données fournissant des informations à la fois sur la composition des comités d'entreprise et sur les salaires en Allemagne. Nous utilisons les vagues

2001, 2003, 2006, 2007, 2011 et 2015 où les personnes interrogées sont questionnées sur leur statut de représentant du personnel.

La principale méthode d'identification du chapitre 1 est une régression MCO à effets fixes individuels du salaire horaire brut sur une indicatrice d'appartenance au comité d'entreprise. Etant donné qu'environ deux tiers des représentants du personnel sont syndiqués en Allemagne, il est important de démêler l'effet de chaque institution. Nous travaillons donc à affiliation syndicale donnée. L'échantillon étudié est composé de travailleurs à temps plein âgés de 20 à 64 ans, employés en CDI dans des entreprises de plus de 5 salariés. Les fonctionnaires sont exclus de l'analyse. Pour s'assurer que les résultats ne sont pas biaisés par des mouvements de main d'œuvre ou par des caractéristiques non observables des entreprises, pour chaque individu, nous ne conservons dans l'échantillon que la plus longue de ses périodes de travail au sein d'une même entreprise. Les observations identifiant l'effet d'intérêt sont donc des travailleurs qui changent de statut (c'est-à-dire qui sont élus au sein du comité d'entreprise ou dont le mandat n'est pas renouvelé) tout en restant dans la même entreprise.

Dans l'ensemble, entrer au comité d'entreprise n'a pas d'impact significatif sur les salaires. Il apparaît cependant que la relation va en fait dans des directions opposées suivant les secteurs. Dans le secteur manufacturier, toutes choses égales par ailleurs, les individus observés à la fois en tant que représentant du personnel et non-élu gagnent environ 4,5 % de plus durant leur mandat. Dans le secteur des services privés - dont sont exclues les banques et les assurances, qui présentent des caractéristiques très particulières en matière de relations professionnelles - les représentants subissent une pénalité de 4%. Les résultats s'expliquent par une évolution du salaire mensuel nominal plutôt que du nombre d'heures travaillées. Nous observons ensuite que la syndicalisation est négativement associée aux salaires. L'effet est entièrement imputable au secteur privé des services où être syndiqué est associé à une baisse d'environ 6,5% du salaire horaire brut.

Dans ce chapitre, nous montrons dans un deuxième temps que, dans le secteur manufacturier, les travailleurs qui se présentent aux élections professionnelles ne sont pas comparables à leurs collègues. Leur trajectoire salariale avant les élections est effectivement défavorable par rapport aux autres salariés. Si l'on en tient compte, la prime finale du mandat de représentant est portée à +7% dans le secteur. Des limites de données nous

empêche d'appliquer la même méthode dans le cas des services. Nous apportons néanmoins des éléments qui suggèrent que, dans ce secteur également, l'impact du statut de représentant du personnel sur le salaire doit être lu comme le résultat d'une politique délibérée de la part de l'entreprise.

Dans un troisième temps, nous montrons donc que, dans les deux secteurs, l'impact moyen des mandats sur les salaires passe principalement par les représentants politiquement impliqués. Dans ce chapitre, l'engagement politique est mesuré successivement par deux canaux différents : (i) la syndicalisation ; (ii) le fait de pencher en faveur d'un parti sur le long terme. Ce dernier résultat est mis en perspective en s'appuyant sur des éléments de contexte et sur la littérature en sciences politiques.

Ce premier chapitre de thèse apporte donc des éléments suggérant que la discrimination stratégique envers les représentants du personnel mise en évidence par Breda et Bourdieu dans le cas de la France se retrouve en Allemagne. Bien que les deux pays présentent des modèles de relations professionnelles très différents, le niveau de discrimination négative à l'encontre des représentants dans le secteur des services en Allemagne est proche de celui que l'on observe globalement en France. La principale différence entre les deux pays tient à l'impact positif des mandats sur les salaires dans le secteur manufacturier allemand. L'intensification de la coopération constatée par Pallier et Thelen (2010) entre représentants et employeurs dans le secteur pourrait donc avoir apporté des gains de flexibilité au prix de hausses salariales pour les représentants.

La formation par apprentissage en France et en Allemagne

La littérature économique a montré que le développement de l'apprentissage explique une grande partie de la variance du taux de chômage des jeunes d'un pays à l'autre (Van der Velben et Wolbers, 2003). Pour cette raison, les études en alternance « ont été à l'honneur dans de nombreux pays de l'OCDE, non seulement au lendemain de la Grande Récession, mais aussi après la reprise économique » (OCDE, 2018 : 15).

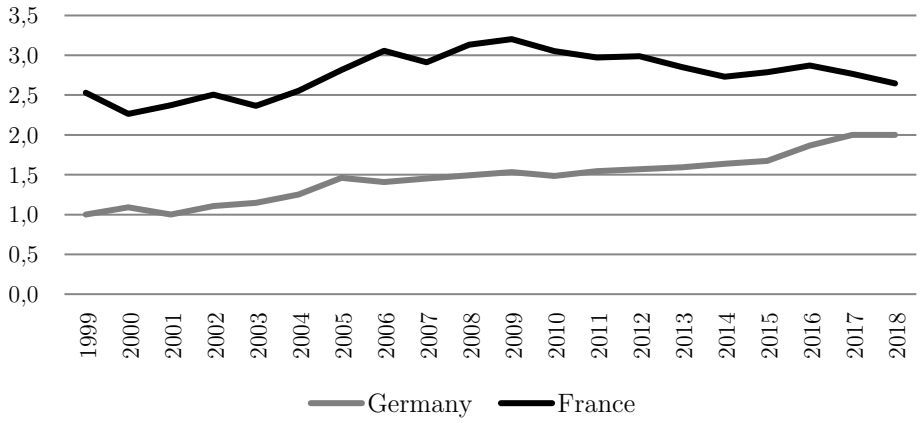
Les cas de la France et de l'Allemagne illustrent ces affirmations. La figure 4 montre que le taux de chômage des jeunes adultes est beaucoup plus élevé

en France, tandis que, comme mentionné précédemment, la part des jeunes en apprentissage parmi les étudiants de filières professionnelles est deux fois plus forte en Allemagne. Le discours public en France incitant à imiter le modèle allemand de formation en apprentissage s'en trouve donc peu discuté. A l'exception de la gauche radicale et de certains syndicats[11], cette politique fait largement consensus alors même qu'elle ne s'appuie pas entièrement sur la recherche scientifique. Avant de se tourner vers la littérature économique pour le montrer, il est intéressant de faire un détour historique pour expliquer brièvement pourquoi la formation en alternance est beaucoup plus développée dans les filières professionnelles en Allemagne qu'en France.

L'explication est à chercher dans le sort inégal réservé aux organisations collectives aux XVIIIe et XIXe siècles dans les deux pays. En France, le décret Allarde et la loi Le Chapelier abolissent les corporations en 1791 et interdisent toute certification de formations professionnelles par des organisations collectives. Enracinée dans une philosophie politique libérale, cette législation s'est attaquée aux principaux producteurs de normes en matière de formation professionnelle (Lemercier, 2007). Il en a résulté une augmentation de la formation sur le tas n'offrant ni contrat de travail ni diplôme (Lequin, 1989 ; Troger, 1993). Inversement, en Allemagne, les lois hostiles aux entreprises au milieu du XIXe siècle ont eu peu d'impact et n'ont été appliquées que sur une courte période. A cette époque, les revendications sociales-démocrates croissantes de la classe ouvrière, d'une part, et la promotion des réformes libérales par l'élite économique, d'autre part, affaiblissent les partis conservateurs et du centre au pouvoir (Thelen, 2004). Ils trouvent donc appui auprès du secteur de l'artisanat indépendant pour soutenir le statu quo au prix d'avantages clientélistes. Ces derniers incluent notamment l'institutionnalisation des chambres d'artisanat. En 1897, les entreprises artisanales sont tenues de s'y inscrire et, en 1908, elles obtiennent le monopole de la formation en apprentissage (ibid).

[11] Interviewé par le journal Le Point (2002), J.L. Mélenchon, l'un des leaders de la gauche radicale a déclaré : « L'apprentissage est une très mauvaise idée ». En ce qui concerne les syndicats, la Fédération Syndicale Unitaire a organisé en 2018 un séminaire de promotion des filières professionnelles par voie scolaire dans les établissements publics en opposition à l'engagement du gouvernement de développer l'apprentissage.

Figure 4 - Ratio du taux de chômage des jeunes par rapport à celui des adultes



Note: Le graphique montre le rapport entre le taux de chômage des 15-24 ans et celui des 25 ans et plus en France et en Allemagne.
Source: Eurostat (2016), calculs de l'auteur.

Confrontées à un besoin commun en travailleurs qualifiés à l'époque des révolutions industrielles, mais inscrites dans des contextes institutionnels divergents, les entreprises des secteurs stratégiques (industries métallurgiques en particulier) ont donc fait pression sur leur Etat respectif pour obtenir des évolutions législatives différentes. En France, en l'absence d'accords de branche, les compétences acquises dans les écoles d'entreprise sont à l'époque peu transférables et de qualité disparate. De plus, les investissements supportés par les entreprises pour financer ces écoles ne produisent pas toujours les bénéfices escomptés. De nombreuses petites entreprises non engagées dans la formation sont en effet en mesure d'offrir des salaires plus élevés et donc de « débaucher » les diplômés (Rojot, 2014). Malgré ses aspirations libérales, l'Association Française pour le Développement de l'Enseignement Technique (AFDET) - créée en 1902 et financée majoritairement par l'industrie métallurgique - appelle donc à une intervention renforcée de l'Etat pour mieux standardiser les diplômes et limiter ces comportements. Dans l'entre-deux-guerres, ce lobbying amène le pays à mettre en place le diplôme national du CAP, l'obligation de former des apprentis hors du lieu de travail et une taxe d'apprentissage (Brucy et Troger, 2000 ; Dayan, 2013).

Dans le même temps, en Allemagne, la principale difficulté à laquelle sont confrontées les firmes modernes est d'attirer les meilleurs étudiants dans leurs

écoles d'entreprises (Thelen, 2004). Pour la plupart des jeunes et de leurs parents, l'obtention d'une certification à la fin du cursus constitue une condition préalable pour se lancer dans un apprentissage (Webb et Webb, 1897). Cependant, comme précédemment mentionné, les chambres de métiers bénéficiaient alors d'un monopole pour sanctionner les études en alternance d'un diplôme. En conséquence, le groupe de pression DATSCH - créé en 1908 par la Verein Deutscher Ingenieure (VDI) et la Verband Deutscher Maschinen und Anlagenbau (VDMA) - fait pression sur l'État pour qu'il reconnaisse le droit des chambres de commerce et d'industrie à organiser et certifier collectivement l'apprentissage (Thelen, 2004). La revendication est traduite dans la loi en 1935. Le choix de l'Allemagne impériale d'offrir aux chambres artisanales le monopole de la formation des apprentis a donc ouvert la voie à un fort niveau de subsidiarité en matière de formation professionnelle.

En France, l'intervention de l'État dans la formation professionnelle s'est intensifiée après la Seconde Guerre mondiale. Face au Parti Communiste Français (PCF), les syndicats anticommunistes F.O. et F.E.N. deviennent des alliés naturels des socialistes qui dirigeaient alors la Direction Générale de l'Enseignement Professionnel (DGET) (Troger, 1989, 1993). Ces syndicats s'opposent à l'ethos ouvrier du PCF. Ils exhortent donc la DGET à privilégier les filières professionnelles à temps plein dans les écoles publiques au détriment de l'apprentissage (ibid.). Ce processus se traduit par l'intégration des collèges d'apprentissage dans les lycées publics au début des années 1960 ainsi que par le développement de la formation professionnelle par voie scolaire. Les grandes entreprises industrielles ne se sont pas opposées à cette tendance (Charlot et Figeat, 1985). En effet, les coûts nets de formation en entreprise augmentent à la fois en raison du coût des innovations technologiques et du fait du rendement limité des investissements qui sont écornés par la propension des autres firmes à débaucher les apprentis formés (Niell, 1954). Les écoles d'entreprise ont également de plus en plus de mal à attirer de bons élèves et se révèlent moins flexibles qu'anticipé par rapport aux écoles publiques (Hatzfeld, 1996 ; Quenson, 1996 ; Gallet, 1996). Le rôle majeur de l'Etat dans la formation professionnelle et la prédominance de la formation professionnelle à temps plein sur l'apprentissage en France prennent donc racine dans l'après-guerre. Ils sont tacitement soutenus par des entreprises stratégiques incapables d'organiser collectivement l'alternance depuis les lois anticorporatistes de 1791.

Ce cheminement historique a conduit à une plus grande importance de l'apprentissage parmi les filières professionnelles et à une plus forte implication des partenaires sociaux dans sa gestion en Allemagne qu'en France. Le deuxième chapitre de cette thèse mesure où la filière est la plus efficace en termes d'insertion sur le marché du travail et de qualité de l'emploi.

La littérature économique a été prolixe sur l'impact positif de l'apprentissage dans l'enseignement secondaire français (Sollogoub et Ulrich, 1999 ; Simonnet et Ulrich, 2000 ; Issehnane, 2011) et, dans une moindre mesure, sur son absence d'effet dans l'enseignement supérieur français (Issehnane, 2011). Mais nous en savons beaucoup moins sur l'effet de l'apprentissage en Allemagne. Les estimations de l'effet global sur l'emploi sont positives, mais la plupart des recherches utilisent des données de l'Allemagne de l'Ouest avant 2000 (Winkelmann, 1996 ; Franz et al., 1997 ; Parey, 2012). A notre connaissance, seuls Riphahn & Zibrowius (2016) ont travaillé au niveau national et sur une période plus récente. Ils se concentrent sur la différence entre les études professionnelles et les études générales, mais l'un de leurs résultats secondaires concerne l'apprentissage et ils n'observent aucun effet sur l'accès à l'emploi.

Le chapitre 2 s'intitule « L'apprentissage, de meilleurs perspectives sur le marché du travail en France qu'en Allemagne ». Il mobilise les données du Panel Socio-Economique allemand (GSOEP) et des enquêtes françaises Génération pour comparer l'impact de la formation en apprentissage sur l'accès au marché du travail dans les deux pays entre 1998 et 2013. La première source de données a déjà été présentée ci-dessus. La seconde est une enquête représentative des élèves et étudiants ayant quitté l'école pour la première fois et pour plus d'un an en France. L'impact de l'apprentissage est mesuré comme l'écart dans les perspectives d'intégration entre les diplômés des filières d'apprentissage et les autres étudiants. Les variables indépendantes exploitées sont les suivantes : le nombre de mois passés au chômage l'année suivant la fin des études, la part du temps en emploi passé à temps plein v.s. à temps partiel pendant cette période de douze mois et le premier salaire observable à temps plein. Les variables d'intérêt sur le moyen termes sont : la probabilité de connaître une période d'emploi continue de plus de 18 mois au cours des trois années suivant la fin d'études, le temps d'attente avant cette période et le salaire en fin de période.

L'analyse est menée séparément sur deux cellules dans chaque pays. Elles rassemblent les répondants en fonction de leur niveau de scolarité avant de quitter l'école : (i) enseignement secondaire professionnel ; (ii) enseignement supérieur. En France, la définition du groupe de contrôle et du groupe de traitement est simple étant donné que la plupart des diplômes peuvent être obtenus via une filière d'apprentissage. Dans chaque cellule, le groupe traité comprend les étudiants qui ont reçu leur dernier diplôme dans le cadre d'une formation en apprentissage. En Allemagne, toutefois, l'apprentissage dans l'enseignement supérieur reste marginal et le chapitre 2 se concentre donc sur la filière traditionnelle de l'apprentissage au niveau secondaire. Le groupe de traitement du sous-échantillon du supérieur est donc composé des étudiants ayant poursuivi avec succès leurs études dans le supérieur, après l'obtention d'un diplôme en apprentissage dans le secondaire. Le groupe de contrôle est composé des autres diplômés du supérieur.

Le premier résultat découle d'une régression par MCO. Il montre que les apprentis bénéficient de meilleures conditions d'accès au marché du travail que les sortants de la voie scolaire. Leur avantage relatif est cependant plus élevé en France. En termes de taux de chômage l'année suivant la sortie du secondaire ou du supérieur, la différence entre les deux pays équivaut à un bénéfice d'environ 6.75 p.p. pour la France. A plus long terme, l'apprentissage est associé à une plus grande stabilité en emploi dans les deux pays. Le gain de rapidité pour accéder à un emploi stable est cependant plus important en France. Il est intéressant de noter que la réussite des apprentis ne résulte pas des mêmes canaux dans les deux pays. Les apprentis sont moins souvent embauchés par leur entreprise de formation après l'obtention de leur diplôme en France qu'en Allemagne. Toutefois, contrairement à l'Allemagne, les diplômés français non retenus bénéficient toujours du bon signal de l'apprentissage sur le marché du travail externe. A valeur des variables de contrôle données, ils passent en effet moins de temps au chômage que les jeunes diplômés de la voie scolaire standard, ce qui n'est pas le cas en Allemagne.

La causalité est assurée par une stratégie de variables instrumentales où l'instrument est le ratio du nombre d'apprentis sur le nombre total d'élèves ou d'étudiants au niveau correspondant et prévalant l'année précédant le choix de filière. A l'issue de l'enseignement secondaire en France, nous montrons que l'apprentissage n'apporte pas de gain salarial aux jeunes en difficulté scolaire

(les ‘compliers’) qui bénéficient cependant d’une forte plus-value en termes d’évitement du chômage. En sortie de secondaire allemand, l’apprentissage aurait un effet négatif sur les chances d’accès à l’emploi pour ces jeunes. Enfin, pour les sortants du supérieur, le passage par l’apprentissage ne favorise pas l’insertion, en France comme en Allemagne.

Pour augmenter le stock d'apprentis en formation suivant le modèle allemand, les gouvernements français ont principalement suivi trois voies : (i) ils ont ouvert l'enseignement supérieur à l’alternance à la fin des années 1980 ; (ii) ils ont lancé des campagnes publicitaires destinées aux employeurs, aux familles et aux jeunes ; (iii) ils ont réduit le coût du travail des apprentis.

Le troisième chapitre, intitulé « L'impact du coût de l'apprentissage sur la propension des entreprises à former et sur la mobilité des apprentis en fin de contrat », porte sur cette dernière voie. Il analyse l'impact des subventions offertes aux employeurs d'apprentis sur la probabilité pour une firme de former en apprentissage et sur les taux de rétention des apprentis dans leur entreprise de formation suite à l'obtention du diplôme. La stratégie d'identification repose sur la régionalisation entre 2005 et 2014 d'une importante subvention offerte aux employeurs d'apprentis, l'indemnité compensatrice forfaitaire (ICF). A l'époque, l'ICF représentait environ un quart de l’ensemble des dépenses publiques consacrées à l’apprentissage. Entre 2005 et 2014, les régions ont pu décider des critères de l’ICF et des montants associés, ce qui a généré d'importantes variations du coût de l'apprentissage. Ces variations sont utilisées pour expliquer : (i) la dynamique régionale du nombre d'apprentis embauchés dans chaque entreprise au fil du temps ; (ii) les taux de rétention régionaux.

Les données proviennent de quatre sources différentes. Tout d'abord, des informations sur l'ensemble des réformes de l'ICF dans 16 des 22 régions métropolitaines françaises ont été recueillies auprès des services régionaux de l'apprentissage. Cette nouvelle base de données a nécessité de nombreuses recherches et il a fallu environ un an pour la constituer. Ensuite, la base de données administrative Ari@ne fournit des informations sur plus de 80% des contrats d'apprentissage signés en France sur la période concernée. Elle apporte des éléments sur les entreprises et les apprentis au moment de la signature des contrats. Troisièmement, la base de données administratives DADS rend compte des contrats de travail de tous les salariés du secteur

privé, à l'exception des salariés des particuliers-employeurs avant 2009. Enfin, la base de données administratives FICUS-FARE fournit des informations annuelles sur les entreprises actives dans le pays. La combinaison de ces sources permet de calculer le coût horaire moyen sur la durée du contrat d'environ 145 000 contrats d'apprentissage signés chaque année entre 2000 et 2012.

Au moyen de régressions linéaires à effets fixes établissements, nous montrons que les subventions favorisent les stratégies de rotation de main d'œuvre. Ainsi, on mesure une élasticité limitée mais significativement négative du nombre d'apprentis embauchés par rapport aux coûts de formation. Sa valeur est de -0,22. Toutefois, l'impact se fait surtout sentir au niveau de la marge intensive (les entreprises formatrices accueillant davantage d'apprentis) plutôt qu'au niveau de la marge extensive (de nouvelles entreprises qui commenceraient à former). Cela suggère qu'en réponse à une hausse de la prime à l'embauche, les entreprises formeraient au-dessus de leurs besoins en compétences. Confirmant cette interprétation, l'élasticité de la mobilité des apprentis en fin de contrat par rapport coût de la formation est négative et égale à -0,40.

La recherche en éducation a prouvé que les jeunes montrant le moins d'appétence pour les études académiques sont ceux à qui les méthodes d'apprentissage en milieu de travail apportent le plus. Il convient donc de s'assurer que le développement de l'apprentissage améliore les perspectives d'emploi de cette population avant de le favoriser. Le deuxième chapitre a montré que, sur le marché massif de l'apprentissage allemand, la filière ne profite pas aux élèves en difficulté scolaire en raison à la fois de leur forte mobilité après l'obtention du diplôme et de la faible valorisation de leur formation sur le marché du travail externe. Sur le marché plus limité de l'apprentissage en France, la filière facilite au contraire l'intégration de la population d'intérêt, ce qui encouragerait à faire croître le stock d'apprentis. Cependant, le faible niveau de coordination des employeurs hérité des lois libérales mises en place après la Révolution de 1789 limite la capacité des acteurs économiques à mener cette évolution. L'État intervient donc par le biais de subventions adressées aux employeurs, ce qui, comme le montre le

troisième chapitre, a un impact légèrement positif sur le nombre de contrats signés, avec un effet préjudiciable sur les taux de rétention.

Prises dans leur ensemble, et en généralisant les résultats, ces conclusions suggèrent qu'il existe un point d'inflexion à partir duquel le développement de l'apprentissage apporte une trop forte concurrence à l'entrée et à la sortie du système pour les étudiants les moins performants. En particulier, leur probabilité d'être conservé dans leur entreprise de formation après l'obtention de leur diplôme devient trop faible. Par conséquent, le développement de l'alternance par le biais de subventions sur les petits marchés de l'apprentissage pourrait gagner à être mené en combinaison avec des politiques garantissant des taux de rétention élevés. Un bon moyen d'y parvenir pourrait être de donner aux comités d'entreprise d'importants droits d'information et de codétermination en la matière. Kriechel, Muehlemann, Pfeifer, & Schütte (2014) ont en effet montré qu'une telle politique a un impact positif sur les taux de rétention dans le cas allemand.

Chapter 1

The impact of works council membership on wages in Germany: a case of strategic discrimination?

Abstract

This paper provides new insight into the quality of cooperation between employers and workers in Germany by estimating the impact of works council membership on wages between 2001 and 2015. It falls within a stream of research on collective organisations that has shifted focus away from the perspective of covered firms and their average worker to concentrate on the actors leading the negotiations. To my knowledge, this is the first economic analysis of a non-unionised form of representation to adopt this orientation. Other factors motivating the paper are as follows. In a generalised context of the decentralisation of collective bargaining, shop-floor delegates are gaining in power and therefore in strategic importance for both employers and employees. Consequently, analysing their career evolution can help open up the 'black box' of firm-level bargaining – increasingly the new core of collective bargaining. The case of Germany is chosen because both national and foreign actors have strongly and steadily praised its traditional model of industrial relations for the cooperative features it brings to the shop floor. However, as discussed in the paper, the model was largely transformed after German reunification, and one can expect that the nature of employer-labour relations has also evolved since then.

The main model of identification is an OLS with time and individual fixed effects conducted on a subsample of the German Socio-Economic Panel. I find that for individuals switching status, being a works councilor increases the hourly gross wage by 4.5% in the manufacturing sector, while a penalty of 4% is evidenced in the service sector. I present several types of evidence showing that the impact is causal. Finally, I show that politically active representatives receive most of the (negative or positive) premium. Turning back to the context, I explain why this may evidence strategic behaviour of employers and a decline in the quality of cooperation in the country.

Introduction

> *"The main body of research on work councils has been conducted on a collective institutional level, neglecting work council members at an individual level. In times of changing industrial relations, the importance of work councils in management decision making has risen steadily and thus further research of its members is required."* (Störmer, 2010: 244)

Depending on a nation's institutions, two main types of elected actors can represent the labour force on the shop floor: union delegates and works councilors. The former take part in collective bargaining and act on behalf of a union which dimensions and preferences exceed the scope of the firm. The latter do not report their decisions before such a superseding organisation; they can only sign firm-level agreements, and their objectives are expectedly shaped according to the conditions that apply within the company. Despite the broad diversity in their entitlements across institutional frameworks, a common trend with regard to their functions can be highlighted (Baccaro and Howell, 2011). In a generalised context of the decentralisation of collective bargaining, works councilors and union delegates have gained in power nearly everywhere. They are entitled to negotiate with their employer over an increasing range of questions and, as such, they take on increasing strategic importance for both employers and employees.

The economic literature has been prolix on the causes and effects of firm-level negotiations from the perspective of covered firms and their average worker. However, very little is known about how representatives themselves fare. To my knowledge, only one stream of research has worked on the issue (Breda, 2014; Bourdieu and Breda, 2016). It focuses on union delegates in France and finds that exerting such mandates is associated with an average wage penalty of about 10%. Bourdieu and Breda suggest that the link is causal and could explain why few workers are running for these positions. More generally, in a context of decentralisation of the bargaining process, such pieces of work are likely to reveal much about the 'black box' of collective bargaining at the firm level.

In this chapter, I focus on the fate of works councilors in Germany. It is indeed especially important to examine the influence of mandates on careers at

the firm level in the country. The traditional German model of industrial relations relies on two mainstays: collective bargaining at the branch level between unions and employers' associations and plant-level codetermination involving managers and works councilors. The German model is renowned for the cooperative features it entails on the shop floor, and the propensity of both national and foreign economic actors to praise it has remained strong and steady over time. In particular, German works councils are often considered the most promising collective organisation in terms of rent generation at the firm level. Traditionally released from negotiations over distributional questions, they still benefit from the strongest codetermination rights in the West. However, despite the resilience of the formal structure of negotiations in Germany (Thelen, 2009), strong forces for change have been exerted on the German institutions of collective bargaining since the reunification[12], to the point that they "have been subject to quite dramatic levels of change" (Baccaro and Howell, 2017). The extent to which the cooperative feature of the traditional German model – and, at its core, the ability of works councils to generate rents – still applies today is therefore unclear.

I use data from the German Socio-Economic Panel (GSOEP) to assess the impact of works council membership on earnings in the country between 2001 and 2015. Thereby, I fill a hole in the economic literature, and I introduce elements from the shop floor to the question of the demise of the cooperative model of reference in industrial relations (Hall, P.A. and Soskice, 2001; Addison et al., 2017). The baseline regression is an OLS model with individual and time fixed effects that controls for union membership. It shows that for individuals switching status within a firm, works council membership increases the hourly gross wage by 4.5% in the manufacturing sector, while a penalty of 4% is evidenced in the private service sectors. In the manufacturing sector, I can show that the average causal gain in fact increases to 7% when correcting for the downward trend in earnings that representatives experience before their election. Such a pre-trend analysis is not possible in the service sector due to data limitations. A series of robustness checks of these results is then

[12] In particular, Kinderman (2005: 432) has highlighted employers' attempts to "subver[t] existing institutions from without (politically) and from within (in the industrial relations realm)".

provided. Finally, I return to the context and build on Breda (2014) and Bourdieu and Breda (2016) to suggest that the strategic behaviour of rational employers is likely to explain the results in both sectors. In particular, two last tables showing that wage (dis-) advantage mostly affects politically involved works councilors bring final statistical evidence in favour of this interpretation.

The text is organised as follows. I first review the economic literature on the impacts of collective organisations on covered firms as well as the few papers analysing the career trajectories of works councilors. Second, I describe the evolution of the German institutional context since reunification. After providing some details on the GSOEP database and presenting some descriptive statistics, I then turn to regressions that bring evidence that works council membership is associated with a differentiated premium according to the sector. I finish by presenting some elements of proof regarding the strategic discrimination that, I claim, is likely to be at play in both the private service sectors and the manufacturing sector.

1 The economic literature

1.1 The literature on collective labour organisations is mostly limited to the estimation of their impacts on covered firms and workers

Economic research on collective organisations has chiefly tried to disentangle their impact on employment, working conditions and performance in covered firms. Until the mid-to-late 1980s, such research mostly dealt with unionized forms of representation. The traditional neoclassical models on the matter emerged in Dunlop's article (1944), which treats unions per the model of firm monopolies. In this view, unions would alter the optimal frictionless equilibrium by negotiating higher wage levels than the competitive one, thereby leading firms to respond with a drop in both employment and production.

A few streams of research departing from the sole rent-seeking feature of unions emerged in the late 1970s. The first one builds on Freeman (1976), who applied Hirschman's exit-voice model (1970) – later completed by Bajoit

(1988) – to the unionized world. It addresses the asymmetry of information regarding the satisfaction of employees with their working environment. According to this stream of research, an agent can react to dissatisfaction with her working conditions in four different ways: 'exit', 'apathy or neglect', 'loyalty' and 'voice'. In the first case, she decides to leave the firm. In the second, she remains in the firm but shirks. When loyal, the agent continues believing in the employer and keeps her dissatisfaction to herself. In the last case, she decides to discuss the source of her dissatisfaction with her employer.

In this stream of research, management is willing to see workers remain in the firm and be involved in their job. Yet managers are unable to precisely observe workers' 'mood' and productivity. The two first options are therefore clearly suboptimal for such employers. 'Loyalty' and 'voice' ensure satisfactory levels of cooperation. However, the former may not constitute a long-lasting equilibrium if the employer is not aware of the source of discontent while the latter eases her task of dealing with it. By easing the 'voice' response to job dissatisfaction, the presence of union representatives therefore decreases asymmetries of information in the firm. Unions are then likely to limit turnover, thereby reducing hiring and training costs and increasing firm-specific investment from both employers and employees. Another way for unions to benefit the firm could also be through the completeness of contracts. In short, unions may have the ability to ensure that both employers and employees act in the bests interests of the firm rather than according to their sole interests, thereby reducing the recurrence of events unplanned in contracts (see Pencavel, 1977: 139).

The rising theoretical recognition of unions' capacity to generate rents opened the way for two robust streams of research. First, a large number of empirical papers have tried to disentangle which of the rent-seeking or rent-generating sides of unions dominate in covered firms by estimating unions' impact on wages, employment or working conditions. Detailing these results is beyond the scope of this paper; for a review, see, for instance, Ferracci and Guyot (2015).

Second, such research renewed scholars' interest in works councils. According to Freeman and Lazear (1995: 29), "in contrast to plant-level unions, councils cannot call strikes nor negotiate wages […]. Their function,

often specified in legislation, is to foster labour and management cooperation with the goal of increasing the size of the enterprise 'pie'". As such, in contrast to unions, works councils have a limited capacity to seek rents while their ability to generate rents is maximised. This is particularly true in Germany. There, collective bargaining agreements on most strategic issues (including wages) are relegated to the branch level, which limits conflicts on the shop floor. German works councils also benefit from the largest rights to co-determination and joint-management[13] in the Western world (see section 2 and box 1.1). At a time of de-unionisation and in a context of the absence of consensus regarding the economic benefits of unions, works councils have therefore appeared as a possible source of welfare gains, opening the way for empirical research on the matter. Since FitzRoy and Kraft's seminal series of papers (1985; 1987, 1990), most research has focused on Germany. A review is provided in box 1.1. Overall, the most recent research in industrial relations finds a positive impact of German works council on firm performance which is boosted when the firm takes part in branch-level collective bargaining. The impact on wages is more ambiguous both in itself and when combined with coverage of branch-level CBAs.

[13] Following Crifo and Reberioux (2019), I distinguish between co-determination and joint-management. The former is defined by a large share of workers' representatives serving on the firm board. The latter applies when representatives benefit from veto power on the consequences of strategic decisions (lay-offs, etc.), thereby constraining employers to find agreements beforehand.

Box 1.1: Review of the empirical literature on works councils in Germany

In this box, I briefly review the empirical literature regarding the impact of works councils and their interaction with bargaining coverage on firm performance and wages.

In their metadata analysis of the impact of works councils on firm performance, Addison et al (2004) classify the literature into three groups. The first includes studies with representative databases of specific sectors in the early 1990s or before. The second builds on representative surveys of the entire private sector in the 1990s. The third is more recent and based on administrative data. The authors show that the estimated causal impact of works councils on firm performance varies according to the type of studies: respectively, mostly negative, positive and ambiguous (though positive if anything). The explanation would stem from differences in sample size, the underlying populations and in the coverage of CBAs. Note that the third type of study has expanded since then; the impact in the 2000s seems unambiguously positive (Addison et al., 2006; Wagner, 2008; Jirjahn and Mueller, 2012; Brändle, 2017).

Works council coverage is then associated with larger wages (about +20%, Addison et al., 2001; Ellguth et al., 2014). However, the causal impact is not clear-cut. Addison et al (2001) and Kraft and Lang (2008) find no effect, whereas Addison et al (2010) and Brandle (2017) observe a positive impact of approximately 6 to 8%. This literature mostly treats selection into covered establishment by adding selectivity terms in the main equations. These are generally computed via side bivariate probits.

A further stream of research has shown that the role works councils play may depend on the coverage of collective bargaining agreements (CBAs). However, if a consensus has emerged on the importance of taking into account the interaction between the two institutions, its impact is still under debate. Note that in any case, coverage of CBAs should therefore be taken into consideration when addressing the endogeneity of works councils. This is barely the case in the aforementioned articles.

According to Jirjahn (2014: 3), CBAs can have "two moderating influences. First, […] collective bargaining coverage limits the opportunities of a works council to engage in rent-seeking activities. Second, collective bargaining coverage increases the effectiveness of the work practices negotiated between works council and employer [and therefore the rent to be shared]". Both push towards an increase in productivity, but they go in opposite directions regarding wages (negative and positive, respectively). Depending on the sample and on the years, the results may differ. Thus, the impact of works councils on productivity is unambiguously stronger in firms covered with CBAs (Hübler and Jirjahn (2003), Mueller (2011), Brandle (2017)). But, the impact of the interaction on wages is positive for Hübler and Jirjahn (2003), non-significant for Addison et al (2010) and Brandle (2017) and negative for Gürtzen (2006) and Gerlach and Meyer (2010).

I turn now to the interaction between WoCos coverage and the existence or the

use of derogations to CBAs (see section 2 for details on derogations to CBAs). Note first that, among firms covered by CBAs, the right to use opening clauses is more widespread among firms with a WoCo. According to Ellguth et al. (2014), this figure reflects the fact that opening clauses are not solely 'austerity measures' – which works councils would be expected to limit – but also 'stepping stone' changes to boost firms' competitiveness. The right to recourse to an opening clause is associated with a rise in wages that is cancelled when used in firms with no WoCo but not in those with a works council (ibid, with a lesser degree of significance, Brandle (2017) finds this same latter result). Note that, for Ellguth et al. (2014: 105), "these results should not be interpreted as sheer rent-seeking actions because it may also be true that works councils offer alternative or even better and more sustainable solutions to economic problems than simple wage reductions".

1.2 The case for analysing the impact of works council membership on wages in the German context

The aforementioned literature focuses on the impact of collective bargaining on firms and their average worker. It has shown that the overall impact of shop-floor labour organisations on working conditions, wages or firm performance depends on the institutional context and on representatives' willingness to cooperate. The value ascribed to labour representation by profit-maximising employers is therefore expected to vary according to these determinants, which are in turn likely to affect representatives' earnings.

These elements urge us to turn our attention towards the careers of shop-floor actors involved in collective bargaining. The economic literature on the matter is very thin[14]. As of today, to the best of my knowledge, the French stream of research led by Breda (2011, 2014) and Bourdieu and Breda (2016) remains the only economic research dealing with workers' representatives at the individual level.

The present chapter falls within the scope of this research stream. In the two following subsections, I formalise the hypotheses according to which the

[14] In 2010, Stormer stated: "the main body of research on works councils has been conducted on a collective institutional level, neglecting works council members at an individual level" (Störmer, 2010: 244). Four years later, Breda wrote: "there is no quantitative economic paper in French or English dealing with the role of union leaders, either at the level of the firm or at the national level" (Breda, 2014: 6).

prerogatives of shop-floor representatives and their vehemence are expected to determine their wage trajectory.

1.2.1 The expected impact of representatives' strength and prerogatives on their earnings

Section 1 shows that large entitlements granted to shop-floor organisations over distributional matters are likely to result in conflictual relations between representatives and their employer and to hinder organisations' ability to generate rents. Conversely, binding collective agreements at a higher level are expected to ease cooperation between employers and representatives on the shop floor. Given these elements, it is therefore expected that works councilors generate stronger rents than union delegates because the latter benefit from more encompassing prerogatives over strategic issues. This is especially likely to be the case in Germany, where the traditional model of industrial relations (i) equips works councils with stronger co-determination rights than in most countries and (ii) ensures that industrial-level collective bargaining predominates on distributional questions.

Assuming that profit-maximising employers integrate the impact of collective organisations in representatives' earnings therefore leads to the following hypotheses.

H1: The more encompassing the prerogatives of a shop-floor labour organisation on distributional matters, the lesser the wage of its members.

H1.1: Works council mandates in Germany are better valued than union delegation in France.

H2a: The larger the coverage of branch-level bargaining and the more binding it is, the higher the wage of shop-floor representatives.

Furthermore, Fairris and Askenazy (2010) have mentioned that collective organisations[15] need involvement of standard workers into cooperation to implement rent-generative policies. In particular, workers must show willingness to provide bottom-up suggestions. Yet, the authors make it clear that goodwill of the workforce depends on the reward. In these lines, two equilibria could appear depending on the capacity of collective organisations to ensure credible commitment from employers to share the surplus generated via cooperation.

In the first case, the works council is able to harm firm's profits[16] in the event where the employer does not respect her commitments. Employees are therefore willing to cooperate which produces some surplus ultimately shared between labour and employers. This is a 'win-win' situation in which works councilors are pivotal. Profit-maximising employers may therefore offer them a specific reward to ensure they 'properly' play their role. This first equilibrium is more likely to take place in high value added sectors where labour-employer cooperation can bring the largest surplus. Note also that the game is dynamic in the way that trust between actors is necessary to achieve rent-generation: behaviour in past periods has consequences on latter quality of cooperation. This 'win-win' equilibrium is therefore more likely to take place in sectors with a strong culture of cooperation.

Consider now a sector with low unionization rates and a weak culture of cooperation. Works council have a low ability to organise the workforce, to refer to unions in case of non-respect of codetermination laws and, in the end, have little capacity to harm firm performance. These situations are especially likely to take place in low value added sector with a strong turnover. There, cooperation on non-distributional issues is less likely to generate large surplus since the most strategic variable is wage levels. Employers therefore have weak incentives to share powers. The strong turnover also limits workers' incentives to invest into forward-looking bargaining. In this context, works councils cannot sufficiently involve employers and the workforce into cooperation. It sticks to its rent-seeking actions and employers lead councilor-busting policies.

[15] Their arguments deal with works councils but can be extended to shop-floor unions.

[16] State-sanctioned codetermination rights help but are neither necessary nor sufficient (Fairris and Askenazy, 2010: 212).

This reasoning reinforces hypothesis *H2a* given that a large coverage of branch-level bargaining is likely to reflect a strong culture of cooperation. More generally, it leads to the following hypothesis which, as mentioned, largely relates to *H2a*:

H2b: The stronger the culture of cooperation and unionization rates, the larger the premium of works councilors

1.2.2 Vehemence and representatives' earnings

In their research, Breda (2011, 2014) and Bourdieu and Breda (2016) showed that French union delegates are at risk of facing "strategic discrimination". Their reasoning is based on the heterogeneity of labour representatives in a given institutional setting. Shop-floor representatives play two bargaining games at the same time with their employer: one through their mandate on behalf of their colleagues, and another about their own career evolution (promotions, working conditions, etc.), like any other employee. As a result, "two Nash equilibria can result from the interaction between the union representative and his employer" (Breda, 2014: 6). The first one is a cooperative equilibrium, where the representative trades laxity in her positions as an elected delegate against particular improvements in her working conditions relative to her colleagues. Conversely, a non-cooperative equilibrium will occur when the representative strongly negotiates for her colleagues. In this latter case, her employer could ensure that the delegate's career stagnates to deter further activism in the firm[17].

Turning to empirics, Breda (2014) and Bourdieu and Breda (2016) find an average wage penalty of about 10% for union delegates, which is positively correlated with the vehemence of the union to which they are affiliated. Bourdieu and Breda suggest that the penalty would stem from a smaller

[17] Note that this reasoning emphasises the rent-seeking feature of shop-floor representatives – for themselves or on behalf of their colleagues – and misses the positive impact that cooperation can have on the total surplus to be shared. As mentioned in section 1.2.1, negotiations on non-distributional issues are connected to wage bargaining and profit-maximising employers can have an interest in being generous in the latter to ensure cooperation of the workforce.

likelihood of being promoted. Accordingly, they consider that employers exert some 'strategic discrimination' against works councilors.

This literature raises a new hypothesis to be tested in the analysis of the impact of works council membership on wages in Germany:

H3: The premium associated with shop-floor mandates is negatively correlated with representatives' vehemence.

Note that it also reinforces hypothesis *H1.1,* according to which works council mandates in Germany are expected to be better valued than union delegation in France. Employers indeed more often characterise labour-employer relations as cooperative in Germany than in France (see box 1.2) – though the difference is less clear-cut in regard to workers' self-estimation.

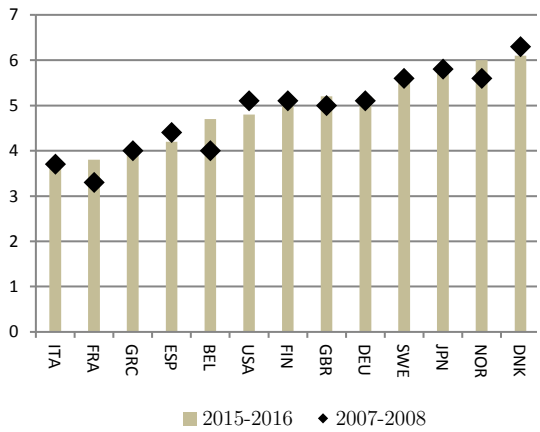
Box 1.2: Quality of the employer – worker relations in the OECD countries

As suggested above, the nature of the relations between employers' and employees' representatives may affect the risk of encountering cases of strategic discrimination. In this box, I classify OECD countries per the quality of their labour-employer relations. Figure 1.1 displays the classification according to employers. Figure 1.2 gives a similar statistic according to employees.

Figure 1.1 uses a country × year index accounting for employers' estimation of the quality of labour-employer relations. It is taken from the Global Competitiveness Index Historical Dataset from the World Economic Forum. The larger the index, the more positive the estimation is. I display this index in 2007 and 2015 in a range of OECD countries. Germany ranks in the second third, while France is nearly last on this scale. According to this ranking, if negative discrimination is positively correlated with confrontational relations on the shop floor, such discrimination is therefore expected to occur less often in Germany than in France.

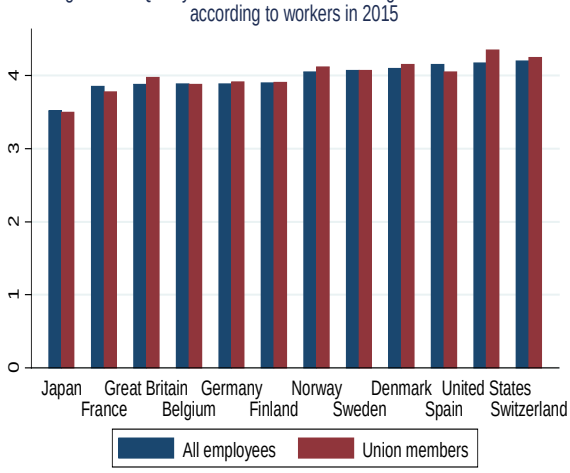
Yet, employees' estimation of the quality of relations between management and employees gives a more nuanced picture. In Figure 1.2, I use a similar index from Figure 1.1 but, this time, according to employees' views. It is taken from the International Social Survey Program. Scores vary from 1 (very bad) to 5 (very good). As displayed in Figure 1.2, scores in 2015 do not strongly differ between countries or according to union status.

Figure 1.1 - Cooperation in labour-employer relations between 2007 and 2016 according to employers



Source: World Economic Forum - The Global Competitiveness Index Historical Dataset
Note: Employers' self-declared estimation based on the following question: "In your country, how do you characterize labor-employer relations?" [1 = generally confrontational; 7 = generally cooperative]

Figure 1.2 - Quality of relations between management and workers according to workers in 2015



Source: International Social Survey Programme
Note: Self-declared estimation based on the question: 'In general, how would you describe relations at your workplace between management and employees?' [1= very bad; 5=very good]

2 The institutional context

Before turning to the data, this section describes the evolution of the German model of industrial relations. It leads to a fourth hypothesis to be tested.

Germany has long been described as an economy where a widespread dual system of industrial relations that relies on both branch-level and firm-level coordination ensures peaceful coordination between employers and employees, which is said to be favourable to rent generation. However, the extent to which this still applies today is unclear. I first describe the traditional structure of bargaining before highlighting how it recently evolved.

2.1 The two pillars of the traditional German model of industrial relations

Modern industrial relations in Germany are structured around two pillars (re)institutionalised by the 1949 Collective Bargaining Act and the 1952 Works Constitution Act. The first pillar consists of industry-wide regional (or sectoral) collective bargaining that takes place every four years between trade

unions and business associations. It typically includes questions of wage, working conditions, working time and job classification. While the agreements reached by these bodies are legally restrained to unionized workers in firms with membership in the signatory association, they are generally also applied to their non-unionised colleagues within these companies. Conversely, they are rarely extended to the whole sector: in 2009, that was the case in only 1.5% of all sectoral agreements (Addison et al., 2017: 30). Importantly, unions are not entitled to call for strikes outside of these four-year rounds. Collective agreements can also be struck at the firm level between unions and a company, even though this possibility is rarely used[18].

The second pillar consists of firm-level bargaining between employers and works councils. When referred to by the workers, employers in private firms with at least five permanent employees are required by law to facilitate the constitution of a works council and to bear its costs – including the cost of elections, works councilors' wage and training, and the cost of premises and equipment (2001 Works Constitution Act (WCA) (sections 20 and 40)). There are also works councils in the public sector ("Personalrat") but with fewer powers. Professional elections take place every four years. As previously mentioned, legally, works councils can only strike deals on issues that "have [not] been fixed or are [not] normally fixed by collective agreement" (WCA section 77-3). This can include pay systems, working time, holidays and social issues, but, in the end, they have few rights over distributional issues (wages[19], etc.).

Confined to these less conflicting questions of personal and social matters rather than to financial and economic decisions, works councils are expected to smooth relations between labour and employers at the plant level. Thus, the WCA (section 2) states that works councils should cooperate with management "in a spirit of mutual trust […] for the good of the employees and of the establishment". Both should therefore "refrain from activities that interfere with operations or imperil the peace in the establishment" (section 74). Nevertheless, works councils' powers should not be underestimated. They

[18] It covers about 7% of all German employees according to Addison et al (2017, p. 15).

[19] Even though they can indirectly influence earnings via wage classification or by negotiating wage premiums (Ellguth et al, 2014:106). See Müller-Jentsch (1995:59-60) for an extensive description of the works council's participation rights.

benefit from extensive information on firms' strategic orientations, they are very well represented in the supervisory board[20] and, for instance, have veto rights on some individual staff movements as well as co-determination rights on overtime and plans of reduced working time. Even though they cannot call for a strike, these entitlements provide them with some power resources to use over disagreements with management. Note that since 1989, the executive staff has been entitled to set up separate representative committees (Müller-Jentsch, 1995: 61) – although joint elections remain possible.

The two pillars are not fully independent for two reasons. First, when a collective agreement is reached, works councilors are in charge of checking its application in the signatory firm(s)[21]. Second, works councils depend *de facto* on unions: the latter supplies the former with expertise, and approximately two-thirds of works councilors are union members (slowly decreasing trend).

2.2 A departure from this theoretical case

Both national and foreign actors have praised the organisation of the traditional German model of industrial relations and, as of today, it remains attractive. In particular, it is deemed to minimise conflict at the firm level and to maximise works councils' capacity to generate rents. However, the collective feature of the model has experienced strong pressure since the mid-1980s, and industrial relations in the country have largely departed from the aforementioned equilibrium. Four main sources of pressure should be noted: (i) unionisation rates have plummeted; (ii) the financialisation of the economy has tilted the balance towards shareholders rather than stakeholders (Goyer, 2007); (iii) globalisation has magnified employers' interest in flexibility (Müller-Jentsch, 2018); (iv) the growing trade integration of the old Eastern bloc has increased threats of production shifts towards the East. In this context, employers have grown increasingly interested in bringing the core of industrial

[20] E.g., half of the seats in the coal and steel industry, half minus one seat in other firms with more than 2000 employees, and a third in those with 500 to 2000 employees.

[21] This was their actual primary responsibility when they were legally established in the Weimar Republic (Müller-Jentsch, 1995:53-54)

relations from the industrial or regional level back to the shop floor, and they have growing power resources to do so. Both an internal and external erosion of the traditional German model of industrial relations have therefore materialised.

2.2.1 Internal discrepancies with the traditional model of industrial relations

2.2.1.1 'Wildcat cooperation': works councils' illegal deals in firms covered by CBAs

De jure, any workplace agreement signed between an employer and his works council to deviate from a collective agreement – either positively or negatively – is null and void (Weiss and Schmidt, 2008). Yet, in practice, 'wildcat cooperation' has never been rare. According to Müller-Jentsch (1995: 62), "during the 1960s and 1970s it was usual for works councils in large companies to negotiate informally with management about additional wage increases after conclusion of an industry-wide wage agreement, although this practice was not authorized by the law". Thus, in his 1980 paper, Witte finds that 85% of the large manufacturing firms had signed works agreements exceeding works councils' legal rights to co-determination. This feature has strengthened since then, but, most importantly, the direction of these deviations has changed. Against downward pressure on employment, works councils are increasingly trading components that are negative for the workforce against more job security. For instance, representatives increasingly keep silent when employers do not apply a collective agreement. Bargaining over "amendments to every single individual employment contracts" (ibid) constitutes another example of widely spread circumvolutions of legal rules today.

Historically, institutional rules in Germany were designed to relegate workplace agreements to secondary importance behind CBAs. However, the spread of 'wildcat cooperation' highlights the strategic importance of works councilors, including for firms covered by CBAs. In these companies also, management has a strong interest in maintaining cooperative relations with labour representatives.

2.2.1.2 'Organised' erosion: the growing number and use of derogations

To limit recourse to 'wildcat' strategies, to accommodate firms' desires to depart from a 'one size fits all' approach and to counterbalance the downward pressure on membership rates, employers' associations and unions have been constrained to engage with innovative institutional designs. They are of several types (see box 1.3), and the trend is towards developing them strongly (see table 1.1 taken from Addison et al. (2017: 46)). These institutional innovations displace the core of industrial relations from the branch to the firm. As such, they strengthen the importance of works councils both positively and negatively.

Such importance is first strengthened positively because, in the aforementioned cases, works councilors can no longer rely on the mandatory character of branch regulations and therefore have to engage in bargaining over broader issues than in the traditional model. As a result, their claims have gained in strategic importance, and management has increasing incentives to take actions to favour more peaceful members against radical ones at election time.

The importance of councils is also strengthened negatively because management's utility may decrease when a works council is first voted in. Firms can indeed recourse to opt-out clauses and 'pacts for employment and competitiveness' (PECs) in the absence of a works council by bargaining directly with the workforce[22]. It is known that works councilors are more unionized than the average worker (respectively about 60% and less than 20%[23]), and they may therefore be more assertive in the concessions demanded from management. As a result, employers could be tempted to avoid the creation of a works council when it does not already exist in the plant or to undermine its continuation when it does exist. 'OT affiliations' are exemplary of this latter case. They go further than single clauses by allowing a firm to leave CBAs more broadly while remaining in the employer association (see box

[22] Most uses of opt-out clauses occur in establishments with no works council – although this is not true in terms of employees – and this feature is clearly strengthening (Addison et al., 2017: 46). Thus, counterintuitively, "there is little indication that the pronounced increase in the use of opening clauses has stimulated works councils since their relative incidence is little affected by activation or nonactivation".

[23] Addison et al (2006: 7) ; same in my data.

1.3). By not taking part in branch collective bargaining, firms expose themselves to local strikes triggered by a union willing to enact collective firm-level agreements. Accordingly, one would expect employers benefitting from OT membership to be harsher against unionized workers – whose leaders are often works councilors – than firms with traditional membership.

Table 1.1 – Share of German employees working in firms…

	… bound to an opt-out clause	…using an opt-out clause (when bound to one)
2005	39,7%	52,9%
2011	52,7%	77,0%

Source: Addison et al (2017:46)

Box 1.3: Different types of institutional innovations deviating from branch-level collective agreements.

First established at the time of reunification, 'hardship clauses' applied to the case of firms in economic distress in Eastern Germany. Generalised to the West under the name of "restructuring clauses", they entitled an employer and a works council to sign agreements deviating from CBAs on the condition that the collective organisations ratified the clause. Note that the latter could ask for detailed economic information to ensure that the deal was indeed necessary and helpful for the company's recovery.

Branch-level unions and employers' associations later relaxed the conditions for local actors to bargain over topics that normally do not lie in their reserved area – including the possibility of deviating from the existing collective agreement.

More recently, the so-called 'opening clauses' are only subject to an explicit goal of increasing competitiveness, to a commitment to innovate or, more broadly, to future investments. Depending on the collective agreement, firms may have to justify their position against the collective actors or not.

Note that in both the case of 'hardship clauses' and 'opening clauses', for derogation to be used in a firm, the management and the workforce or the works council have to come to an agreement on the issue. The job alliance is therefore often reached against some explicit pledge on the employer's part to protect employment or to engage in investment programs. According to Seifert and Massa-Wirth (2005), 87% of all job alliances involved concessions from management in 2003. In this case, job alliances are generally branded 'company-level pacts' or 'pacts for employment and competitiveness' (PECs). Note that PECs

do not necessitate the existence of a works council in the firm because the workforce can be directly consulted.

A third innovative institutional design is the development of OT (Ohne Tarifbindung) membership. This new type of affiliation provides a firm with the traditional services of an employers' association but does not compel it to apply the collective agreements signed by the association. Note that the capacity for an employer to have recourse to this form of affiliation relies on the lack of power resources of the industrial union to oppose it. As such, this form is mostly taken up by small and medium-sized firms where unionisation is the weakest (Haipeter, 2011a: 182).

2.2.2 External discrepancies: Incidence of works councils and coverage of collective bargaining

The traditional dual system of industrial relations is no longer the rule in Germany. To a certain extent, this has never been the case. According to the Codetermination Commission (1998) cited in Addison et al (2004: 401–402), in 1984, more than a third of all German employees were not working in a firm with a works council. In the private sector, the figure was approximately half, and it was even larger for small firms and in the service sector. To a lesser extent, this also applied to branch collective bargaining because approximately 20% of all German employees were not covered in 1980. Despite these figures, the traditional model still occupied a central position until the mid-1980s because non-covered firms often used the standards set up in the collective agreements as reference points (even though a mitigation by sector would be necessary).

The external erosion has deepened concomitantly with the aforementioned internal erosion. Accordingly, currently, of all German employees working in firms with five or more employees, only less than half are represented by a works council, and approximately 60% are covered by collective bargaining. In the end, only 40% benefit from both mainstays of the traditional German model of industrial relations (Oberfichtner and Schnabel, 2017: 22). Moreover, firm agreements in non-covered companies decreasingly take industrial collective agreements as a baseline (Haipeter, 2011a). The gap between covered and uncovered firms is therefore widening.

This process of external erosion has not affected all firms similarly (see table 1.2). In 1996[24], works councils and collective bargaining agreements were already more frequent in the manufacturing sector, the public sector and in large firms overall. But the difference became stronger since then. For collective bargaining coverage, the drop is negatively correlated with the establishment size. It is also stronger in services[25] than in the manufacturing sector, while the public sector is not affected (in relation to the respective situations in 1996). The trend is the same regarding works council coverage. For our case, we should keep in mind that a lower incidence of works councils and a stronger trend towards external erosion are likely to evidence a stronger opposition of employers against these institutions. Furthermore, given *H2a and H2b*[26], hypothesis *H2.1* can be formulated:

> *H2.1: The premium associated with works council membership in Germany is expected to be larger in the manufacturing sector than in the service sector.*

Table 1.2 – Share of German employees working in firms…

	… covered by a works council			… covered by CBAs		
	All economy	Private service sectors	Manufacturing sector	All economy	Private service sectors	Manufacturing sector
1996	57.2%	50.1%		81.3%	75.0%	
2000			65.4%			70.9%
2011			65.9%			61.3%
2015	47.3%	38.8%		59.3%	52.6%	

Source: Oberfichtner and Schnabel (2017) and Addison et al (2017); both sources use data from the IAB establishment panel. CBAs account for both sectoral and firm-level agreements.

[24] Figures come from the IAB Establishment panel, which was first introduced in 1993 but included Eastern Germany only starting in 1996.

[25] Note the spread among services: the banking and insurance sector is widely covered whereas industrial services are at the opposite end of the spectrum.

[26] *H2a: "The larger the coverage of branch-level bargaining and the more binding it is, the larger the wage of shop-floor representatives". H2b: "The stronger the culture of cooperation and unionization rates, the larger the premium of works councilors".*
Unionization rates are much larger in the manufacturing sector.

3 Data

The two previous sections have produced 3 hypotheses to be tested:

H1.1: Works council mandates in Germany are better valued than union delegation in France.

H2.1: The premium associated with works council membership in Germany is expected to be larger in the manufacturing sector than in the service sector.

H3: The premium associated with shop-floor mandates is negatively correlated with representatives' vehemence.

These hypotheses are tested using different sub-samples of the German Socio-Economic Panel (GSOEP). The database is a yearly survey, representative at the household and the individual levels (Haisken-DeNew and Frick, 2005). To my knowledge, it is the only database combining information on wages and works council membership in Germany. Note that there is no firm identifier in the panel.

The availability of the main variables of interest per wave in the GSOEP is displayed in table 1.3. In particular, respondents are asked whether they are works councilors in 2001, 2003, 2006, 2007, 2011 and 2015. I therefore only use these waves in the main analyses.

Table 1.3 – Availability of the main variables of interest in the German Socio-Economic Panel according to the wave

	2001	2003	2006	2007	2011	2015	2016
Coverage status of the firm	✓		✓		✓		✓
Works council membership	✓	✓	✓	✓	✓	✓	
Union membership	✓	✓		✓	✓	✓	

Source: German Socio-Economic Panel

Next, as previously mentioned, employees working in firms covered by a works council differ from the rest of the workforce on many observables (see section 4 and table 1.11 in appendix A1). It can therefore be expected that they also differ on a number of unobservables. In the estimation of works council membership on wages, a good control group for councilors can therefore not include uncovered workers. Information on works council coverage is only available in 2001, 2006, 2011 and 2016. I therefore need to approximate coverage status in 2003, 2007 and 2015. To do so, I assume that firms with no change in status between two consecutive waves with coverage information (e.g., between 2001 and 2006) experienced no variation on the matter in the intervening time. Coverage status for agents whose firm exhibits such a sequence can then be approximated[27,28]. The recoding procedure seems legitimate because works councils elections normally take place once every four years. The procedure allows me to infer works council status for approximately 40% of the respondents in waves 2003, 2007 and 2015. Among this population, approximately 75% work in a covered firm against 65% in the other waves. The difference likely stems from the stronger average seniority in covered firms. However, note that the share of works councilors among covered firms in the final sample (see below) is approximately 7.9% similar in each wave (year-to-year t-tests of equality in the yearly share of WC members is never rejected at the usual thresholds). Some robustness checks will still be performed in section 5 using an alternative sample built without these recoding assumptions.

Approximately two-thirds of works councilors are unionized. The impact of the two variables on wages should therefore be disentangled. Information on union status is given in all years of interest but 2006. For the respondents who answered in both 2006 and 2007, I therefore approximate the status in 2006 by the one that is applicable in 2007[29]. The other observations in 2006 are

[27] Respondents do not change firms in the sample of analysis, see below.

[28] Concretely, I approximate the works council status in 2003 (resp. 2007, 2015) by the one that is applicable in 2001 and 2006 (resp. 2006 and 2011, 2011 and 2016) if the firm did not change status. For all waves, I then drop observations that are not covered by a works council.

[29] By construction, the procedure applies to respondents who did not switch firms (see below). This makes the procedure more legitimate, as union status is associated with both the job and

dropped. For the previous procedure, this method biases the sample towards longer seniority. I make sure to control for this in the regressions. The procedure is also likely to produce some noise.

I further restrict the sample to full-time workers[30] (i.e., between 30 and 60 working hours per week), aged between 20 and 64 and employed on open-ended contracts in firms with more than 5 employees. Civil servants are dropped, as are apprentices and interns, voluntary workers, members of the military and workers in the agricultural sector. Finally, to ensure that results are not driven by agents changing firms, for each individual, I restrict the sample to the longest of her working spells within a firm[31]. As the main model of identification is an OLS with individual and time fixed effects, estimations are therefore free of firm intrinsic characteristics that are constant over time. I finally drop individuals with only one observation.

The main dependent variable is the logarithm of the hourly gross wage. It is computed using the answers to the questions *"How high was your income from employment last month?"* and *"how many hours [per week] do your actual working-hours consist of including possible over-time?"*. The dependent variable is the ratio between the former and (4.3 times) the latter. Side regressions will also be performed separately on the two variables. They show that the main result mostly stems from an evolution in monthly wages rather than in working hours. To limit the risk of outliers driving the main results, I trim the bottom and top 1% of the yearly distribution of the gross hourly wage. More information on the earnings and timetables of works councilors is available in box 1.4. The distribution of earnings and wages in the main sample according to works council status are given in table 1.10 in appendix A1.

the industry. The method creates some noise in the data: using the other waves, it can be shown that yearly change in union membership affects approximately 5% of the sample.

[30] Focusing on full-time workers drops a significant number of works councilors. In some sectors, part-time work is indeed the norm and there are high chances that works councilors themselves work part time. The restriction is used because the evolution in working time after election is not clear-cut in the case of part-time workers. In particular, the stability brought by mandates may affect the results for simple mechanical reasons.

[31] Observations are too few in the other within-firm spells for these to be used.

The final unbalanced panel therefore includes 9,253 observations from 2,762 respondents. On average, a respondent is observed 3.35 times over 6.8 years (corresponding to the time span between the first and last observations).

Box 1.4: Works councilors' timetables and earnings

In this box, I provide details on the number of works councilors per firm, their time of delegation, the way they are remunerated and the timing of elections.

The number of works councilors per firm and, among them, the number who receive full release depend on the firm size (see table 1.12, in appendix A2). The choice of who will benefit from a full release within the WoCo is taken through an internal ballot after professional elections. For these representatives, the amount of time to be spent on their mandate is clear-cut. For the others, the blurred definition of released time makes things more difficult.

The WCA states: "the members of the works council shall be released from their work duties […] to the extent necessary for the proper performance of their functions, having regard to the size and nature of the establishment" (WCA, section 37-2). As a result, a works council member is expected to take the initiative on the amount of time needed to properly accomplish her mandate and inform her employer in due time. A conciliation meeting can be held if the employer considers this 'unproductive' time to be excessive.

In theory, as far as possible, any hour of representation must be spent during normal working hours. When impossible, overtime spent on a mandate should then be converted to time-off in the following 30 days and, only as a last resort, be paid (WCA, section 37-2).

As for wages, section 37-1 of the WCA states that "the post of member of the works council shall be unpaid". Being a works councilor is not a job in legal terms. It is an honorary position and, as such, an elected representative keeps working on the same contract as the one she had before. Accordingly, two works councilors spending identical amounts of time on their mandate (fully released, for instance) will not earn the same amount if they used to receive different wages prior to their election.

As for wage evolution, "during his term of office and for one year thereafter [it should] not be fixed at a lower rate than the remuneration paid to workers in a comparable position who have followed the career that is usual in the establishment. The same shall apply to general benefits granted by the employer" (WCA, section 37-4). As a result, if a councilor used to receive a bonus for working on Sunday and, once elected, works only from Monday to Friday, she should keep receiving the aforementioned bonus if this is part of the remuneration of her 'comparable' colleagues.

Finally, elections normally take place every four years at the same time in all firms. Since 2000, they should have taken place between 1 March and 31 May in

2002, 2006, 2010, 2014 and 2018. Note, however, that there are non-negligible exceptions to the rule that, to my knowledge, are not quantified. This prevents me from using election timing in the identification strategy.

4 Descriptive statistics

Table 1.4 shows the incidence of works council and union memberships in the final sample. As previously mentioned, two-thirds of works councilors are unionized in the main sample. In total, members of the works council account for 7.9% of the sample. This figure may seem large in comparison with legal requirements (see table 1.12 in annex). The criteria applied to build the main sample indeed over-select works councilors: in particular, works councilors are rarely on short-term contracts or employed part time. Overall, a third of the sample is a member of a trade union. This rate is an average over the panel duration. Yearly rates do show a decreasing trend in the final sample, even though it is much weaker than in firms with no works council.

Table 1.4 – Incidence of WoCo and union memberships in the final sample

		Member of a Trade Union		
		No	Yes	Total
Member of the Works Council	No	5992	2531	8523
		64.8%	27.4%	92.1%
	Yes	245	485	730
		2.6%	5.2%	7.9%
	Total	6237	3016	9253
		67.4%	32.6%	100.0%

Source: German Socio-Economic Panel, own calculations

Table 1.11 in appendix A1 displays average values of different variables according to the WoCo membership status in the main sample. T-tests for mean difference are also provided. For information, an extra column shows the

same statistics for workers before the main selecting procedures were applied. In the main sample, works councilors earn, on average, about one euro per hour less than their colleagues – significant at the 1% level. This accounts for approximately a sixth of a standard deviation in the hourly gross wage distribution of the main sample, or 5.5% of the average. This difference mostly stems from monthly earnings, although workers in offices do declare working approximately 25 minutes less per week. More generally, works council members are, on average, older in age and seniority, less educated and more often males than their colleagues. They also work relatively more often in smaller firms; this is a mechanic consequence of the institutional rules on the matter (see table 1.11 in appendix A1).

5 Estimations

What follows is organised in 4 steps. First, the baseline regression is estimated. It is an OLS model with individual and time fixed effects. As mentioned, no firm identifier is available in the GSOEP, but agents do not change firms in the selected sample by construction. The dependent variable is the log of the hourly gross wage, and the independent variables of interest are union and works council memberships[32]. Then, I verify that the baseline results are driven by gross income rather than working hours. Third, robustness checks are led on a different sample (all respondents working in firms with more than 200 employees). I also show that attrition in wave *t+1* does not depend on works council membership in wave *t* for the subsamples of interest. Fourth, to ensure causality in the results, I test for the absence of

[32] Given the large unionization rate of works councilors (table 1.4), multicollinearity should be discussed. Independent variables that are too correlated may generate a large variance in the associated coefficients. This can result in a lack of stability of estimates across samples and in coefficients being non-significantly different from 'anything'. However, these risks seem small in our case. First, correlation between works council and union membership is approximately 0.2 in the main sample; thus, it remains limited. In the main baseline regression (column (1) of table 1.5), the variance inflation factor of works council membership is approximately 2.9. Second, more pragmatically, one of the robustness checks consists of changing the sample. It appears that the main results remain stable (see section 5.3).

difference in pre-trends between respondents about to be treated (i.e., about to become works councilor) and their colleagues in the manufacturing sector.

All estimations – except the one comparing trends in earnings (column (1) of table 1.7) – include the following control variables: gender, age categories (4), seniority categories (4), 9 SES dummies, 9 firm sector dummies, 6 firm size dummies, the month of interview and dummies to control for the region (East, West) and for whether a number of hours is specified in the individual's contract. A year fixed effect is also included. In the few regressions with no individual fixed effect, I also control for the level of education (6 categories) and sex. Standard errors are clustered at the individual level in these latter cases.

5.1 The impact of works council and union memberships on wages depends on the sector.

Table 1.5 displays the estimations of the baseline OLS regression with time and individual fixed effects. Column (1) shows that, overall, no association between works council membership and wages can be evidenced in Germany. However, when separately zooming in on economic sectors, it appears that works councilors in fact experience different situations depending on the sector.

In the manufacturing sector, works councilors on average earn 4.5% more during their mandate than before or after their election. This sector shows a pattern different from the rest of the private sector: a non-significant penalty of approximately 2% can be evidenced in both the construction[33] and the private service sectors.

Among private services, it is known that industrial relations in the financial sector stand apart – with very large degrees of coverage of both CBAs and works councils – to an even larger extent than in the

[33] The construction sector is set aside in the analysis. As in the manufacturing sector, it shows high coverage by CBAs. Yet, as in the service sector, works councilors have limited relations with their sectoral union (Behrens, 2009) and works council coverage is very low and exhibits a strong negative trend.

manufacturing sector. Separate estimations on this sector are not robust due to the sample size and are therefore not displayed here. But, if anything, they show a non-significant positive association between works council membership and wages. Banking and insurance could be gathered with the manufacturing sector on the rationale that the traditional model of industrial relations applies in both sectors. The impact of works council membership rises to 4.8% in that case. This will not be continued in the rest of the paper, however, because the two sectors remain too distinct[34]. When banking and insurance are removed from the rest of the services, the wage penalty works councilors experience during their mandate proves stronger (4%) and statistically significant (see column (5)). In the rest of the paper, analyses on the private service sectors will therefore never include banking and insurance.

Table 1.5 – Effect of works council and union memberships on the log hourly gross wage according to the sector (Baseline model)

	(1)	(2)	(3)	(4)	(5)	(6)
	All sectors	Manufacturing sector	Construction sector	Private service sectors --- (incl. banking and insurance)	Private service sectors ---- (no banking or insurance)	Public Sector ---- (no civil servant)
Member of the Works Council	0.003	0.045***	-0.020	-0.022	-0.040**	-0.011
	(0.009)	(0.017)	(0.028)	(0.017)	(0.018)	(0.016)
Member of a Trade Union	-0.013*	-0.010	0.001	-0.061***	-0.065***	0.003
	(0.008)	(0.014)	(0.022)	(0.018)	(0.019)	(0.014)
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,253	2,442	1,241	2,036	1,557	2,731
Adjusted R^2	0.853	0.835	0.826	0.899	0.901	0.828
Individuals	2761	768	396	673	529	834

Model: OLS with individual and time fixed effects.

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: German Socio-Economic Panel, own calculations

[34] In particular, the relation between unions and works councilors is much stronger in the manufacturing sector; rights to open clauses and firm agreements are also more widespread there.

In the private sector, works councilors therefore receive a positive premium in sectors where the traditional German model of industrial relations is the most developed. Conversely, at its periphery, the premium becomes negative. This result is consistent with hypothesis *H2.1* elaborated in section 2.2.2. However, the comparison with union delegates in France is less straightforward than hypothesised in *H1.1*. Overall, employers value works council mandates more in Germany than they value union delegation in France. However, the penalty in the service sector is in fact very close to what Breda (2014) and Bourdieu and Breda (2016) found in France overall[35]. Note that the difference in estimation method is not essential here. If individual fixed effects are dropped as in Breda (2014) and Bourdieu and Breda (2016), estimates only change at the margin (see Table 1.13 in appendix A3). Finally, no effect can be evidenced in the public sector for non-civil-servants (column (6)).

Importantly, estimates of the association between works council membership and wages displayed in table 1.5 are identified by workers changing status. Useful information on their numbers according to the different specifications is given in the very last appendix.

Estimates of the relation between works council membership and wages in table 1.5 are the resulting effect of both changes in status when voted in and out of the works council. Table 1.14 in appendix A4 disentangles the two, presenting results separately for the manufacturing sector and the private service sectors (not including banking and insurance). To simplify, I separate agents who switch status at least once (hereafter the "switchers") into three groups: respondents whose only change in status is to become a works councilor, respondents whose only change in status is to leave the works council and respondents who are observed both voted in and out of the organisation. In columns (1) and (3), 'switchers' from the second and third groups as well as respondents who are always in office are dropped from the sample. In these columns, the coefficient of interest is therefore only estimated with information from 'switchers' entering the treatment. Following the same

[35] Recall that Breda (2014) and Bourdieu and Breda (2016) found a negative impact of union delegation in France of about 10% in net hourly gross wage.

principle, in columns (2) and (4), 'switchers' from the first and third groups as well as respondents who are always in office are dropped. Here, the coefficient of interest is estimated on the only agents who switched out of treatment. Interestingly, no significant difference can be observed per sector between the two types of estimations. In other words, the association between membership and wage plays all along the mandate, and the effects seem to vanish when voted out of the organisation.

As for union membership, table 1.5 shows an overall wage penalty of 1.3%, fully stemming from the private service sectors, where the penalty spikes to 6.5%. It is difficult to compare the size of the coefficients with previous literature given the difference in methods: the vast majority of articles dealing with the issue measure the difference between members and non-members, at a given time, generally within firms. Thus, Bourdieu and Breda (2016) find a penalty of 3.5% against union members in France, while Booth and Bryan (2004) evidence a non-significant impact in the UK. Booth uses a within-firm variation. Using within-wage quantile regressions (but between firms), Eren (2009) exhibits a wage benefit of 9% in the US. As for Germany, little has been done on the union wage premium. In an OLS setting simply controlling for individual and workplace characteristics, Blanchflower and Bryson (2002) find a positive but non-significant union premium of 4%.

The impact of all control variables for columns (1), (2) and (5) are displayed in table 1.15 appendix A4.

5.2 Works council and union memberships affect 'pure' incomes rather than working hours

In the baseline regressions, the dependent variable is calculated as the ratio between the monthly gross wage and the actual number of weekly working hours (multiplied by 4.3) – both self-declared. Both the numerator and the denominator can therefore drive the correlations between works council or union membership and the hourly gross wage. In table 1.6, I therefore lead regressions in a similar spirit as the baseline ones, but I do so separately using the actual number of weekly working hours and the log of the monthly gross wage as dependent variables. As mentioned, I only focus on the

manufacturing sector and the private service sectors (not including banking and insurance).

It appears that for 'switchers', works council membership and union membership affect 'pure' incomes rather than working hours. Columns (1) and (2) of table 1.6 indeed show significant results of very similar size as the results from table 1.5 for both the manufacturing sector and the private service sectors. Note that the negative impact of works council membership on 'pure' incomes in the private service sector should not be read as a wage drop in nominal terms. Earnings are indeed computed from the question "How high was your income from employment last month?". As such, it is expected that respondents include extras such as bonuses or premia in their answer. A drop in such earnings is a first possible explanation. A differentiated rate of promotion between councilors and their colleagues is also possible. Recall that table 1.6 uses SOEP waves 2001, 2003, 2006, 2007, 2011 and 2015 rather than yearly waves. On average, respondents are observed every 3.05 years. Therefore, the combination of an average wage growth in the sector of about 1% and flat wage evolutions in earnings after election would be sufficient to generate a point estimate of about -3%.

No significant correlation can then be evidenced between works council or union memberships and working hours. Yet, if anything, the correlation tends to inflate the effects found on councilors' incomes in both sectors. This result may seem unexpected. It is sometimes argued that the time releases granted to councilors are not sufficient to fulfil their role and, more generally, that works councilors and union members spend extra time in meetings or in organising the labour force. The present estimation tells us that either (i) these presuppositions are wrong; (ii) workers do not declare these extra hours as overtime; (iii) entering collective organisations does not significantly affect the number of extra hours. This latter case is compatible with the presence of individual fixed effects in the model. Switchers to and from the works council would show some intrinsic interest in dealing with work-related issues outside of working hours, which would be unaffected by their status.

Table 1.6 – What drives the baseline results? Estimations on alternative dependent variables: log monthly gross wage and number of actual working hours

	Dependent variable: log of the monthly gross wage		Dependent variable: number of actual working hours	
	(1) Manufacturing sector	(2) Private service sectors	(3) Manufacturing sector	(4) Private service sectors
Member of the Works Council	0.044***	-0.032*	-0.124	0.392
	(0.017)	(0.018)	(0.387)	(0.482)
Member of a Trade Union	-0.013	-0.060***	-0.107	0.121
	(0.013)	(0.018)	(0.310)	(0.497)
Individual Fixed Effect	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes
Observations	2,442	1,557	2,442	1,557
Adjusted R^2	0.877	0.926	0.661	0.696
Individuals	768	529	768	529

Model: OLS with individual and time fixed effects.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source : German Socio-Economic Panel, own calculations

5.3 Robustness checks – estimation of the baseline regression on an alternative sample and test of a differentiated attrition between the treated and control groups.

In this part, I perform two series of robustness checks. The first is motivated by the risks of measurement error stemming, on the one hand, from the self-declared feature of works council coverage and, on the other hand, from the recoding procedure explained in section 3. Regarding the first issue, despite the central importance of works councils in the traditional German model of industrial relations, employees may not be fully aware of whether their firm is covered. The use of self-declaration on the matter to restrict the main sample to covered workers may therefore have brought some endogeneity to the regressions[36]. Second, the recoding procedure prevented the loss of all observations in waves with no information on coverage, but increased the risk

[36] For instance, it is possible that, among non-elected workers, the least invested in their job are also the least aware about WoCo coverage. If they tend to have flatter careers and to underreport their WoCo coverage, the selection process would artificially decrease estimands.

of measurement error. To ensure that previous results are not dependent on these choices, I build an alternative sample that includes the longest job spell of all workers – observed at least twice – from firms with more than 200 employees. There is indeed a strong positive correlation between works council coverage and firm size. Table 1.16 in appendix A5 shows that between 2001 and 2011, coverage in firms with more than 250[37] employees remained at a high rate of approximately 90%. Note that sectoral collective agreements also cover the vast majority of employees in these firms. The same restrictions as in the main sample apply otherwise.

This alternative sample includes 9,874 observations, two thirds of which are common with the main sample. Table 1.17 in appendix A5 shows that all conclusions previously mentioned regarding the association between works council membership and wages still apply to this sample with no strong change in nature or magnitude. Conversely, correlations between wages and union status described in the baseline analysis are slightly less robust. The effect becomes significant in the manufacturing sector and loses its significance in the private service sectors.

Firm size and coverage status in fact seem to work in opposite directions on the link between union membership and wages. It can be shown that restricting the sample to (self-declared) covered workers employed in large firms leads to no change in the nature of the baseline results for both the manufacturing sector and the private service sectors. Conversely, if the regression is led on a sample built on a similar spirit as the main one, but this time including only workers from uncovered firms, it appears that union membership plays negatively on wages in the manufacturing sector and positively in the service sector – though not significantly in the former at the usual thresholds. Despite their weak representation in the alternative sample based on large firms, the presence of uncovered unionized workers could affect the estimates of the coefficient for union membership.

Another robustness check consists of ensuring that there is no differentiated attrition likelihood between the treated and the control groups in the main sample. Finding such a spread would indeed evidence a risk of

[37] I could not find the figure for firms larger than 200. Figures for 2015 are not available yet.

endogeneity bias in the estimates. For instance, works councilors could have a stronger intrinsic motivation to reply to interviews, and the latter could be positively correlated with wage trajectories. Table 1.18 in appendix A5 displays the estimates of a probit regression where the dependent variable is the likelihood of disappearing in wave t+1 given presence in the sample in t[38]. No systematic association between works council or union memberships and attrition can be found in the samples of interest.

6 How to explain the results

6.1 Some adverse selection at stake?

What have we learnt from the preceding estimations? (i) As hypothesised in *H2.1*, works council membership and incomes are negatively associated in the private service sectors and positively associated in the manufacturing sector. (ii) The size of the penalty in the service sector is close to that applied in France for union delegates, which rejects hypothesis *H1.1*. (iii) The relation in Germany stems from an evolution of 'pure' incomes rather than in working hours. (iv) The results are not biased by some unequal attrition likelihood between the treatment and control groups, and they are robust to variations in samples. (v) In firms covered by a works council, the association between union membership and incomes seems negative in both the private service sector and the manufacturing sector – though less significantly in the latter.

Now, are the relations between union or works council memberships and incomes simple correlations or causal impacts? I build here on Breda (2014) and Bourdieu and Breda (2016). Consider first the risk of adverse selection. Its most typical case applies when the treatment and control groups display inherent differences in productivity. This is excluded here given the presence of individual fixed effects in the main models. Conversely, some reverse causality could be at play. It is possible that agents experiencing an evolution

[38] t is 1 for wave 2001, 2 for wave 2003, 3 for wave 2006, 4 for wave 2007, 5 for wave 2011

in their wage different from 'normal' trajectories are more likely to run for elections because of this specific trend[39].

Cases of a specific upward pre-trend in earnings that benefit representatives are not common in the literature. Conversely, cases of workers running for elections because of a pre-existing downward trend in their wage are more commonly described. First, consider an employee who has been shirking for a few years. At some point, her employer notices this behaviour and freezes her earnings at their current level. With time, the worker therefore suffers a downward trend in her wage relative to her colleagues while being at risk of losing her job. She therefore (successively) runs for works council elections to benefit from the job protection feature attached to the position. As required by the WCA (see box 1.4), her wage trajectory then keeps up with the pace of her colleagues' – though at a lower level due to the relative stagnation previously endured. A second example comes from Artus' typology (2013) of typical profiles likely to fight for collective action in the private service sectors. One of the three profiles she describes includes "employees who have, in the past, invested much personal energy and time to work in their occupational activity […] and who have either not been 'thanked' for their engagement, or who can or will no longer meet the high level of loyalty and demands required" (ibid: 418)[40]. Here, the wages of candidates for works council elections are on a relative downward trend for reasons that do not necessarily relate to their productivity[41]. Unsatisfied with their situation, they run for election to fight for recognition of their own – as well as their colleagues' – past contributions on the job.

[39] Note that the relation has to be causal – i.e. the drop or increase in wages must urge the person to run in the election. Otherwise, it is possible that workers aiming at upcoming elections begin to lose wages ex-ante (think of discrimination or of a drop in their productivity) without this being a case of reverse causality.

[40] The second case includes precarious workers without much to lose, while the third one corresponds to employees who "do not rely exclusively upon rational cost-benefit calculations, but rather have a pronounced orientation towards the symbolic values of justice, respect, solidarity and dignity" (Artus, 2013: 418).

[41] Promotions could be randomly offered to employees with similar levels of productivity, lack of acquaintance with the employer may limit career evolutions independently of productivity levels, etc.

Differentiation in wage pre-trends between works councilors to be and their colleagues may therefore take place in both the manufacturing and the private service sectors. However, to explain the main results, the difference in pre-trends should go in opposite directions in the manufacturing and private service sectors. Intuitively, no obvious reason for this stands out; but, how can risks of reverse causality be rigorously treated? The first-best and most-used solutions are unsuited here: no source of exogenous variation explaining elections into or out of the works council is available (think of poll records). Graphical analyses would need longer sequences of observations of switchers' status after their election. What follows is therefore a second-best solution. It aims to test whether pre-trends in wages differ between respondents about to become works councilors and workers who will never be in office. Because of data limitations, this test is only performed in the manufacturing sector.

In this part, I restrain the main sample to never-elected workers (group 1) as well as to 'switchers' who were first observed out of office for at least 2 waves (group 2). For the latter, I only keep observations preceding their first time in office (e.g., until 2007 if the individual is first observed in office in 2011). I then assume that I observe all entrances or exits to the works councils. In other words, I assume that no individuals in group 1 or 2 changed status twice between the two waves with observed status. This allows me to fill holes between these waves with the waves that have no information on industrial relations in the panel[42]. In the end, the sample is a yearly unbalanced panel over 2001-2011 composed of unelected workers from two groups: 'councilors to be' and workers never observed elected in the GSOEP. I can then estimate whether the trend in wages between pre-election years for switchers differs from never elected workers. The model is an OLS with fixed individual and time effects led on the aforementioned sample. It is described in equation (1):

$$\ln(w_{i,t}) = \alpha * t + \beta * t * 1_{group2} + \Gamma . X_{i,t} + \alpha_i + c_t + \mu_{i,t} \; ; \; t \in [\![2001,2011]\!] \qquad (1)$$

[42] Concretely, if an individual was out of office in 2001, 2003 and 2006 and then observed in office in 2007, I drop the last observation and retrieve information on the dependent and control variables in 2002, 2004 and 2005. In these years, I assume that the respondent was out of office.

Reverse causality therefore materialises if β is significantly non-null and is of the same sign as the baseline estimates. Note that union membership cannot be used in the model because no assumption can be made on status in 2002, 2004, 2005, 2008, 2009 and 2010.

Column (1) of table 1.7 shows that in the manufacturing sector, the career trajectories of representatives were evolving more slowly than those of their colleagues before they entered the council. The yearly pace of evolution in their earnings was 1.9p.p. lower than 'normal'.

In column (2) of table 1.7, I estimate the impact of works council membership, taking into consideration the downward pre-trend representatives experience before their election. Following Monras (2019), I estimate the following two equations:

$$\ln(w_{i,t}) = \alpha * t + \beta * t * 1_{group2} + \alpha_i + c_t + \mu_{i,t} \ ; \ t \in [\![2001,2011]\!] \tag{2}$$

$$\ln(\widetilde{w_{i,t}}) = \gamma . RP_{i,t} + \Gamma . X_{i,t} + \alpha_i + c_t + \epsilon_{i,t} \ ; \ t \in [\![2001,2015]\!] \tag{3}$$

In (2), I regress the dependent variable on an average and a group-specific linear trends as well as on individual and time fixed effects. Here, the sample is the same as in equation (1). In a second step, I extend the sample to all observations from individuals found in groups 1 and 2. For these, I compute residuals $ln(\widetilde{w_{i,t}})$ from the difference between the outcome variable $ln(w_{i,t})$ and the prediction based on equation (2). The results are displayed in column (2) of table 1.7. Expectedly, the real effect of becoming a works councilor in the manufacturing sector – i.e., after treating for the downward pre-trend – is larger than the baseline result. The coefficient associated amounts to +7%. This means that, when in office, switchers' earnings were 7% higher than what they would be if they had followed their pre-election trend.

Note that whether this effect is a simple catching-up of earlier drops in wages is not central to our argument. Indeed, as mentioned in box 1.4, once elected, a works councilor should keep working on the same contract and benefit from a wage trajectory at least similar to that of comparable workers. No legal rule therefore constrains to inflate representatives' wages so that they keep up not only in pace but also in level with their colleagues. Were baseline results in the manufacturing sector mere catching-up to pre-election downward

trends in wages, they would still be the result of an unconstrained choice on the employer's part.

Table 1.7 – Taking into account the difference in pre-trends between the treatment and control groups in the manufacturing sector

	(1)* Manufacturing sector	(2)* Manufacturing sector
Dependent variable	Ln(hourly gross wage)	Residuals from equation (2)
Pre-trend in the hourly gross wage	0.022***	
	(0.002)	
Pre-trend * Group 2+	-0.019***	
	(0.007)	
Member of the Works Council		0.070***
		(0.023)
Member of a Trade Union		-0.004
		(0.008)
Individual Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
Group 1+	✓	✓
Group 2+	✓	✓
Observations	3,645	3,829
Adjusted R^2	0.852	0.858
Individuals	621	621

Models: OLS with individual and time fixed effects.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
+ Group 1 includes respondents never observed in office. Group 2 includes respondents first observed at least twice out of office before being elected.
* In column (1), all observations from group 1 falling between 2001 and 2011 are used. For group 2, observations preceding first time in office are used. In column (2), all observations from groups 1 and 2 falling between 2001 and 2015 are used
Source : German Socio-Economic Panel, own calculations

Another source of adverse selection should be mentioned here. Once in office, works councilors could indeed lose/gain in productivity relative to their counterparts. Two different channels could be at work. First, representatives benefit from released time and therefore spend fewer hours on their usual 'productive' tasks. As a result, when confronted with options to promote

workers, rational employers may, illegally, privilege unelected employees. Second, when elected, works councilors benefit from job protection and may then start shirking, thereby urging rational employers to reduce their relative earnings. No proper econometric test can be provided for these two paths. Yet, these channels assume employers' ability to measure councilors' productivity given their delegation time, which, for many, is not formally defined and evolves over time[43]. Furthermore, again, they seem inappropriate to account for the positive causal impact of works council membership on wages in the manufacturing sector[44]. As a result, even though they cannot be fully excluded, the risks of adverse selection seem limited in the present case.

6.2 Turning back to the context, a case of strategic discrimination

Claims that the relation between works council membership and wages is driven by specific behaviours by representatives before their election can now be rejected for the manufacturing sector. In the private service sectors, data limitations prevent me from applying the same method. One cannot exclude the possibility that councilors experience a downward trend in their earnings before election – similar to their counterparts in the manufacturing sector – which could explain all of the effects found in section 5. In other words, it cannot be rigorously proven that the negative relationship between works council membership and wages is causal in the private service sectors. With this limitation in mind, in this section, I do introduce elements suggesting that a least part of the baseline effect is also causal in the private service sectors. More specifically, I explain the baseline results in terms of strategic discrimination.

[43] Note that, would employers be unable to properly measure productivity, they may, rightly or not, still believe that representatives do shirk when elected. Accordingly, they would then limit promotions for works councilors. This mechanism would relate to statistical discrimination rather than to adverse selection.

[44] This limitation similarly applies to explanations in terms of statistical discrimination.

Let us recall that representatives are "supposed to negotiate with [their] employer as equals, but [are] under his authority as employee[s]"[45] (Breda, 2014). As previously mentioned, councilors play two bargaining games with their employer: they negotiate both for their own account (promotions, etc.) and for the whole workforce. Employers can therefore use their capacity to slow down or speed up representatives' careers via the first bargaining game to put pressure on them in the second one. Discussion can however be taken regarding employers' interest in the second game. As in Breda (2014), if negotiations cover distributional questions, employers have interest to limit councilors' claims. Conversely, according to the reasoning taken in section 1.2.1, if bargaining refers to issues likely to generate rents, employers' interest may then be to show commitment in wage rises and to have councilors lead the workforce towards cooperation to reach a win-win equilibrium. While both situations would be compatible with the aforementioned results, I show that the first one better fits the facts. In all cases, as mentioned in box 1.4, if acknowledged, such practice would be illegal. According to the WCA (section 119), "prejudicing or favouring a member or substitute member of the works council […] by reason of his office [is] punishable by a term of imprisonment not exceeding one year or a fine, or both" (WCA, section 119).

Despite its non-legality, some elements suggest that some strategic discrimination may explain (at least part of) the impact of mandates on wages. I first recall the context to explain why some discrimination of opposite signs could be playing in the manufacturing sector and in the service sector. I then show that all works councilors are not affected to the same extent and that politically involved representatives in fact drive most of the effects in both sectors.

First, consider the manufacturing sample. Historically, this sector has been at the core of the traditional model of industrial relations in Germany. As such, it has long been characterised by a strong density of employers' and employees' unions, resulting in broad coverage of collective bargaining agreements (CBAs). Because coverage and norms were the most generalised in

[45] This statement Breda applies to union delegates in France is also valid for works councilors in Germany.

this sector, employers' demands for flexibility in the CBAs have emerged most strongly there. In the aftermath of the reunification and at a time when Germany was called the 'sick man of Europe', the 'organised' decentralisation of industrial relations described in section 2.2.1 therefore first applied in the manufacturing sector in the 1990s to the benefit of firms in economic distress.

This first series of open-clauses resulted in a large wave of wage restraints. As a result, when branch-level associations agreed upon the further spread of derogations conditioned on less-stringent economic requirements in the early 2000s[46], employees strongly opposed their application in firms, considering them "as violations of the norms of distributional justice" (Haipeter, 2011b: 689). Works councils' support for firm-level dialogue over the enactment of derogations therefore gained strategic importance for employers.

Their role is clearly established in Haipeter's study of 12 firms, half from the metal-working industry, half from the chemical industry (ibid). He shows that in the early 2000s, works councils were constrained to sit at the negotiating table due to employers' threat of imminent job cuts (in particular through outsourcing). However, once the dialogue opened, they structured with their union "to develop common strategies and demands for the negotiations with management [and were] able to negotiate with their management on equal terms. They were recognized by management as competent and powerful negotiators. In many cases they even gained more respect from management. […] The works councils were not helpless victims of structural constraints; on the contrary, they actively tried to restructure the situation to their own advantage. […] By demonstrating a new capacity to act, in most of the cases they have been able to regain a great deal of the power lost through the structural constraints management was able to impose on them" (ibid, p. 687).

In the end, despite employees' opposition, works councils and unions proved to be cooperative partners for employers willing to use their recent rights to derogate from CBAs. Concretely, in Haipeter's sample of firms, works councils implemented two strategies. The first one consisted of gathering

[46] E.g., the Pforzheim agreements signed in 2004 in the metal-working industry rendered derogations possible provided that "jobs would be safeguarded or created as a result and they would help to improve competitiveness and the ability to innovate, as well as investment conditions" (Haipeter, 2011a: 184).

employees to insist on the risk that some of them would lose their jobs and therefore on the need to stand unified against job losses. The second strategy was to organise short-term strikes to "channe[l] the critical attitude towards derogations into broad support for the works councils in their negotiations with management" (ibid, p. 689). Note that when this second strategy was applied, works councilors ended up restraining employees from intensifying their struggles once sufficient levels of support were achieved (ibid)[47].

From these elements, therefore, emerges the fact that in the manufacturing sector, both employers and works councils gained by negotiating over derogations that employees first rejected. It seems quite clear that the theoretical reasoning stated in section 1.2.1 does not apply here: it does not seem that works councilors were the guarantor of employers' commitments to reach a win-win equilibrium. Conversely, the positive impact of works council membership on wages in the sector should therefore be interpreted as incentives, or rewards, for works councilors' investment in negotiations.

Providing general elements of context in the private service sector[48] in the vein of what precedes proves more difficult given the variety of industries employing the respondents in this sample. 33% of them work in trade, 21% in transport, 10% in services to industries and 36% in personal services. However, all these sectors have in common a weak tradition of collective bargaining: coverage of both CBAs and works councils in the service sector is historically much lower than in the manufacturing sector. More recently, actors have also been leaving collective organisations (external erosion, see section 2.2.2) more quickly in the service sectors than in the manufacturing sector (see table 1.2). In the former, decisions are more often seen as pertaining to managers and firm-holders. As a result, works councils are more often considered to exceed the normal prerogatives of employees. Thus, managers from the non-manufacturing sector more often classify works agreements as increasing the rigidity in the firm (Nienhueser, 2009). Expectedly, works council busting is

[47] It should be stated that works councils generally obtained concessions from the management and did not give employers free rein to freely recourse to derogatory agreements.

[48] As previously mentioned, banking and insurance are not taken into consideration here.

more often found in these sectors. Behrens and Dribbusch (2018) have surveyed local full-time union officials on their perceived estimation of employers' actions against the establishment or the proper working of works councils. Union officials detect such behaviours more often in the service sectors than in the manufacturing one[49].

Case studies on the relations between works councilors and management are fewer in the private service sector than in the manufacturing sector. But, among these, Artus' research stands out. She focuses on low-wage private services and highlights the strong opposition of managers against, first, the formation of works councils and, once set up, the most vehement councilors. In these sectors, "wage costs and flexible work-time are key dimensions of [the] competitive strategies" and are altered by councilors' demands (Artus, 2013: 415). Moreover, in some of the cases studied, she notices the prevalence of a strong corporate identify. In these firms, "the absolute identification with the company […] is an explicit aim of personnel policy" (ibid, p. 416). Employees "try[ing] to establish the legitimacy of other interests" than those of the company community are therefore castigated (ibid).

In the end, in the precarious service sectors, "co-determination arrangements remain a permanent deviation from the norm in a cultural universe that is oriented towards unilateral management decisions. Even when a works council exists, a climate that is hostile to co-determination still dominates". Accordingly, the negative impact of works council membership on wages should therefore be interpreted as a proof of works council-busting, probably driven by the precarious services that constitute a large chunk of the sample.

The (dis-)advantage works councilors experience in terms of wages therefore seems (at least) partly driven by voluntary policies of strategic discrimination implemented by managers in the manufacturing and the service sectors. In the final discussion below, I present some elements to strengthen this interpretation by showing that wage policies in fact target the most

[49] The difference is not statistically significant but samples are small.

politically active representatives. This analysis constitutes a test of hypothesis *H3*[50].

To do so, I re-estimate the baseline regression, but this time, the dummy for works council membership is successively interacted with two types of political involvement: political steadfastness and union membership. The former is measured by a dummy variable taking the value 1 if the respondent leans towards one party in the long run[51]. Note that approximately half of the respondents fall into each category of the dummy variable and that the correlation with union membership is very low (0.015). The results are displayed in tables 1.8 and 1.9.

Estimates show that the sector-specific (dis-)advantage in terms of monthly wages is fully concentrated on politically steadfast representatives. Their remuneration is clearly distinct from that of the other representatives, and this stems from differences in monthly wages rather than working hours (though slightly less significantly so in the manufacturing sector).

Similarly, in the manufacturing sector, unionized works councilors receive the whole premium observed in the baseline results. In the private service sectors, the penalty in terms of monthly wages is also experienced by unionized representatives. However, in this sector, becoming a works councilor has a negative (resp. positive) impact on working time when unionized (resp. non-unionised) so that, overall, unionisation does not affect the penalty representatives endure in terms of hourly gross wage.

[50] *H3*: *The premium associated with shop-floor mandates is negatively correlated with representatives' vehemence.*

[51] The question I use in the GSOEP is: "many people in Germany lean towards one party in the long term, even if they occasionally vote for another party. Do you lean towards a particular party?".

Table 1.8 – Effect of the interaction between works council membership and political steadfastness on the log hourly gross wage, the log monthly gross wage and the actual number of working hours

	Dependent variable: log hourly gross wage		Dependent variable: log monthly gross wage		Dependent variable: number of actual working hours	
	(1) Manufacturing sector	(2) Private service sectors	(3) Manufacturing sector	(4) Private service sectors	(5) Manufacturing sector	(6) Private service sectors
Supports a Political Party	0.001	0.008	0.005	0.010	0.141	0.084
	(0.010)	(0.011)	(0.010)	(0.011)	(0.226)	(0.298)
Member of the Works Council	0.015	0.003	0.021	0.013	0.219	0.474
	(0.024)	(0.024)	(0.023)	(0.023)	(0.528)	(0.632)
Member of a Trade Union	-0.010	-0.065***	-0.013	-0.061***	-0.101	0.118
	(0.014)	(0.019)	(0.013)	(0.018)	(0.310)	(0.496)
WoCo Member * Supports a Pol. Party	0.055*	-0.076***	0.042	-0.080***	-0.644	-0.189
	(0.030)	(0.028)	(0.029)	(0.027)	(0.673)	(0.733)
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,436	1,556	2,436	1,556	2,436	1,556
Adjusted R^2	0.836	0.902	0.878	0.926	0.661	0.697
Individuals	768	529	768	529	768	529

Model: OLS with individual and time fixed effects.

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: German Socio-Economic Panel, own calculations

Table 1.9 – Effect of the interaction between works council and union memberships on the log hourly gross wage, the log monthly gross wage and the actual number of working hours

	Dependent variable: log hourly gross wage		Dependent variable: log monthly gross wage		Dependent variable: number of actual working hours	
	(1)	(2)	(3)	(4)	(5)	(6)
	Manufacturing sector	Private service sectors	Manufacturing sector	Private service sectors	Manufacturing sector	Private service sectors
Member of the Works Council	-0.012	-0.031	-0.017	-0.007	-0.207	1.089*
	(0.030)	(0.024)	(0.029)	(0.023)	(0.668)	(0.632)
Member of a Trade Union	-0.015	-0.061***	-0.018	-0.050***	-0.115	0.413
	(0.014)	(0.020)	(0.013)	(0.019)	(0.314)	(0.525)
WoCo Member * Union Member	0.084**	-0.019	0.089***	-0.056*	0.121	-1.586*
	(0.036)	(0.036)	(0.034)	(0.034)	(0.794)	(0.930)
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,442	1,557	2,442	1,557	2,442	1,557
Adjusted R^2	0.835	0.901	0.878	0.926	0.661	0.697
Individuals	768	529	768	529	768	529

Model: OLS with individual and time fixed effects.

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: German Socio-Economic Panel, own calculations

These results are intuitive given the elements of context previously given. First, in the manufacturing sector, in the context of negotiations over the application of derogations to CBAs, works councils played the role of "junior partners in the labour coalition with the unions" (Haipeter, 2011b: 687); representatives thus relied to a large extent on the support of their union. Works councilors indeed needed some expertise on the topics at stake and considered derogations as part of the collective bargaining sphere that should be managed by unions.

In parallel, IG Metall and IG BCE – the metal-working and the chemical trade unions – showed rising interests in coordination at the firm level. In a context of declining union density, they both ruled for increased participation rights of union members on the shop floor and privileged cooperation with works councils to gain concessions from employers to frontal opposition on negotiations rights (ibid). As a result, it is expected that unionized works

councilors had a particular strategic importance within the works councils for employers as go-betweens with the union. Targeting wage premia on these representatives can therefore seem rational.

Regarding the private service sectors, here again, a fit-all explanation is difficult to give. The literature on the issue is thin, and the following lines of explanation should only be taken as suggestive elements. According to Artus (2013), managerial intrusion into the composition of works councils is common in the low-wage service sector. It can manifest through pro-management lists or corruption. In both cases, "dependable members of lower and middle management are […] instructed to make themselves available as worker representatives" (ibid: 419). Works councils therefore end up in a mix between pro-management members and more vehement delegates. The latter – previously described in section 6.1 – take "more strongly diverging positions of interest representation" and often label their struggle as 'war' (ibid, p. 420). Table 1.18 shows that they end up receiving most of the negative effect of membership on wages. Note that one could expect the others to receive a positive premium for their mandate, which is not observed in the data. Like Bourdieu and Breda (2016), I do not have the means to explain why firms do not 'buy' the most cooperative councilors in the private service sectors.

The rather negative impact of mandates on the monthly wage of unionized workers is more surprising. In the service sector, unions "often play a rather ambivalent role. […] For the trade union organisations concerned, the question here is whether it is worthwhile to engage with all-powerful companies, as long as the general works council chairperson […] [is] a Ver.di member[52] and (at least) bothers to enforce the low-wage sectoral collective agreement. These union organisations would, in turn, have to be a bit 'crazy' to invest work and time in the organisation and defence of the precariously employed, whose membership dues are tiny and who in three months will change jobs again anyway. […] The 'all-too-critical' activists are often advised to take the settlements offered and not to start yet more 'crazy' conflicts that cannot be maintained over the longer term". According to these lines, in the private

[52] Ver.di is the largest union for workers in the service sector.

service sectors, we could therefore expect unionization to deflate councilors' vehemence; which is not found in the data.

In the end, these elements do not fully validate hypothesis *H3*. Politically active representatives experience most of the discrimination caused by mandates. However, the sign of this discrimination is not one-way and depends on the sector. The prerogatives ascribed to representatives and the cultural expectations regarding their actions apply differently between the manufacturing and the service sectors. They give employers incentives to react differently when facing politically active works councilors. In the private service sectors, negative discrimination is a way to undermine opposition and to avoid sharing decision power. In the manufacturing sector, positive discrimination is a way to 'buy' councilors' cooperation in order to escape the constraints of the traditional German model of industrial relations.

Conclusion

In this paper, I estimated the impact of works council membership on labour incomes in Germany. Three main elements of motivation drove the analyses. First, for years now, Western European countries have experienced a strong trend towards decentralisation of collective bargaining. This means that negotiations on questions of strategic importance for both employers and employees are increasingly led at the firm level, thereby increasing the role of works councilors.

Second, this evolution is of particular relevance for Germany, where the traditional model of industrial relations relies on large coverage of branch-level bargaining, ensuring a cooperative atmosphere at the firm level. On the shop floor, works councilors endowed with the largest entitlements in the West could therefore peacefully negotiate with their employers to increase the size of the entreprise's pie. The latter is then shared between labour and employers according to the rules decided ex-ante at the branch level. Strongly and steadily, foreign and domestic actors have praised this model. However, as documented in the paper, Germany has not avoided the upheaval occurring in Western industrial relations since the 1980s, and it is unclear to what extent the cooperative feature of its traditional model still applies today. Zooming in

on how works councilors fare in Germany is therefore a way to shed light on the quality of shop-floor negotiations in the country.

The final motivating factor is the lack of economic literature on the matter. We know much about how collective organisations (works councils, trade unions) impact covered firms and their average worker. However, we know very little about how the very actors leading the negotiations themselves fare. A sole stream of research has addressed this issue in the case of union delegates in France (Breda, 2014; Bourdieu and Breda, 2016). This paper therefore builds on that literature, using this time panel data. To my knowledge, this is the first paper to focus on a non-unionised form of representation.

The data come from the German Socio-Economic Panel, a yearly panel representative of the German population. It provides information on industrial relations – and, in particular, on works council membership – in 2001, 2003, 2006, 2007, 2011 and 2015. The main model I estimate is therefore an OLS with individual and time fixed effects on individuals working in firms with a works council. For each respondent, I restrict the sample to the longest of her working spells within a firm, so that estimations are free of firm intrinsic characteristics that are constant over time.

For individuals observed both in and out of office (switchers), estimations show a differentiated impact of works council membership on the hourly gross wage according to the sector. In the manufacturing sector, 'switchers' earn approximately 4.5% more during their mandate than when out of office. Conversely, a penalty of 4% is found in the private service sector – from which I excluded banking and insurance, which display very particular patterns of industrial relations. These results are robust to several tests, including variations in the sample or differentiation between entrance and exit from the works council. No difference in attrition likelihood can be evidenced between works councilors and their colleagues in the samples of interest. A side result addresses the impact of union membership on wages: it is negative in both sectors.

In the manufacturing sector, I then show that, before their elections, representatives experience a downward trend in their earnings relative to their

colleagues. Taking this trend into consideration inflates the final premium to 7% in this sector. Data limitations prevent me from leading similar estimations in the private service sectors. I nevertheless present elements showing that, in these sectors as well, the association between works council membership and wages should be understood as a deliberate firm policy targeting elected representatives. Here, I build on Breda (2014), who formalised why rational employers can have an interest in strategically discriminating works councilors during their mandate.

I explain why this framework is likely to apply to the German case and better fits our results than a win-win scenario in which shop-floor cooperation would generate rents well distributed between labour and employers. In particular, I show that politically active representatives experience most of the discrimination caused by mandates – either positively or negatively. The prerogatives ascribed to representatives and the cultural expectation regarding their actions apply differently in the manufacturing and the service sectors, giving employers incentives to react differently when facing politically active works councilors. Using Artus' work, I show why, in the private service sectors, negative discrimination is a way to undermine opposition and to avoid the sharing of decision power. Relying on Haipter's research, I then explain that in the manufacturing sector, positive discrimination is a way to 'buy' councilors' cooperation in order to escape the constraints of the traditional German model of industrial relations.

Appendix

Appendix A1: Descriptive statistics

Table 1.10: Distribution of the dependent variables

		Number of observations	Mean	Standard deviation	Minimum	Maximum
Works councilors	Hourly gross wage	730	17.2	5.9	6.8	43.5
	Monthly gross wage		3106	1126	1176	8638
	Actual working hours		42.0	4.7	30.0	60.0
Non-elected workers	Hourly gross wage	8523	18.2	6.7	6.2	54.3
	Monthly gross wage		3339	1403	1140	11660
	Actual working hours		42.4	5.1	30.0	60.0

Source: German Socio-Economic Panel, own calculations

Table 1.11: Average values of different variables according to the sample, firm coverage and within covered firm according to the WoCo membership status (see note).

	Workers in the SOEP	Workers in non-covered firms	WoCo members in covered firms	WoCo members in covered firms who switch status	Non-elected workers in covered firms	Difference (3) – (5)
	(1)	(2)	(3)	(4)	(5)	(6)
Hourly gross wage	14.99	13.89	17.25	17.31	18.22	-0.97***
Monthly gross wage	2,525.25	2,648.51	3,106.12	3,142.30	3,339.43	-233.31***
Actual working hours	37.78	44.28	41.95	42.28	42.35	-0.40**
Sex m=1 fem=2	1.48	1.33	1.28	1.27	1.32	-0.04**
Age of Individual	42.28	42.68	45.54	44.56	44.59	0.95***
Region W=1 E=2	1.22	1.31	1.24	1.22	1.23	0.02
Senioriy	10.43	11.06	16.93	16.59	16.16	0.77**
Education						
General Elementary	0.08	0.05	0.07	0.06	0.06	0.00
Middle vocational	0.51	0.58	0.56	0.55	0.49	0.07***
Vocational + Abitur	0.08	0.08	0.07	0.07	0.08	-0.01
Higher Vocational	0.08	0.09	0.07	0.10	0.10	-0.03**
Higher Education	0.22	0.18	0.22	0.21	0.26	-0.04**
Inadequate or no answer	0.03	0.01	0.01	0.01	0.01	-0.00
Isco88 (1 digit)						
Legislators senior officials and managers	0.05	0.08	0.06	0.04	0.06	-0.00
Professionals	0.14	0.11	0.17	0.16	0.18	-0.01
Tech. and associate professionals	0.24	0.22	0.27	0.29	0.27	0.00
Clerks	0.13	0.10	0.14	0.12	0.13	0.00
Service workers and shop and market sales workers	0.10	0.09	0.03	0.03	0.03	-0.00
Craft and related workers	0.14	0.25	0.19	0.21	0.15	0.04***
Plant and machine operators and assemblers	0.09	0.09	0.08	0.10	0.12	-0.04***
Elementary occupations	0.08	0.05	0.05	0.04	0.05	0.00
Unknown	0.03	0.02	0.02	0.01	0.01	0.00
Sector (1 digit)						
Energy	0.01	0.00	0.02	0.01	0.03	-0.00
Mining	0.00	0.00	0.01	0.01	0.00	0.00*
Manufacturing	0.20	0.26	0.28	0.29	0.28	-0.00
Construction	0.14	0.20	0.13	0.14	0.16	-0.02*
Trade	0.15	0.22	0.10	0.09	0.06	0.04***
Transport	0.06	0.05	0.07	0.07	0.07	0.00
Bank Insurance	0.05	0.01	0.06	0.05	0.09	-0.03**
Other Services	0.36	0.25	0.33	0.33	0.31	0.01
Public sector	0.22	0.06	0.30	0.29	0.31	-0.01
Firm size						
[5 ;20[	0.18	0.37	0.02	0.03	0.02	0.01*
[20 ; 100[	0.21	0.37	0.16	0.15	0.10	0.07***
[100 ;200[	0.10	0.10	0.12	0.14	0.11	0.01
[200 ;2000[	0.23	0.10	0.37	0.33	0.37	0.00
≥ 2000	0.24	0.05	0.31	0.34	0.40	-0.09***
Unknown	0.04	0.02	0.01	0.01	0.01	-0.00
Number of observations	48,562	3,870	730	473	8,523	

Source : German Socio-Economic Panel own calculations

Note: Column (1) includes all workers in firms with at least 5 workers in the non-agricultural sector excluding civil servants, voluntary workers and militaries. In the other columns, selection goes further: the sample is restrained to the longest spell observed within a firm of full-time workers employed on open-ended contracts and aged between 20 and 64. Column (2) shows statistics for the workers in firms non-covered by a works council to the contrary of columns (3), (4) and (5). Column (3) and column (5) are based on a split of the main sample of estimation. They respectively account for works councilors and non-elected workers. In between, column (4) gives information on the years of mandate of respondents observed both in and out of office in the main sample.

Appendix A2: Number of full and partial releases of works councilors according to firm size

Table 1.12: Number of works councilors according to the firm size

Number of employees	Number of works councilors	Number of works councilors fully released
5–20	1	0
21–50	3	0
51–150	5	0
151–200	7	0
201-300	7	1
301-500	9	1
501–600	9	2
601–900	11	2
901-1000	11	3
1001–1500	15	3
1501-2000	15	4
2001–2500	19	5
2500-3000	21	5
3001–3500	23	6
3500-4000	25	6
4001–4500	27	7
4501-5000	29	7
5001–6000	31	8
6001–7000	33	9
7001–8000	35	10
8001-9000	35	11
9001-10000		12
>9000	+2 per bracket of supplementary 3000 workers	
>12000		+1 per bracket of supplementary 2000 workers

Source : 2001 Works Council Act

Appendix A3: OLS with no individual fixed effect

Table 1.13: Effect of works council and union memberships on the log hourly gross wage according to the sector (baseline model without individual fixed effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	All sectors	Manufacturing sector	Construction sector	Private service sectors --- (incl. banking and insurance)	Private service sectors ---- (no banking or insurance)	Public Sector ---- (no civil servant)
Member of the Works Council	-0.021*	0.033	-0.029	-0.074**	-0.066**	0.006
	(0.013)	(0.022)	(0.035)	(0.029)	(0.031)	(0.021)
Member of a Trade Union	-0.006	-0.006	-0.003	-0.031	-0.034	-0.006
	(0.009)	(0.016)	(0.022)	(0.023)	(0.024)	(0.015)
Individual Fixed Effect	No	No	No	No	No	No
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,253	2,442	1,241	2,036	1,557	2,731
Adjusted R^2	0.488	0.463	0.576	0.491	0.472	0.481
Individuals	2761	768	396	673	529	834

Model: OLS with time fixed effects.

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source : German Socio-Economic Panel, own calculations

Appendix A4: Details and further analysis of the baseline regressions

Table 1.14 - Differentiation of the baseline effects between entrance and exit from the works council. Dependent variable: log hourly gross wage

	(1) Manufacturing sector	(2) Manufacturing sector	(3) Private service sectors	(4) Private service sectors
Member of the Works Council	0.040*	0.083**	-0.038	-0.067*
	(0.022)	(0.035)	(0.024)	(0.036)
Member of a Trade Union	-0.014	-0.023	-0.066***	-0.064***
	(0.014)	(0.015)	(0.021)	(0.023)
Individual Fixed Effect	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes
Group 1 (enter WoCo)+	✓		✓	
Group 2 (leave Woco)+		✓		✓
Group 3 (enter & leave WoCo)+				
Group 4 (always in WoCo)+				
Group 5 (never in WoCo)+	✓	✓	✓	✓
Observations	2,252	2,144	1,417	1,347
Adjusted R^2	0.842	0.843	0.908	0.900
Individuals	720	686	487	464

Model: OLS with individual and time fixed effects.

Standard errors in parentheses are clustered at the individual level. *** p<0.01, ** p<0.05, * p<0.1

Source : German Socio-Economic Panel, own calculations

+ I separate agents who are observed at least once as a works councilor into four groups. Among the 'switchers', group 1 includes respondents whose only change in status is to become a works councilor, group 2 includes respondents whose only change in status is to leave the works council, group 3 includes respondents who are observed both voted in and out of the organisation. Group 4 includes respondents always observed in office. Respondents never observed in office are part of the group 5

Table 1.15: Details of the baseline regression for the main samples of interest

	All sectors		Manufacturing sector		Private service sectors ---- (no banking or insurance)	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Member of the Works Council	0.003	(0.009)	0.045***	(0.017)	-0.040**	(0.018)
Member of a Trade Union	-0.013*	(0.008)	-0.010	(0.014)	-0.065***	(0.019)
Age Category (ref: 20-35 y.o.)						
36-43 y.o.	0.028***	(0.008)	0.059***	(0.017)	0.015	(0.018)
44-50 y.o.	0.034***	(0.012)	0.061**	(0.024)	0.035	(0.026)
51-64 y.o.	0.020	(0.015)	0.057*	(0.032)	0.009	(0.034)
Seniority (ref: [0; 6.2[ )						
[6.2;11.9[	0.046***	(0.007)	0.060***	(0.014)	0.022	(0.014)
[11.9;20[	0.060***	(0.010)	0.066***	(0.020)	0.028	(0.022)
>= 20	0.053***	(0.014)	0.064**	(0.029)	0.005	(0.034)
Isco88 (ref: Legislators senior officials and managers)						
Professionals	-0.004	(0.011)	-0.002	(0.024)	0.020	(0.022)
Technicians and associate professionals	-0.014	(0.011)	0.018	(0.023)	-0.015	(0.021)
Clerks	-0.025**	(0.012)	-0.002	(0.029)	-0.036	(0.024)
Service workers and shop and market sales workers	0.001	(0.020)	0.121	(0.158)	-0.002	(0.029)
Craft and related workers	-0.015	(0.014)	0.011	(0.026)	0.006	(0.040)
Plant and machine operators and assemblers	-0.023	(0.015)	0.010	(0.026)	-0.033	(0.049)
Elementary occupations	-0.007	(0.017)	0.037	(0.031)	-0.028	(0.036)
Unknown	-0.069**	(0.032)	-0.117*	(0.063)	-0.011	(0.063)
Sector (ref: c1=energy, c5=trade)						
Mining	-0.055	(0.056)				
Manufacturing	-0.011	(0.029)				
Construction	-0.018	(0.029)				
Trade	0.000	(0.031)				
Transport	-0.033	(0.033)			-0.110***	(0.039)
Bank Insurance	0.023	(0.037)				
Other Services	0.001	(0.028)			-0.084**	(0.038)
Unknown	-0.029	(0.118)				
Firm size (ref: [5 ;20[ )						
[20 ; 100[	0.014	(0.019)	0.013	(0.070)	-0.063	(0.053)
[100 ;200[	0.028	(0.020)	0.075	(0.070)	-0.082	(0.054)
[200 ;2000[	0.014	(0.019)	0.049	(0.069)	-0.072	(0.053)
>= 20	0.011	(0.020)	0.068	(0.070)	-0.097*	(0.053)
Unknown	0.049	(0.034)	0.162*	(0.088)	-0.149*	(0.084)
No working hour agreement	0.014	(0.014)	0.034	(0.027)	0.018	(0.032)
Survey year (ref: 2001)						
2003	0.088***	(0.005)	0.075***	(0.010)	0.102***	(0.012)
2006	0.130***	(0.006)	0.101***	(0.013)	0.161***	(0.015)
2007	0.133***	(0.007)	0.111***	(0.015)	0.164***	(0.017)
2011	0.227***	(0.009)	0.200***	(0.020)	0.261***	(0.022)
2015	0.352***	(0.012)	0.323***	(0.025)	0.409***	(0.030)
Month of interview (ref: Jan)						
February	-0.009	(0.007)	-0.009	(0.014)	-0.033**	(0.017)
March	-0.011	(0.008)	-0.012	(0.015)	-0.029*	(0.018)
April	-0.004	(0.008)	-0.002	(0.017)	-0.009	(0.019)
May	-0.011	(0.009)	-0.012	(0.018)	-0.018	(0.021)
June	-0.008	(0.010)	-0.009	(0.020)	-0.027	(0.024)
July	-0.008	(0.012)	-0.019	(0.026)	-0.027	(0.027)
August	-0.008	(0.014)	-0.006	(0.028)	0.018	(0.033)
September	0.006	(0.017)	0.023	(0.036)	-0.036	(0.035)
October	0.018	(0.033)	0.082	(0.069)	-0.029	(0.092)
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,253		2,442		1,557	
Adjusted R^2	0.853		0.835		0.901	
Individuals	2761		768		529	

Model: OLS with individual and time fixed effects; Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1; Source : German Socio-Economic Panel, own calculations

Appendix A5: Robustness checks

Table 1.16: Share of German employees working in firms with more than 250 employees covered by …

	… sectoral collective agreements	… firm-level collective agreements	… a works council
2000	76.6%	12.8%	92.4%
2001	75.2%	14.6%	92.0%
2002	77.8%	12.1%	93.7%
2003	74.7%	13.9%	92.2%
2004	76.8%	12.4%	92.7%
2005	76.3%	12.6%	91.5%
2006	73.3%	14.0%	89.2%
2007	73.6%	12.1%	89.3%
2008	70.0%	13.3%	88.9%
2009	67.1%	15.6%	89.5%
2010	69.9%	14.2%	88.9%
2011	70.1%	13.0%	89.0%

Source: Addison et al (2017).

Table 1.17: Alternative sample - workers in firms with more than 200 employees. Dependent variable - log hourly gross wage

	(1)	(2)	(3)	(4)	(5)	(6)
	All sectors	Manufacturing sector	Construction sector	Private service sectors --- (incl. banking and insurance)	Private service sectors ---- (no banking or insurance)	Public Sector ---- (no civil servant)
Member of the Works Council	-0.003	0.035**	0.007	-0.045**	-0.062**	-0.020
	(0.010)	(0.018)	(0.031)	(0.022)	(0.024)	(0.018)
Member of a Trade Union	-0.012	-0.024*	-0.012	-0.013	-0.022	-0.001
	(0.008)	(0.014)	(0.023)	(0.019)	(0.021)	(0.016)
Individual Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,874	2,624	1,386	2,484	1,889	2,480
Adjusted R^2	0.859	0.843	0.841	0.896	0.895	0.821
Individuals	3121	852	458	867	675	807

Model: OLS with individual and time fixed effects.

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source : German Socio-Economic Panel, own calculations

Table 1.18: Test of a differentiated attrition between the treatment and the control. Dependent variable - probability to be unobserved in the next wave

	(1)	(2)	(3)	(4)
	All sectors	Manufacturing sector	Private service sectors	Public Sector (no civil servant)
Member of the Works Council	-0.126*	-0.041	0.230	-0.235*
	(0.070)	(0.138)	(0.153)	(0.132)
Member of a Trade Union	0.055	0.097	-0.025	0.090
	(0.043)	(0.079)	(0.117)	(0.078)
Individual Fixed Effect	No	No	No	No
Time Fixed Effect	Yes	Yes	Yes	Yes
Observations	8,275	2,209	1,374	2,422
Individuals	2762	768	530	835

Model: OLS with time fixed effects.

Standard errors in parentheses are clustered at the individual level. *** p<0.01, ** p<0.05, * p<0.1

Source : German Socio-Economic Panel, own calculations

Appendix A6: Number of individuals identifying the main effects

Table 1.19: Number of individuals identifying the main effect (i.e. switching status) according to the regression model and the sample

	All sectors	Manufacturing Sector	Private Service Sectors (excl. banking and insurance)	Public Sector
Baseline regression	300	86	65	81
Robustness Check - Large firms	262	86	48	70
Robustness Checks - Enter WoCo		60	44	
Robustness Checks - Exit WoCo		26	21	

Source: German Socio-Economic Panel, own calculations

Table 1.20: Number of individuals identifying the main effect in the baseline regression according to their union and political status when first observed

	Manufacturing Sector	Private Service Sectors (excl. banking and insurance)
Total number of individuals identifying the main effect in the baseline regression …	86	65
… of which, N were unionized when first observed	59	23
… of which, N supported a political party when first observed	52	35

Source: German Socio-Economic Panel, own calculations

Table 1.21: Number of individuals in the group of respondents about to be elected in column (1) of table 7

Manufacturing Sector
29

Source: German Socio-Economic Panel, own calculations

Chapter 2

Apprenticeship training, better labour market outcomes in France than in Germany

Abstract

This paper compares how well apprenticeship training helps open the door to the labour market in France and Germany between 1998 and 2013. The data used come from the German Socio-Economic Panel and the Enquêtes Génération from Céreq. Estimates using instrumental variables reveal that, in relation to standard academic studies, apprenticeships offer a greater labour market advantage in France than in Germany upon leaving secondary school. Hiring rates in training companies, at the end of an apprenticeship contract, are higher in Germany, but, for those who are unsuccessful, finding a job on the external market is easier in France. A higher education diploma in apprenticeship does not represent an advantage on the labour market in either country.

Introduction

The unemployment rate since 1991 for 15-25-year-old Germans has averaged 11 percentage points (pp) below the French rate. For the population aged 25-74, the difference is 0.5 pp. German success, in terms of the specific integration of its young people, is usually explained by the importance of its apprenticeship system. More than half of each age cohort has indeed become qualified this way, while the development of work-linked training largely explains the international variance in terms of youth unemployment (Van der Velden and Wolbers, 2003).

In France, on the other hand, apprenticeships are a minority. Nearly half of secondary school students are involved in vocational studies, as in Germany; however, only one third of them undertake an apprenticeship, compared to more than double across the Rhine. This situation, institutionalized in the post-war years, was called into question from the 1970s, with the increase in unemployment among the least qualified and the youngest. The impact of reforms aimed at increasing the number of apprentices, has been limited however: the target of 500,000 apprenticeships announced by various government majorities since 1993 has not yet been achieved. In this context, the political discourse has taken a new direction: to import the principles of the German apprenticeship system. This new orientation is based on two presuppositions. On the one hand, apprenticeship in Germany is more widespread because its organization involves more companies. On the other hand, apprentices experience faster transitions to employment, these two aspects reinforcing each other.

However, to my knowledge, the only studies on the labour market outcomes of German apprentices are based on old data (1980s, 1990s) and on (ex-) West Germany alone. In addition, there is no comparative study of the two countries. This work intends to fill the gap. Its objective is both intra- and inter-country.

The higher representation of apprentices in Germany mechanically accounts for a share of the youth unemployment difference between the two countries. They belong to the active labour force, while students in the school curriculum are counted as inactive. When calculating the unemployment rate

at the end of studies and considering apprenticeship as initial training, the difference is markedly reduced and diminishes over time. The paper therefore mostly focuses on the 12 months after leaving school – though I show that most results are persistent on the medium run. By mobilizing data from Céreq Generation surveys, for France, and from the German Socio-Economic Panel, for Germany, the impact of apprenticeship training on the following variables is therefore analysed: number of months unemployed the year after leaving school, time spent in full-time *compared to* part-time work during that twelve-month period, first observable full-time salary. The medium-run outcomes are the following: the likelihood to experience a continuous period of employment longer than 18 months in the three years after leaving school, the waiting time before this period, and the wage at its end. The selection bias is processed with instrumental variables[53]. The instrument is the proportion of apprentices in the total number of pupils or students at the relevant level prevailing in the year preceding the choice of stream.

On average, between 1998 and 2013, apprentices in both countries enjoy better access to the labour market than school leavers. However, the relative advantage on the short run is greater in France. In fact, in terms of the unemployment rate in the year after leaving school, it represents a benefit of about 6.75 pp more than in Germany. This is partly driven by the much better outcomes that German students experience upon completion of standard education in comparison with their French counterparts. It is then shown that apprentice success is a result of different channels upon completion of secondary education in both countries. In France, the hiring rate of training companies is lower. Nevertheless, companies on the external market prefer former apprentices, even if not hired by their school-leavers training company, which does not seem to be the case in Germany. On the longer run,

[53] Apprenticeship and non-apprenticeship populations in the databases are expected to differ according to unobservable characteristics. This must be taken into account in order not to attribute an effect to apprenticeship training that actually results from these "intrinsic" differences (selection bias). An instrumental variable approach is then used to estimate the causal relationship between apprenticeships and insertion, by restricting the analysis to sub-populations considered comparable.

apprenticeship is associated with greater stability in employment in both countries. The gain in speed to access stability is however stronger in France.

The causal analysis provides the main results[54]. Firstly, it is suggested that, in France and Germany, compliers in the IV analysis are good students from higher education and pupils in difficulty from secondary education. The dual track does not have the same effect on their insertion in both countries. In France, apprenticeship at the secondary level does not seem to bring a higher wage to these young people, who nevertheless benefit from a strong added value in terms of avoiding unemployment. In German secondary schools, on the contrary, apprenticeship tends to have a negative effect on their chances of finding a job. Finally, for the above-mentioned students from higher education, in both countries, the transition to apprenticeship does not help integration.

The first section of this article presents the institutional models of apprenticeship from both countries and replaces this work in the existing literature. The second section details the data and justifies the choice of the instrumental variables method and the instrument. The third section provides some descriptive statistics on the unemployment rate of the youth and the likelihood to be retained in the training firm upon completion of an apprenticeship contract in the countries. The fourth and fifth sections describe the results mentioned above – respectively on the short and the medium run.

1 Apprenticeship and insertion: institutional models and pre-existent literature

The institutional context of apprenticeship in France and Germany is first defined here. The main aspects of the literature on the impact of the curriculum on integration in both countries are then summarized. Their analysis allows me to formulate hypotheses to be tested in the next sections.

[54] These are the results obtained from the instrumental variables method and identified on specific sub-populations. The "average" differences previously mentioned do not take into account the "intrinsic" differences between apprentices and non-apprentices. See note 53.

1.1 Apprenticeship: a heterogeneous training in both countries...

In Germany, apprenticeship traditionally takes place in upper secondary education and, in principle, makes it possible to pursue higher education (Bernhard, 2019). It is accessible after the three streams of lower secondary education (*Hauptschule, Realschule, Gymnasium*). However, in a context of inflation of diplomas, *Hauptschule*-armed school leavers - generally with poorer grades - find it increasingly difficult to find a company in which to do their apprenticeship (see table 1.14 in appendix A1). Only 40% manage to do so, compared to 60% for those exiting *Realschule* – though most students of both tracks target the dual system. Moreover, when this is the case, students from *Hauptschule* receive poorer quality training on average than *Realschule* and *Gymnasium* school leavers. The former most often sign two-year contracts in the craft industry, while the latter gain access to contracts of three to three and a half years in large German industrial companies (Granato and Kroll, 2013).

What unifies apprenticeship in Germany is therefore "a common system of training [defined by the same legislation], rather than a single level" (Möbus and Sevestre, 1991: 82). Note that the dual system is not a dead-end in terms of education since it is a gateway towards higher education. On-the-job training also provides good opportunities for postapprentices, especially through the Maister qualification which is needed to train apprentices (see figure 1.3 in appendix A1).

In France, apprenticeship is even more heterogeneous, since most diplomas can be obtained *via* the standard academic path or by apprenticeship. In particular, the baccalaureate (GCE A-levels) constitutes a “glass ceiling”, separating two apprentice populations quite distinct showing few movements on either side (Moreau, 2008: 126). Only 28% of the apprentices from secondary education access higher education; similarly, 12% of the apprentices in higher education are former graduates from apprenticeship in secondary education (Moreau, 2003). Apprentices from secondary education are more often coming from disadvantaged social classes and are more likely to have faced difficulties in lower secondary education. As such, they are more

similar to vocational high school students than to apprentices from higher education (Kergoat, 2010).

Heterogeneity in contracts is strong in France as well: more craft-based in secondary schools, training programmes in large industrial companies and services for the tracks in higher education. The apprenticeship function there is also distinctive. While it lasts at least two years in secondary education, it is often a kind of "super-internship" in higher education, and lasts less than a year in 35% of cases (Martinot, 2015: 21). Triggered with the 'Séguin' (1987) and 'Cresson' (1992) laws which enacted higher education apprenticeships, the heterogeneity of apprentices in France has been accelerating. Nearly all of the increase in the number of apprentices since 1996 has materialized in higher education which now accounts for 30% of the total (see figure 1.4 in appendix A1).

1.2 ... improving the transition to employment in France, and, in a more ambiguous way, in Germany, with no clear-cut impact on wages.

In France, Sollogoub and Ulrich (1999) and Simonnet and Ulrich (2000) show that, among students leaving school at the end of secondary education, apprentices are advantaged in terms of rapidity of access to the first job and of employment duration during the first four years following the school exit. This latter effect decreases with the diploma level. They use the several-step method from Barnow, Cain and Goldberger (1980) to clear the selection bias into apprenticeship. Using a bivariate probit[55], Issehnane (2011) finds similar results. The effect on wages is more ambiguous: none in the short term (Simonnet and Ulrich, 2000; Issehnane, 2011), but it is positive three years after the completion of studies for Abriac and al. (2009) (bivariate probit) and negative four years after the completion of studies for Sollogoub and Ulrich (1999). At the exit of higher education, Issehnane (2011) notes a positive effect of apprenticeship on wages, but not on the probability of employment once the selection bias is taken into account.

[55] These two methods are discussed in appendix A5.

In Germany, according to Winkelmann (1996) and (Franz et al., 2000), apprentices find a job quicker after graduation than school-leavers. Parey (2012) shows that taking the selection bias into consideration does not affect the nature of the result: among young men aged 23 to 26 who left school at the end of secondary education, ex-apprentices are less likely to experience a period of unemployment in excess of a month. On the other hand, according to Winkelmann (1996) when they are unemployed, ex-apprentices find it more difficult to find a job than school-leavers. As for wage prospects, no significant difference can be evidenced between young people with standard schooling and apprentices – both on average and after taking into account the selection bias – (Winkelmann, 1994 ; Parey, 2012). Importantly, the aforementioned studies refer to West Germany before 2000. To my knowledge, only Riphahn and Zibrowius (2016) have worked nationwide and over a more recent period. They focus on the difference between vocational and general studies, but one of their secondary outcomes refers to apprenticeship and they do not observe any effect on access to employment.

1.3 Different mechanisms can explain why apprentices integrate quicker on the labour market…

The literature has mostly referred to four mechanisms to explain why apprentices integrate quicker on the labour market than students graduating from standard schooling. The first one relates to the positive impact of work-based learning for students to acquire skills. Thus, the literature in education research has first argued that apprenticeship increases the motivation of students showing the least taste for academic studies by making concrete the theory learnt at school (Lerman and Pouncy, 1990; Unwin and Wellington, 1995). Being surrounded by expert workers would also extract students from peer pressure opposing hard work at school (Lerman and Pouncy, 1990). On the cognitive side, the combination of theoretical and applied learning may generate positive spillovers on each other (Parey, 2012). Through work experience, apprenticeship may finally provide a young person work-related skills such as self-discipline or team-work abilities, thereby easing the often sharp transition between full-time studies and work (Brzinsky-Fay, 2007; Parey, 2012). By combining school and work and bringing the young into the

firm, apprenticeship training would therefore be a more efficient way to transmit a given set of skills to students – and especially to those showing the most difficulties at school.

But apprenticeship training and standard schooling do not provide similar sets of skills. Contrarily to the case of standard schooling, employers' associations have a role to play on the design of both the school-based and the in-house parts of apprenticeship curricula. This should shape teaching more efficiently towards the actual production needs, and particularly so if firms are more likely to share private information such as their skills requirements to business associations than to the public actors in charge of designing courses for standard education (Culpepper, 2003; Wolter and Ryan, 2011).

Third, even though regulatory rules on apprenticeship limit employers' discretionary power regarding on-site training, there is still some room to adapt it to firms' specific needs (Barone and van de Werfhorst, 2011). According to Becker (1962) this is even necessary for the system to hold. He indeed forecasted that, confronted with a risk of seeing their apprentices 'poached' upon graduation, firms involving in apprenticeship would only invest in (i.e. pay for) firm-specific human capital. The literature has proven his theory insufficient in the presence of rigidities since then (see appendix A2), but, what matters here, is that firms do adapt apprenticeship curricula and provide a mix of firm-, sector- and general- skills suiting their activities. In Germany for instance, Dustmann and Schönberg (2007: 6) show that apprenticeship training consists in 5% of firm-specific skills, 35% of sector-specific skills, and 60% of general skills. As a result, firms can follow a train-to-hire strategy at low cost thanks to the low wage of apprentices[56]. Note that this `investment strategy' (Lindley, 1975) is especially likely to happen when firms face (or expect) a shortage in the external supply of skilled labour (Fougère and Schwerdt, 2002). Apprentices benefitting of such training are therefore likely to be retained by the company after graduation.

[56] This argument should be nuanced: in his 1994 article on the German apprenticeship, Soskice leads a back-of-the-envelop calculation suggesting that on-the-job training costs necessary to adapt a worker externally hired to the tasks ascribed to her is "of the same order of magnitude as the net costs of an apprenticeship" (Soskice, 1994:46). Yet, this is only a one-fit-all intuition and more research on the issue is needed.

A last explanation accounting for the advantage that apprentices benefit on the labour market is the signal offered by the track. In both France and Germany, apprenticeship training is often more selective than standard curricula. Unable to fully observe students' abilities, external firms could therefore prefer graduates from the former.

1.4 ... which analysis struggles to establish in which country the relative advantage is the strongest

Within-country articles mentioned in section 1.2 are insufficient to state which of the French or German apprenticeship systems provides the best relative outcome to apprentices. To my knowledge, no empirical study has compared the impact of apprenticeship training in the two countries, although this is a prerequisite for any institutional transfer. In this section I build hypotheses relying on three streams of literature at the basis of modern analysis of vocational training: the human capital literature, the Aix school of thought and the Varieties of Capitalism.

1.4.1 The literature of human capital

In section 1.3 and in appendix A2, I explained why some firms endure negative net training costs to provide apprentices with a set of firm-specific, sector-specific and general skills putting them in a good position for labour market integration (both on the internal market of the training firm and on the external labour market). But all firms involved in apprenticeship do not follow this investment strategy. The literature in human capital has evidenced a second possible equilibrium (Lindley, 1975). Firms can indeed substitute regular unskilled workers by apprentices to take advantage of the cheap labour costs of the latter. This 'current production' strategy is cost-based and turned towards present benefits: training firms ensure that their apprentice produces more than she costs through her wage, the training facilities and the non-productive time of the maister. West Germany for instance was plagued with

this type of behaviour before the 1969 vocational law (Taylor, 1981) [57,58]. Note that taking on an apprentice with no plan of subsequent hiring can also be attractive in the case of a shortage of unskilled labour or against an unstable business cycle since apprentices constitute a flexible workforce with low firing costs (Wolter and Ryan, 2011). An apprentice trained in this context therefore ends up in a worse position than the rest of her cohort as she is unlikely to receive a job offer by her training firm and has little credentials to value on the market.

At first look, it seems that the balance between investment and current production strategies is more likely to tip towards the latter when costs exogenous to the firm are lower. In other words, apprentices' outcomes on the labour market would be positively correlated with wages and negatively so with subsidies. As a first estimation, although wage scales are arduous to compare, constrained costs seem to be more important in Germany because public subsidies per year of training are about 5000€ larger in France (Martinot, 2015: 71)[59]. Given the human capital literature, one would therefore expect German students to benefit more from apprenticeships than their French counterparts.

1.4.2 The Aix school of thought

The Aix-school of thought has voiced critics against the human capital literature (see the seminal works of Maurice et al., 1979, 1986). In their words, "the universalism of these approaches assumes invariant across societies two

[57] Such profits during the training period are impossible in a competitive set up since firms enter the market until the surplus drops to zero (Wolter and Ryan, 2011: 537). Negative net training costs therefore highlight the existence of monopsony power, see appendix A2.

[58] The 1969 vocational law incorporated unions as full participants of the apprenticeship system. Before, training was merely under the sole responsibility of firms and chambers (Deissinger, 1996)

[59] Martinot (2015: 71) quantify subsidies to 5644€ per apprentice in France and 455 € in Germany. As for wages, they depend on the school year and the age in both countries. In France, it varies between 25% and 78% of the national minimum wage (i.e. between 366€ and 1144€) or of the sectoral minimum wage if higher. In Germany, apprentices do not benefit from the national minimum wage. Their wage is sectoral and varies between lander, thereby resulting in an even larger spread (for instance, 214€ for a hair-dresser to be in Eastern Germany, 1374€ for an apprentice working with reinforced concrete in Western Germany).

elements of the basic model: the social nature of actors […] and the rationality directing their actions. The strategies implemented and the constraints which constitute the environment solely vary" (Maurice et al., 1979: 333). Conversely, the authors regard social phenomena as coherently interacting and, thereby, they explain differences in outcomes. As for vocational education, this leads Möbus and Verdier (2000: 272) to state: "the vocational diploma, as a result from social bargaining and as a basis of a labour market regulation, is of an extremely different nature on each side of the Rhine: fundamentally an organizing rule of the labour market in Germany (Reynaud, 1987), a mere signal to value on this market in France (Gamel, 2000)".

From this literature several hypotheses on the relative size of the advantage experienced by apprentices on the French and German labour markets can be given. To give them, I first need to sum up the main differences between the two political economies according to this literature. According to Maurice, Sellier and Silvestre (1979) (MSS hereafter), at equilibrium, countries sort into two broad categories depending on the organisation of tasks at the shop floor level. Either firms choose their own criteria to define the work stations and expect workers to adapt to them ("organisation dominates qualifications"), or they firstly take into account workers' qualifications to delineate the job tasks accordingly ("qualifications dominate organisation"). The latter is more frequent when professional training is rare and barely involves employers' associations and unions.

France would therefore fall in this category. There, jobseekers are ranked according to their highest level of diploma from the general education which is thought to best proxy their ability to adapt to work stations. Further, jobs requiring only short on-the-job training are undervalued in comparison with managing or designing tasks. This reinforces the social appeal for long and general education against vocational training. MSS name this ideal-type "Internal Labour Markets" (ILM) and, as mentioned, see France as a good example of it.

The spine of the second ideal-type – to which MSS associate Western Germany – is vocational education and training. It is more likely to develop where "the generalisation of vocational education and its social legitimation urge the firm to define work organisation in function of the professional norms stemming from it, and that the company legitimizes in its turn" (Maurice et

al., 1979: 347). Here, firms enjoy a strong traditional role in the design and organization of the VET. As a result (or as a "compensation" in MSS' words), they acknowledge the referential stemming from the educative system. MSS name this case an "Occupational Labour Market" (OLM).

This framework opens the way for several conclusions. First, as an example of OLM, Germany displays a coherent linkage between the initial and further vocational education systems. Once hired, vocational graduates are often eligible to advanced further training offering them qualifications specific to their branch of trade, transferable to the whole sector and necessary to reach better positions in their firm. This is in particular the case of Maister diploma which entitles to supervise apprentices. Initial and further vocational training in Germany therefore generate cores of professional identity within each branch (Silvestre, 1990). Vocational tracks, and, in particular, apprenticeship training, are therefore attractive. Conversely, such a strong professional identity does not exist in France and VET is depreciated. In particular, French vocational diplomas are targeted towards the continuity of initial education tracks rather than aiming at a direct entrance on the labour market (Möbus and Verdier, 2000). Thus, exiting school after a vocational diploma of secondary education offers better outcomes on the German labour market than in France (Möbus and Sevestre, 1991: 77) (see section 3).

Conclusions regarding the relative advantage of apprentices over full-time students are ambiguous. First, the German OLM better values specific skills than general training and apprenticeship is the school track where qualifications delivered are the most specific (Brauns et al., 1997). Conversely to the French ILM, apprentices should therefore be preferred to full-time vocational students on the external market. Second, since the 18th century, firms are the cornerstone of the organisation of apprenticeship training in Germany while VET is more of a public institution in France (see the general introduction). Intuitively, the positive influence[60] employers' associations can have on apprentices' outcomes on the external market should therefore also be stronger in Germany. But reading of MSS also brings reverse conclusions: during their apprenticeship, students gain knowledge of the specific organisation designed by their training firm and the specific set of skills

[60] Through the design of curricula and the no-poaching condition.

relevant for it. If we believe MSS, this should be more valued in France[61]. This latter hypothesis is reinforced by the fact that French firms have more discretionary power on the contents of on-site training than their German counterparts.

1.4.3 The Varieties of Capitalism

The theories of the Aix School of Thoughts are mostly framed in terms of 'socialisation of the agents' and mostly pertain to a path dependency explanation. Outcomes are rooted in the fact that social agents act according to integrated norms on the industrial sphere and in function of pre-existing levels of recognition of professional training in their own society (this is particularly salient in MSS, 1979; see also MSS, 1982, p. 313-314). Instead, the Varieties of Capitalism literature (Hall, P. and Soskice, 2001) pertains to a framework of game theory. It reintroduces rational and investment-thinking actors[62] in the analysis. In their words, "workers face the problem of deciding how much to invest in what skills, […] firms face the problem of securing a workforce with suitable skills" (ibid, 7). In each country, the vocational education and training system is therefore shaped to solve this equation given the environment applying in the next four spheres: industrial relations institutions, corporate governance, inter-firm relations and the internal structure of firms. As in the previous setion, I first give the main lines of explanation provided by Hall and Soskice to account for the difference in the sphere of VET in France and Germany before showing that here again hypotheses one can draw are ambiguous.

In Germany, access to finance does not traditionally rely on balance-sheet criteria or current benefits. Instead, investors have access to private information through cross-shareholding, joint-membership in business associations and joint-research. Here, reputation plays an important role since exchanges in this sphere consist in a repeated game – notably channelled

[61] The retention rate of apprentices is lower in France than in Germany (see section 3). But this difference does not go against the above-mentioned hypothesis since full-time vocational students also benefit from better outcomes in Germany.

[62] They do refer to informal rules (Hall and Soskice, 2001:13) but this is secondary in their analysis.

through business associations which can monitor and sanction firms if they hide information. Hence the efficiency of business associations in understanding sectoral needs and their ability to pressurize members to take on apprentices. Note that business associations also use industrial-level bargaining to limit poaching risks. The long-run expectations of the financial system allow firms to offer their employees long-term contracts unlikely to be broken in time of recession. Works councils also play a major role in this regard. As members of the supervisory boards, they have some power over lay-offs and working conditions. All in all, the country therefore shows strong levels of rigidities in the management of the workforce. For workers, the cost of investing into firm-specific skills and therefore to engage in apprenticeships is lower than elsewhere.

These main lines of coordination in Germany explain the development of apprenticeship in the country via channels different to MSS. More importantly for our case, long-job tenure as well as the no-poaching condition provides incentive to invest into apprenticeship training to both firms and students. Following Hall and Soskice, after graduation, apprentices should therefore benefit from strong advantages over full-time students in Germany. The sanctioning power of business association necessary for the system to hold should however be put into question. First, firms voluntarily enter these associations. Second, exclusion may lead to a rise in poaching undesired by business associations (Culpepper, 2001: 292). Third, business associations' membership has strongly declined since the 1980s, with particular strength in Eastern German small and medium firm (see chapter 1).

France is an outlier in the VoC literature: it is a Mixed-Market Economy where the State has traditionally played a predominant role in organising the economy both directly via legislation or management of public-owned firms and indirectly through elite civil servants taking position in major private firms (Thatcher, 2007: 155). The organising role of both elected and unelected civil servants has not favoured the development of stakeholders' organisations in the country (Culpepper, 2001; Hancké, 2001; Goyer, 2007). Thus, despite important cross-shareholding between large firms, business associations remain weak. They lack "the capacities of information circulation and deliberation" (Culpepper, 2001: 298) and are generally seen as some State's co-opted bodies

(ibid). Moreover, there are only few cooperative links between suppliers and large firms (Hancké, 2001: 319). With generally low levels of coordination between private actors, apprenticeship training has remained limited in the country.

The State has tried to foster dual tracks. But, with no private actors with whom to coordinate its action, it largely failed its objective (Culpepper, 2001). As a result, apprentices benefit from low levels of portability of sector-specific skills, though poaching risks for training firms remain strong in sectors where competitors are willing to pay high prices for revealing apprentices' abilities (see appendix A2). As for industrial relations, decision power is concentrated in CEOs' and managers' hands; employees have little power resources to block managerial decisions. In particular, "firm-level works councils possess [...] [no] full veto power that could prevent employers from replacing current workers with new employees" (Goyer, 2007: 210). With lesser guarantees to keep their job in case of firm reorganization than their German counterparts, French students have therefore lesser incentive to invest into apprenticeship training.

Here again, two competitive forces therefore seem to play on the relative outcomes of French and German apprentices. First, skills provided in the school part should be less properly targeted at current industrial needs in France because of the weaker involvement of private actors. Skills provided in-house should also be less portable in France. In these respect, German apprentices should benefit from better outcomes on the external labour market. Conversely, skills taught in-house should be more firm-specific in France and one would expect French apprentices to do better on the internal labour market. The 'traditional' institutional literature dealing with apprenticeship training therefore leads towards comparably ambiguous hypotheses.

2 Data and identification strategy by instrumental variables

This methodological section presents the data on which the analysis and choices made to carry out estimates are based. The results of these will be described and discussed in the fourth and fifth sections after some descriptive statistics displayed in section 3.

2.1 Data from two national surveys

I use the Céreq Generation surveys for the French case. Respondents are representative of the cohort of young people - including apprentices - leaving the education system for the first time for more than one year in 1998, 2001, 2004, 2007 or 2010. The results presented here are estimated on the sample which results from pooling these five surveys (see note 71).

On the German side, the sample of young people who left school between 1998 and 2013 is taken from the German Socio-Economic Panel (SOEP), representative survey of the population as a whole. Ideally, we would like to work on this population's first school-to-work transition. However, it cannot be identified with certainty because of a high degree of attrition and the panel entry age in a country where studies are very frequently resumed. The last recorded school-to-work transition is therefore used for both countries[63,64]. Note that, inherently, the German sample is narrower than the French one, which restricts the comparison.

Young people are categorized according to the diplomas obtained and not according to the last course of study, since the SOEP only provides this information. Training specialities are not differentiated herein. If the selection

[63] An underlying assumption is that the probability that the last *recorded* transition is the last *in reality* is independent of having taken an apprenticeship.

[64] I do not take into consideration transitions from further education towards employment since these are occurring in the course of a job. Likewise, training delivered by the public employment service (Pôle emploi and the Bundesagentur für Arbeit) are not taken into consideration here.

to obtain the apprenticeship diploma proved stronger in one of the two countries, this method would generate a bias in the comparative analysis in relation to a categorization based on the last diploma prepared before leaving the education system. Study subjects are different however and there does not seem to be any preference from one to another[65].

Estimates are made separately for two sub-samples per country: leavers after obtaining a high school diploma (secondary sub-sample) and graduates (tertiary sub-sample). We are indeed expecting a differentiated effect of apprenticeship training for these two groups.

For France, the definition of these two sub-samples is trivial: young people leaving school after a certificate of professional aptitude, a vocational studies certificate, a professional baccalaureate or a professional certificate (all taken at the secondary level) for the first group; after a higher education vocational training certificate, a university degree, a degree from a technology university, engineering or business school for the second group. In both cases, the treatment group includes apprenticeship graduates and the control group those from standard academic paths.

In Germany, the principle is the same for the secondary sub-sample: pupils leaving school after a diploma from the dual system form the treatment group, the control group encompasses the graduates of the full-time *Berufsfachschule* and *Fachoberschule.* In the higher education sub-sample, the method is different. For Germany, the traditional apprenticeship track at the upper secondary level is studied exclusively, since tertiary apprenticeship is marginal over the period considered here. The tertiary sub-sample treatment group is therefore composed of students who have successfully pursued their studies in higher education after obtaining a diploma in apprenticeship at the secondary level. The control group consists of other graduates from higher education.

[65] Defined on the basis of entry to apprenticeship only, the group of ex-apprentices would thus include young people who were not very diligent and who have left the course of study after a few weeks alongside the graduates. Interpreting the impact of apprenticeship would then be tricky. The categorization based on the diplomas obtained thus probably more clearly marks out treatment group and control group. Moreover, it constitutes an international comparison benchmark.

Comparing estimates for the tertiary sub-samples between the two countries must therefore be cautious.

The analysis is two-fold. First, it consists of successively estimating the impact of apprenticeship on unemployment, full-time employment and the wage upon graduation. Three variables are used. The study first looks at the number of months spent unemployed, as well as at the ratio of time spent in full-time vs. part-time employment, during the first twelve months after completing study. These variables are calculated from the calendar data in both surveys. Thirdly, a salary analysis of full-time jobs is conducted. Respondents in the SOEP survey provide only one monthly salary per year[66]. We use the survey from the year of completion of studies when available, otherwise the one after. In the French context, the salary used is that from the longest full-time employment episode in the twelve months following the completion of studies.

I then turn to medium-run outcomes and estimate the impact of apprenticeship on three other variables. First, I analyse the likelihood to experience employment for at least 18 months in a row within the 36 months following the school exit. The second dependent variable is the number of unemployed months spent before such an employment spell for those who experience it. Here again, calendar variables are used. The last variable is the medium-run full-time wage. In the French case, I use the wage declared at the end of the first full-time job finishing after the 18th month of the period or in the 36th month if none is observed before. In the German case, I use the first wage declared for a full-time job after the 18th month of the period and before the 36th month.

The time between the completion of studies and the month of interview (respectively beginning of episode) for Germany (respectively for France) is controlled for in the regressions on wages. Note that the size of the estimation samples differs depending on the dependent variable considered[67].

[66] Winkelmann (1996) uses the same method and specifies that the declaration of a monthly salary only once in the year rather than each month only marginally affects its results.

[67] Apart from the number of months spent unemployed in the first post-exit year, all variables are conditioned by labour market outcomes (e.g. be employed for wages). According to Heckman's method (1979), the inverse of a Mills ratio is inserted in the equation of interest.

The impact of apprenticeship training on the dependent variables is initially studied without taking the selection bias into account. The impact on the number of months spent unemployed the year after completion of studies as well as before the 18-month employment spell are calculated by a Poisson estimate because both dependent variables are counting variables. Note however that an OLS estimate provides very similar results for the four sub-samples. The distribution of the former is provided in figures 1.5 and 1.6 of appendix A3. The impact on the likelihood to experience an employment spell of 18 months within the first 36 months is estimated via a probit. The impact on wages and the ratio of full-time hours worked *vs.* part-time hours worked during the first twelve months after completion of studies, are finally estimated by ordinary least squares (OLS).

Box 1.1 Control variables used in the estimates

Estimates are made with control variables that are as close as possible for the two countries: gender, age of school leaving (linear and squared), a dummy variable stating whether the father is of German nationality (respectively French) or born in Germany (respectively in France) for the SOEP (respectively the Générations surveys), father's SES in six categories, level of the last degree obtained (CAP, BEP, professional baccalaureate or professional diploma, BTS or DUT, university, engineering or business schools for France, dual system, full time Berufsfachschule or Fachoberschule, Fachhochschule or university for Germany), age in 6th grade in three categories for France (under 11, 11, over 11 years old) and type of lower secondary education for Germany (Hauptschule, Realschule, Gymnasium), size of the city of residence the year of completing studies for Germany and the city three years after completing study for France (used as a proxy variable for the city in which studies were completed), having children upon completion of studies (used alone and in interaction with the individual's gender), region of the last school and the year studies were completed. For the study of wages, the sector and the size of the hiring company (respectively 3 and 4 categories) and the duration between the completion of studies and the month of interview (respectively beginning of episode) for Germany (respectively for France) are controlled for. The averages and standard errors of the main variables are provided in tables 1.15 and 1.16 in appendix A4.

Acronyms: German Socio-Economic Panel (SOEP), Socio-Economic Status (SES), Certificat d'Aptitude Professionnelle (CAP - vocational training diploma taken at secondary school), Brevet d'Etudes Professionnelles (BEP - vocational training diploma taken at secondary school), Brevet de Technicien Supérieur (BTS - vocational training diploma taken at end of 2-year higher education course), diplôme universitaire de technologie (DUT - vocational training diploma taken at end of 2-year higher education course).

2.2 Taking the selection bias into account

As mentioned in the introduction, it is likely that apprentices have specific characteristics that are unobservable and therefore not captured by the control variables (e.g. higher appetite for the business world). The results obtained in the regressions could then be explained, not by the course followed, but by these intrinsic differences (selection bias).

A method using instrumental variables is therefore mobilized. A two-stage model with a Control Function (CF) is used for the counting variables (short term unemployment and number of months spent unemployed before the 18-month employment spell), where the first stage is an OLS and the second is a Poisson estimate (Wooldridge, 2007, 2014). Two-stage least square (2SLS) results are very close (see tables 1.8 and 1.12). The other dependent variables are estimated by 2SLS. Apart from these models, the literature has used two other methods to clear the selection biais in the case of discrete second-stage variables. The first one jointly estimates the equation of interest and the probability of following an apprenticeship through maximum likelihood technics (Issehnane, 2011). It requires strong assumptions on the joint-distribution of the residuals from the two equations. I do not use it because of the strong lack of accuracy of this method when those assumptions do not stand (Chiburis et al., 2012). The second technique relies on a several-step estimation based on the maximum likelihood technic of the Barnow, Cain, Goldberger paper (1980) (Simonnet and Ulrich, 2000). Yet, as shown in appendix A5, this method does not suit discrete second-step dependent variables and requires manipulation of the data with a risk of error in any case. Hence the recourse to usual IV procedures despite first-stage and some second-stage variables being discrete (Parey, 2012).

The instrument is the apprenticeship rate prevailing in the region in the year preceding the choice to enter apprenticeship or to continue to study in school. There is indeed a strong territoriality of apprenticeships in both countries - see below and Garrouste and al. (2018). Regional spending and involvement in apprenticeships are therefore expected to explain individuals' likelihood to undertake an apprenticeship. The chosen approach is based on the assumption that the apprenticeship rate is a good proxy for this regional investment. In other words, that the latter actually develops apprenticeships.

There are several reasons why a region would choose to invest into apprenticeship training. They include, but are not limited to: (i) political ideas favourable to dual tracks; (ii) strong ties between political actors and business; (iii) efficient lobbying from local trade and industrial chambers. A second hypothesis is that the apprenticeship rate depends primarily on regional investment, and in particular that it does not rely on aspects directly influencing the dependent variables (exclusion condition). These assumptions seem relatively conservative and, as stated above, are regularly used in the literature. The instrument level per sub-sample is visible in table 1.1 (see table 1.7 for its effect in the first-stage equation).

As mentioned, there is indeed a strong regionalization of apprenticeships in both countries. In France, the 1983 law transferred the apprenticeship-related ordinary jurisdiction from the State to the regions. The five-year law of 1993 continued the decentralization process. It transfers all capabilities in the vocational training field for young people under the age of 26 to the regions and requires that a Regional Plan is set up to develop vocational training for young people. It is also accompanied by a financial disengagement in that field on behalf of the government. Regions now account for 23% of spending on apprenticeships. Conversely, apprenticeships are responsible for half of regional expenditure. From 1983, and particularly since 1993, regions have therefore been forced to build regional apprenticeship policies whose orientation depends on the willingness and ability of the regional councils to coordinate the action of the many local stakeholders.

In Germany, the key role of the Länder in the organization of apprenticeship is well known. Along with the local authorities, they manage the expenditure involving dual system institutions. They are also the main players in the choice and management of academic courses in the school part of apprenticeships. On the other hand, companies can use the local office of the Federal Employment Agency to help them fill a vacant position. Finally, in addition to the prerogatives of local and regional authorities, Chambers of Commerce and Industry are responsible for "advising companies, registering apprentices, certifying trainers' specialist aptitude, accepting examinations and conducting social dialogue at regional level" (Hippach-Schneider et al., 2007).

Before examining the results, how the instrument is calculated should be specified. In the French context, the apprenticeship rate is the ratio of the number of apprentices in secondary education (respectively in higher education), relative to the total number of students in vocational training at the secondary level (respectively in higher education) prevailing three years before leaving school. For Germany, apprenticeship is an upper secondary education diploma. The decision on whether or not to undertake an apprenticeship was therefore made at the end of lower secondary education for both the secondary education sub-sample and the higher education sub-sample. The reference ratio for the whole sample is the one that applies in the region the year before the end of lower secondary education. The ratio prevailing at the age of 15 is used by approximation for agents in the secondary education sub-sample and at the age of 16 for those in the higher education sub-sample[68]. Regarding the exclusion restriction, these rates have no expected clear channel of effect on the outcome variables.

To this instrument, some authors have added the crossed effect of apprenticeship rates with a proxy for the level in the first year of secondary education (Alet and Bonnal, 2011) or the size of the city where students were living at age 11 (Simonnet and Ulrich, 2000). Yet, these variables seem to have an effect on labour market outcomes independent independently of whether the respondent has taken an apprenticeship. For these reasons, I stick to the apprenticeship rates as a singular instrument.

Table 1.1: Distribution of the apprenticeship ratio per sub-sample

	French sub-samples			German sub-samples		
	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations
Ratio of apprenticeship in sub-samples ...						
... from secondary education	46%	13%	23,119	74%	8%	1,005
... from higher education	4%	2%	32,416	75%	8%	478

Reading: The ratio of the number of apprentices to the total number of pupils in vocational education prevailing in secondary education, three years before pupils complete their studies, in the French sub-sample is on average 46%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

[68] Pupils leave the *Hauptschule* (respectively *Realschule*, *Gymnasium*) at 15-16 years old (respectively 16-17, 16-18).

3 Descriptive statistics

3.1 Unemployment rates

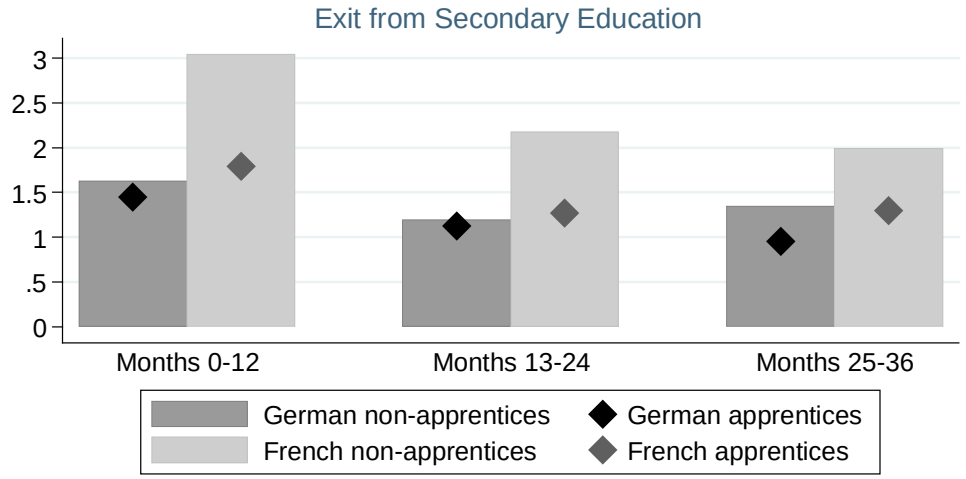
Figures 1.1 and 1.2 display the ratio between the unemployment rate of the treated or control groups and the general unemployment rate applying in the region after the first, second and third years following respondents' school exit. The ratio is separately computed for each of the four cells of analysis. In France, it is the average of the yearly value in 1998, 2001, 2004, and 2007. In Germany, I pool years 1998 to 2007. Note that declarations of unemployment registration are used in Germany, against declarations of job-search in France.

As well known, young people do better in Germany than in France and, in both countries, graduates from higher education do much better than students exiting school upon completion of secondary education. Second, in France, graduates from apprenticeship training benefit from much lower unemployment rates than graduates from standard schooling in all circumstances analysed. This is not as clear in Germany where both groups integrate with a relative similar ease the labour market.

A group-to-group comparison between the two countries brings further information. In the secondary cell, French apprentices benefit from an integration of comparable quality to German graduates from the dual system. It is not the case of students from standard schooling: their relative unemployment rate is twice larger than their German counterparts. Note that the spread quickly drops over time. Upon completion of higher studies, both ex-apprentices and students from standard schooling integrate less well than their German counterparts. Recall however that ex-apprentices are not fully comparable at that level between the two countries.

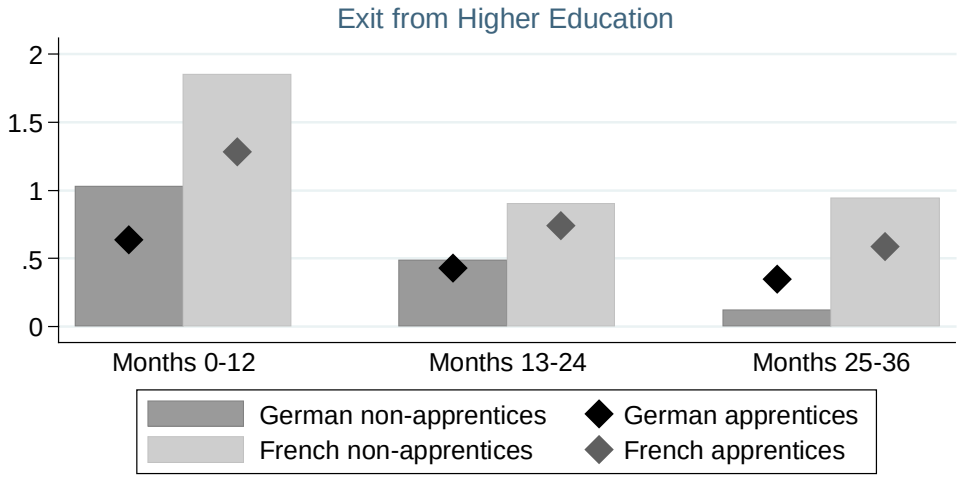
At first sight, the French youth therefore seems to benefit more from apprenticeship training than German students. Further, the French public discourse focusing on the quality of the German dual system in fact misses how well students from standard schooling do across the Rhine.

Figure 1.1 : Youth-to-regional unemployment ratio the first, second and third years following the school exit



Note: The ratio is the average of yearly ratios applying between 1998 and 2007 in Germany and in 1998, 2001, 2004 and 2007 in France
Reading: On average in Germany between 1998 and 2007, apprentices exiting school after graduation at the secondary level are 1.5 times more often unemployed than the average adult in their region the year following their school exit. In France, the ratio is about 1.8

Figure 1.2: Youth-to-regional unemployment ratio the first, second and third years following the school exit



Note: The ratio is the average of yearly ratios applying between 1998 and 2007 in Germany and in 1998, 2001, 2004 and 2007 in France
Reading: On average in Germany between 1998 and 2007, ex-apprentices exiting school after higher education are 0.6 times more often unemployed than the average adult in their region the year following their school exit. In France, the ratio is about 1.3

3.2 Retention of apprentices per firm type

Table 1.2 displays the retention rates of apprenticeship graduates per sector. These figures matter because, as evoked in section 1.4.1, they reflect firms' strategy when training, and therefore training quality. Decision of mobility upon completion of an apprenticeship contract is shared between the apprentice and her employer. Yet, overall, "[f]irms seem to play a more structuring role in the apprentices' immediate mobility" (Lene and Cart, 2018: 22)[69].

As now known in the literature, on average, Germany does better than France on this matter. The German outcomes are mostly driven by heavy industrial sectors but, overall, very few sectors exhibit rates lower than 50%. Strikingly, retention rates in France upon completion of secondary and higher education are close on average. This table suggests that French firms resort more often to current production strategies than their German counterparts.

Table 1.2: Retention of apprenticeship graduates per firm type[70,71]

	German Secondary Education	French Secondary Education	French Higher Education
Agriculture		43%	44%
Industry	76%	42%	40%
Finance Services	67%	32%	38%
Trade	58%	38%	37%
Transports	61%	47%	69%
Total	67%	40%	39%

Reading: 76% of German students leaving school upon completion of an apprenticeship in the industrial sector at the secondary level are hired by their training firm. In France, the figure drops to 42%.
Source: German Socio-Economic Panel and Céreq Génération surveys (1998, 2001, 2004), own calculations.

[69] Conversely, deferred mobility is more often the graduate's choice (Lene and Cart, 2018).

[70] This figure is only available at the end of secondary school for Germany, because apprenticeship takes place at this level.

[71] Numbers for France are computed using surveys 1998, 2001 and 2004 because the variable is not available in the two most recent waves. They appear larger than in most of the literature because authors generally work on the sample of all students leaving apprenticeship training, therefore including non-graduates.

4 Apprenticeship training, better labour market outcomes in France than in Germany on the short run

The results from regressions on short-run dependent variables are presented in two steps. Initially the focus is on the estimates, value of the control variables given, of the average quality of integration of former apprentices compared to that of standard-study school leavers. This first sub-section ignores the selection bias and therefore has no causal claim.

The instrumental variable identification strategy described above is then implemented for the short-run analysis so as to take into account the selection bias. As mentioned, this causal identification of the links between apprenticeship and integration relates to specific sub-populations. They are described in the second sub-section. Finally, the third sub-section reveals and discusses the causal impact of apprenticeship on the quality of integration of these sub-populations.

The medium-run analysis is led in the next section.

4.1 Average effect of apprenticeship on integration, type of contract and wages the year following graduation

In each of the sub-samples, former apprentices enjoy better access to employment than school leavers do. The average difference is however larger in France than in Germany. In terms of the unemployment rate in the year after leaving secondary education (resp. higher education), it equates to an advantage of about 6.5 pp (7.0 pp) more in France than in Germany (see table 1.3)[72,73].

[72] With the exception of the analysis of the salary at the end of secondary school in 2001, the French estimates are stable, without taking the selection bias into account, if we restrict the sample successively to each of the surveys. The results by instrumental variables are less so because of the calculation of standard deviations in clusters at the regional level and the presence of indicators of 'super-regions'. With the exception of the wage of secondary school leavers in 2001, the restriction of the sample to a single survey however never provides significant results that are contrary to those presented here.

Table 1.3: Marginal effect of apprenticeship training on the number of months spent unemployed in the year following completion of study

	Completion of secondary education		Completion of higher education		
	Germany	France	Germany	Germany [(1)]	France
	Poisson	Poisson	Poisson	Poisson	Poisson
	(1)	(2)	(3)	(4)	(5)
Apprenticeship	-0.57***	-1.35***	-0.22*	-0.21	-1.06***
	(0.14)	(0.03)	(0.11)	(0.17)	(0.03)
Individual controls	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,005	23,119	714	478	32,416

Reading: Obtaining an apprenticeship diploma, by the end of French secondary school, represents 1.35 months less spent unemployed during the next 12 months.
Note: *** p<1%, ** p<5%, * p<10%.
(1) Sub-sample identical to that used in regression taking the selection bias into account, see note 72.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

As suggested when discussing the institutional literature, the success of apprentices on the internal market of their training company and their position on the external market of other firms should be differentiated. In the data, the share of French apprentices hired by their training company after graduation, is 40% upon completing higher education and 39% upon leaving secondary education, against 67% at the end of secondary school in Germany (see section 3). If French apprentices are subject to lower retention rates, table 1.4 reveals, however, that upon completion of secondary education, non-retained apprentices are preferred to pupils or students from the conventional school background on the external market, while the opposite is true in Germany. For Germany, this surprising result has already been highlighted in another context by Winkelmann (1996). Compared to former pupils from the standard school system, former high school apprentices not hired by their training firm spend 0.37 months more unemployed in the year after leaving

[73] In Germany, the value of the instrument is only known from 1992. However, among students who graduated from higher education between 1998 and 2013, some completed their lower secondary education before 1993. They are included in the analysis without taking into account the selection bias of the German tertiary sub-sample in column 3 (resp. 5) of table 1.3 (resp. 5 and 6) and are not in column 4 (resp. 6).

school, at the value of control variables given[74]. This result seems to contradict the traditional institutionalist literature on the subject.

Indeed, according to the VoC literature and the Aix School, the high level of coordination – embodied by strong employers' associations and Chambers of Industry – that traditionally prevails in the German apprenticeship system should ensure a supply of skills that is broad enough to be valued by other firms in the sector (see section 1). According to Dustmann and Schönberg (2007: 6) only 5% of the skills acquired during apprenticeship between 1982 and 1992 would be specific to the training company in Germany. The result described here therefore suggests an institutional change.

Work undertaken by Busemeyer and Thelen (2011) probably provides part of the explanation. They highlight a gradual change in the German apprenticeship system from a "*collective training system*" in which employers' associations compel large firms to train above their needs, for the benefit of smaller firms, towards a "*segmented training system"* in which large companies leave these organizations or obtain less restrictive clauses. According to the two authors, large training companies in this process, are therefore increasingly orienting the transmission of skills to their internal market, and are increasingly less inclined to train without hiring. Apprentices who are not retained could then struggle to promote their skills on the external market.

[74] This result is a lower bound of the actual preference on the external market, since apprentices retained by their training company are probably on average more employable on the external market.

Table 1.4: Marginal effect of apprenticeship training on the number of months spent unemployed in the year following completion of study depending on retention by the training company

	Completion of secondary education		Completion of higher education
	Germany	France	France
	Poisson	Poisson	Poisson
	(1)	(2)	(3)
Apprenticeship	0.37***	-0.57***	0.03
	(0.14)	(0.03)	(0.05)
Apprenticeship * Hired by the training firm	-3.39***	-4.42***	-4.48***
	(0.16)	(0.09)	(0.16)
Individual controls	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes
Observations	1,005	15,386	19,612

Reading: Leaving education in Germany upon completion of a secondary apprenticeship represents 0.37 months more during the next twelve months spent unemployed for young people not hired in their training firm, compared to a 3.39 months less for the others.
Note: Information on retention is not available in 2007 and 2010 in France. Hence the difference in number of observations with table 1.3. *** p<1%, ** p<5%, * p<10%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

The average effect of apprenticeship training on wages is positive in France, but non-significant upon completion of higher education and negative for secondary education leavers in Germany (see table 1.5). This latter result applies to both the apprentices hired by their training firm and those who look for a job on the external market. It contradicts the literature - almost all of which uses data on West Germany before 2000[75].

[75] Several elements yet rationalize this result. First, German apprentices enter a labour market with a lot of former apprentices, which is not the case for leavers from full-time vocational schools. Employers who give preference to pupils armed with an apprenticeship therefore benefit from a larger job supply than those who prefer school leavers. Second, young people leaving school after an apprenticeship have often received poorer quality training (see section 1.1). Their productivity would therefore be poorer than students graduating from standard schooling. Third, the training company is also in a stronger position, given the low employment opportunities of these apprentices on the external market, as stated above. It is

Table 1.5: Marginal effect of apprenticeships on the log of the first full-time salary reported in the year following completion of studies

	Completion of secondary education		Completion of higher education		
	Germany	France	Germany	Germany [(1)]	France
	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)
Apprenticeship	-0.11**	0.02***	-0.02	-0.10	0.05***
	(0.05)	(0.00)	(0.06)	(0.08)	(0.00)
Individual controls	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	442	15,522	356	233	24,965

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with a salary increase of 2%.
Note: *** p<1%, ** p<5%, * p<10%.
(1) Sub-sample identical to that used in regression taking the selection bias into account, see note 72.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Lastly, apprenticeships are associated with a better probability of working full-time upon leaving high school, in both countries, as well as after higher education in France (see table 1.6). It should be noted that, for a given gender, the average effect is similar in the high school sub-sample in both countries. The higher proportion of girls among German apprentices explains the higher coefficient (see table 1.17 in appendix A6).

therefore possible that, all things being equal, this surplus of bargaining power will limit the hiring wage of apprentices on the internal market.

Table 1.6: Marginal effect of apprenticeship training on the ratio of full-time vs. part-time work in the year following completion of studies

	Completion of secondary education		Completion of higher education		
	Germany	France	Germany	Germany (1)	France
	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)
Apprenticeship	0.13***	0.08***	-0.01	-0.04	0.08***
	(0.03)	(0.01)	(0.03)	(0.04)	(0.01)
Individual controls	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	901	19,133	682	435	29,312

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with an increase of 0.08 units in the ratio of working time spent full-time vs. part-time, in the following 12 months
Note: *** p<1%, ** p<5%, * p<10%.
(1) Sub-sample identical to that used in regression taking the selection bias into account, see note 72.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

4.2 Identifying the orientation processes to determine the target population - the first stage equation

The previous results do not take into account the possible risk of selection into apprenticeship training. As previously stated, to ensure that the calculated effect of apprenticeship on integration is causal, an instrumental variable strategy is adopted, where the instrument is the regional apprenticeship rate in the year preceding the decision to undertake an apprenticeship or to pursue into full-time studies. In section 2.2, we discussed why this instrument is relevant. Here, the analysis deals with its impact.

The effect of the instrument on the probability of undertaking an apprenticeship (first stage equation) is presented in table 1.7. It is highly significant in all cells. In France, an increase of one percentage point in the regional apprenticeship rate increases the probability of successfully committing to a secondary school apprenticeship by 0.54 pp and a higher education apprenticeship by 0.98 pp. In Germany, the effect of the apprenticeship ratio is less clear-cut. Among young people who left school at the end of the secondary level, a surplus of 1 pp of the instrument decreases

the probability of entering the dual system the following year and graduating from it by 0.43 pp. In the tertiary sub-sample, the effect is positive(+0.78 pp).

Table 1.7: Marginal effect of the apprenticeship ratio on the probability of obtaining an apprenticeship diploma

	Completion of secondary education		Completion of higher education	
	Germany	France	Germany	France
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Apprenticeship ratio	-0.43***	0.54***	0.78***	0.98***
	(0.15)	(0.07)	(0.22)	(0.32)
Individual controls	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
'Super-region' fixed effects	Yes	Yes	Yes	Yes
Observations	1,005	23,119	478	32,416

Reading: A one point percentage increase in the apprenticeship ratio in French secondary education is associated with an increase of 0.54pp. in the probability of taking an apprenticeship the following year, at this level, in France.
Notes: This is the first-stage equation used for IV regressions. An estimate by probit gives similar results. The standard errors in brackets are clustered by region. *** p<1%, ** p<5%, * p<10%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

The causal effect of apprenticeship on integration is local (LATE) and valid only for young people whose decision to undertake an apprenticeship is affected by the regional apprenticeship rate (i.e. for the compliers). Before discussing it, compliers need to be identified. To do this, the analysis of the processes for orientation towards apprenticeship is studied in more depth hereafter.

The apprenticeship entry selection is a complex process. Three major mechanisms can be identified (Couppié and Gasquet, 2017: 83–85). The first is geographical. Apprenticeships are location-based due to their regionalization, but also because of longer-term local traditions (ibid; Culpepper, op. cit.). The second is "micro and individual": Young people's interest in apprenticeships

depends on their socio-demographic characteristics. In particular, gender and the family environment's closeness to the course of study strongly predict the probability of applying for an apprenticeship (Couppié and Gasquet, 2017). The third mechanism is based on the ranking of young people by companies and CFA (apprentice training centres) or *berufsfachschule* (ibid.).

It is expected that the more regional authorities commit to apprenticeships and manage to increase the number of contracts in a given year, the greater the supply of apprenticeship contracts the following year in the region[76]. The final impact of the instrument (regional apprenticeship rate) on the type of apprentices then hired depends on the elasticity of the training demand on regional investment. It is therefore important to understand whether the rise in the apprenticeship ratio attracts young people from different backgrounds or simply provides to the students traditionally inclined to follow an apprenticeship, and situated at the end of the queue, access to the curriculum.

We herein present evidence suggesting that the two French sub-samples and Germany, taken as a whole, fall into three different ideal-types.

In the French secondary school system first of all, while apprenticeships in the 1990s were "reserved for young people in school dropout situation", pupils now prefer it to full-time vocational training (Arrighi et al., 2009). "The training mode appeal" is thus the determinant factor in choosing to undertake an apprenticeship which (positively) evolved the most between 1992 and 2007 (Moreau, 2008). Illustrative of the increased attractivity of apprenticeship in the French secondary education, students who repeated class(es) (proxied here by the fact of being older in 7th grade – 6eme – than normally expected) show no specific likelihood to graduate from this track (see table 1.15 in appendix A4). This trend is, at least partly, due to the policies of promoting these courses of study (through discussions with pupils, among companies, by advertising, etc.). It is therefore expected that regional investment will attract

[76] The underlying mechanism includes a conventional turnover, the opening of new apprenticeship courses, but also the mimetic behaviour of firms that had previously not been training companies. It is assumed here that the regional investment surplus does not generate negative externalities on pre-existing offers.

good pupils, who were traditionally more inclined to opt for a full-time vocational high school, to apprenticeships. In a context of high selectivity, these young people could take the place of "traditional" pupils who are at the end of the queue to access apprenticeship contracts. This does not seem to be the case, however.

Tables 1.18 and 1.19 in appendix A7, which mobilize the data from the Génération 2004 survey, show that an increase in the apprenticeship ratio of 1 pp is associated with an increase in the satisfaction with the choice of orientation at the end of ninth grade the following year of 0.16 pp. This correlation is mainly the result of less failure in accessing apprenticeship and a decrease in forced orientations to fields of study other than the one requested[77].

Thus, an increase in the apprenticeship ratio seems to be associated with a decrease in selectivity the following year. In other words, if some good pupils, 'non-traditional' from the course of study, are likely to opt for an apprenticeship as a result of regional policies, it would primarily allow 'traditional' pupils at the end of the queue to find a contract[78]. In this way, compliers would be mostly pupils who are less valued in the labour market than the average apprentice is.

There is no information to help carry out similar work at the tertiary level in France. However, it is known that adherence to apprenticeships is stronger than in secondary schools. So, while 27% of pupils in level V apprenticeship[79] did not learn the desired occupation in the region Pays de la Loire, in 2007, they were 20% at level III and 12% at levels I and II (Moreau, 2008). Similarly, only two-thirds of level V pupils mentioned being interested in this mode of training, compared to more than 90% in higher education (ibid). Therefore, the opening of new places and new apprenticeship courses, made

[77] 17% of pupils from the secondary school sub-sample reported having experienced frustration with the orientation at the end of year nine. Failure to access an apprenticeship and orientation towards a field other than the one requested represent more than 60% of the frustrated orientations. Note that only the 2004 survey presents this information

[78] With the assumption that the propensity of these young people to move towards apprenticeships does not decrease when the apprenticeship ratio increases.

[79] Level V represents the completion of studies after the final year of CAP or BEP (year 8). Level III accounts for completion of a 2-year track in higher education. Levels II and I combine completing studies after more than 3 years in higher education.

possible by regional investment for higher education, should attract higher-level compliers more frequently than in secondary schools, convinced by the training method, and turning to apprenticeships in an unforced way (see Sarfati, 2015). The presence of these compliers alongside young people situated at the end of the queue and benefitting from the surplus supply in the traditional higher education apprenticeship tracks should result in a greater heterogeneity of the compliers upon completion of tertiary studies compared to secondary studies.

In order to analyse the German context, the strategy of following an apprenticeship at secondary education level before moving on to higher education should be explained. According to (Lewin et al., 1996), for the majority of young people who have taken this course of study, the decision to continue to higher education was made at the end of lower secondary education - and therefore before entering the dual system. According to them, young people who have completed an apprenticeship before graduating from higher education are active in their choice of studies: they expect to lack practical training in their higher education course of study and are determined to remedy it. Thus, a particular regional commitment to apprenticeships should attract these good students if new contracts meeting their expectations are created[80].

The positivity of the coefficient associated with the apprenticeship ratio for the tertiary sub-sample suggests that this is indeed the case. In addition, it seems that, on top of this process, there is a reputation effect that accentuates all the positive response of these compliers. Regional policy commitment and an improved supply would increase propensity of young people aiming at a higher education degree to initially choose apprenticeship, so much so that

[80] Some authors such as Herget (1997) have suggested that the strategy consisting in taking an apprenticeship before entering higher education is not formalized at the time of lower secondary education. Yet, this implies that students turning to higher education after an apprenticeship chose first the dual system for similar reasons as the apprentices from the secondary cell – namely: low school results and high risk aversion according to Büchel and Helbreger (1995). Yet, this does not fit the opposite sign of the two coefficients applying in each cell.

rising demand outstrips the increase in supply[81]. The last in line to obtain an apprenticeship contract at the pre-existing equilibrium point no longer access the course of study. These are the compliers from the secondary sub-sample[82]. For them, the rise in the apprenticeship rate has a negative effect on the probability of entering the dual system: the more the region develops apprenticeship training, the more attractive it is for the rest of their cohort and the least chances they have to access it. In this regard, the compliers of the secondary cell would therefore be the least able students from the firms' point of view.

4.3 Causal impact of apprenticeship on the integration of the target population - second stage equation

The causal effect of apprenticeship (local treatment effect, LATE) on the ratio of full-time *vs.* part-time work is greater than the average effect without considering selection bias in the secondary sub-sample, in France. The same is true in terms of avoiding unemployment, which, for the compliers, confirms the existence of unobservable characteristics viewed negatively on the labour market, result highlighted in the literature[83]. On the contrary, it appears that the coefficient on wages loses its significance when selection is taken into account, suggesting apprenticeship has no effect on the productivity of the compliers. The results of regressions are provided in tables 1.8, 1.9 and 1.10.

This last result is counter-intuitive if we believe section 4.2 and if we believe that the compliers are mainly pupils with difficulties at school in relation to other apprentices. Recall indeed that the literature in education research has shown that the positive externalities that theoretical and practical lessons produce on each another are at their highest for young people showing the least taste for academic studies. (Unwin and Wellington, 1995). It is therefore expected that, for any given apprenticeship contract, this

[81] For action taken by the Länders in this regard, see the example of Schlögl (2010, pp.23-24).

[82] It should be remembered that young people from the two German sub-samples were competing when applying for the dual system.

[83] Estimates of the impact of apprenticeships on unemployment upon completion of studies are robust in relation to the two specifications used. This is true for the five sub-samples.

curriculum would offer higher productivity gains to compliers than to the average apprentice, in relation to full-time studies.

This result therefore highlights the heterogeneity of apprenticeships. Compliers are at the end of the queue for apprenticeship contracts and are likely to receive poorer quality training. Two mechanisms are expected to play. First, such contracts could only bring limited productivity gains to compliers. Second, these graduates may struggle to value their credentials on the external labour market. Training firms therefore benefit from bargaining power when offering to retain their apprentice.

Table 1.8: Marginal effect of apprenticeship training on the number of months spent unemployed in the year following completion of study

	Completion of secondary education				Completion of higher education			
	Germany		France		Germany		France	
	CF	2SLS	CF	2SLS	CF	2SLS	CF	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apprenticeship	7.92**	6.69*	-2.49**	-2.81**	-0.18	0.71	1.15	1.14
	(3.72)	(3.95)	(1.01)	(1.12)	(2.14)	(1.93)	(2.06)	(2.35)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
'Super-region' fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,005	1,005	23,119	23,119	478	478	32,416	32,416
F-statistic		9.426		214.8		11.85		37.43

Reading: Obtaining an apprenticeship diploma, for the target population (compliers), by the end of French secondary school, represents 2.49 to 2.81 months less spent unemployed during the next twelve months, depending on the specifications.

Note: The standard errors in brackets are clustered by region. *** p<1%, ** p<5%, * p<10%.

Acronyms: 2SLS: Two-Stage Least Squares; CF: Control Function.

Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Table 1.9: Marginal effect of apprenticeship training on the log of the first full-time salary reported in the year following completion of studies

	Completion of secondary education		Completion of higher education	
	Germany	France	Germany	France
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Apprenticeship	0.79	0.01	0.38	0.02
	(0.54)	(0.05)	(0.31)	(0.12)
Individual controls	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
'Super-region' fixed effects	Yes	Yes	Yes	Yes
Observations	442	15,522	233	24,965
F-statistique	4.485	118.4	6.511	32.51

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, has no significant impact on the remuneration of the target population (compliers).
Note: Standard errors in brackets are clustered by region in the 2SLS regressions. *** p<1%, ** p<5%, * p<10%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Table 1.10: Marginal effect of apprenticeship training on the ratio of the full-time vs. part-time work in the year following completion of studies

	Completion of secondary education		Completion of higher education	
	Germany	France	Germany	France
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Apprenticeship	0.02	0.15**	-0.19	-0.14
	(0.22)	(0.07)	(0.16)	(0.17)
Individual controls	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
'Super-region' fixed effects	Yes	Yes	Yes	Yes
Observations	901	19,133	435	29,312
F-statistique	8.226	163.4	13.35	35.17

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, has a causal impact of 0.15 units for the target population (compliers).
Note: Standard errors in brackets are clustered by region in the 2SLS regressions. *** p<1%, ** p<5%, * p<10%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

In the German secondary school sub-sample, the average effect on wages and working time seems to disappear when the selection is taken into account - although these two results must be put into perspective given the low F-statistics. The LATE on avoiding unemployment is more conclusive. More than the value of the coefficient, which is high in the two models, its sign must be discussed. As in the French context, the compliers are at the end of the queue for an apprenticeship contract (see section 4.2). Consequently, they are also likely to receive poorer quality training than the average apprentice. They have a low probability of being hired in their training company - relative to other German apprentices - and few skills that can be promoted in the external labour market. As a result, apprenticeships seem to be less profitable for them than standard schooling to fit into a German labour market already heavily staffed with former apprentices.

In the tertiary sub-samples of both countries, no causal impact of apprenticeship can be highlighted on the variables studied (unemployment, salary, full-time *vs.* part-time work periods). In France, this result is consistent with the literature on the question and underlines selectivity at work in these streams. The compliers are good students in both countries - although in France their heterogeneity is probably higher, see section 4.2 - who would have been equally successful in a standard full-time track. In France, the considerable subsidies allocated to apprenticeships for this population therefore seem difficult to justify.

5 Most impacts are persistent on the medium run

Table 1.11 provides information on the probability to experience a period of continuing employment longer than 18 months over the 36 first months after the school exit. Table 1.12 evaluates the waiting time in months before such a period and table 1.13 displays the effect of apprenticeship training on the first wage declared after the 18th month of this period.

Medium run effects of apprenticeship on stability in employment follow the same pattern as labour market integration on the short run. Thus, on average, apprentices benefit from a stronger likelihood to experience a period of stable work. The effect is of 14 p.p. (resp. 12 p.p.) upon completion of

secondary education in France (resp. Germany) and of 11 p.p. (resp. 6 p.p. with a p-value of 10.7%) upon completion of higher education. The advantage of apprentices is also more important and significant in France than in Germany with respect to the waiting time before experiencing such a period. In France, the IV estimates confirms that apprenticeship training benefit more compliers than the average student in secondary education. Here as well, no significant impact is found upon completion of higher education. The German dataset does not have enough power for an IV estimate in these cases.

As for wages in France, ex-apprentices remain in a better position than graduates from standard schooling on the medium-run. Yet, as in the short-run analysis, the IV estimates suggest that compliers expectedly benefit from training of lower quality translating into no wage advantage. In Germany, the disadvantage for apprentices exiting school after secondary education is non-significant in the medium-run – though it remains negative if anything.

Table 1.11: Marginal effect of apprenticeship training on the probability to experience a continuous employment spell of 18 months in the 3 years following completion of studies

	Completion of secondary education			Completion of higher education		
	Germany	France	Fr. IV	Germany	France	Fr. IV
	OLS	OLS	2SLS	OLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Apprenticeship	0.12**	0.14***	0.46***	0.06	0.11***	0.15
	(0.05)	(0.01)	(0.10)	(0.04)	(0.01)	(0.29)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effects (1)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	630	23,119	23,119	489	32,416	32,416
F-statistique			214.8			37.43

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with an increase of 14p.p. in the likelihood to enjoy a continuous period of employment of at least 18 months in the 36 first months following the school exit, and has a causal impact of 46p.p. for the target population (compliers).
Note: Std. err. are clustered by region in the 2SLS regressions. *** p<1%, ** p<5%, * p<10%.
(1) "Super-region" fixed effects for 2SLS regressions.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Table 1.12: Marginal effect of apprenticeship training on the waiting time before the beginning of a 18-month employment spell

	Completion of secondary education				Completion of higher education			
	Germany	France	France IV		Germany	France	France IV	
	Poisson	Poisson	CF	2SLS	Poisson	Poisson	CF	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apprenticeship	-0.23	-1.48***	-1.79**	-1.70**	-0.41*	-1.72***	3.38	3.77
	(0.29)	(0.03)	(0.78)	(0.79)	(0.24)	(0.04)	(2.70)	(3.36)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effects (1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	454	15,891	15,891	15,891	429	25,144	25,144	25,144
F-statistique				157.7				25.69

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with a decrease of 1.48 months before experiencing a continuous period of employment of at least 18 months in the 36 first months following the school exit, and has a causal impact of about 1.70 months for the target population (compliers).
Note: Standard errors are clustered by region in the 2SLS regressions.*** p<1%, ** p<5%, * p<10%.
(1) "Super-region" fixed effects for 2SLS regressions.
Acronyms: 2SLS: Two-Stage Least Squares; CF: Control Function.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Table 1.13: Marginal effect of apprenticeship training on the log of the first full-time salary reported after the 18th month of the period of stability

	Completion of secondary education			Completion of higher education		
	Germany	France	Fr. IV	Germany	France	Fr. IV
	OLS	OLS	2SLS	OLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Apprenticeship	-0.05	0.02***	0.02	0.02	0.04***	0.03
	(0.05)	(0.00)	(0.05)	(0.04)	(0.01)	(0.20)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effects (1)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	292	12,025	12,025	279	20,190	20,190
F-statistique			109.8			22.66

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with a salary increase of 2% at the end of the period of stability, but has no significant impact on the medium-run earnings of the target population (compliers).
Note: Standard errors are clustered by region in the 2SLS regressions.*** p<1%, ** p<5%, * p<10%.
(1) "Super-region" fixed effects for 2SLS regressions.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Conclusion

This paper compares the impact of apprenticeship training on job market outcomes in France and Germany between 1998 and 2013. The main focus is the short-term impact – i.e. the twelve months following the completion of studies – but stability in employment in the first three years after leaving school is also considered. Estimates are made separately for leavers from secondary and higher education.

Firstly, I show that, on average, in France and Germany, apprentices enjoy better conditions of access to the labour market than school leavers do. However, the relative advantage is greater in France. In terms of the unemployment rate in the year after leaving secondary school or higher education, the difference between the two countries is equivalent to about 6.75 pp more for France. On the longer run, apprenticeship is associated with greater stability in employment in both countries. The gain in speed to access stability is however stronger in France. Importantly, the difference in labour market outcomes of the control groups – namely graduates of standard education – plays a lot in these results. Thus, unemployment rates differ much more strongly between the French and German full-time graduates than between apprenticeship graduates.

Next, I show that the success of apprentices upon completion of secondary education does not result from the same channels in both countries. Although the hiring rate in training companies is lower in France, companies on the external market prefer former apprentices, even if not hired by their school-leavers training firm, which does not seem to be the case in Germany. This result, consistent with a part of the economic literature, questions the validity, for the current period, of certain conclusions of the traditional institutionalist literature. For the French case, it goes in line with the development of a market segment in which, increasingly, qualifications acquired in the firm are valued via external mobility (Gazier and Petit, 2007).

These average results are not necessarily causal because of the risk of selection bias. Therefore, a method using instrumental variables has to be implemented in a second step, for which the compliers should be defined. In secondary education, our results suggest that young people whose access to

apprenticeships depends on the instrument are pupils in difficulty, at the end of the queue for apprenticeship contracts in France and Germany. The effect of the dual track on their integration diverges between the two countries.

In France, apprenticeships do not seem to bring a higher wage to these pupils, who nonetheless benefit from a strong added value in terms of avoiding unemployment. Given the low hiring rates in training companies - suggesting a rather poor quality of training - these results also reveal the poor quality of their professional integration when they follow standard school studies.

In German secondary schools, apprenticeship tends to have a negative effect on the chances of obtaining employment for these young people on the short run. This result goes against the literature on the subject, but is built on more recent data - including an apprenticeship crisis period - and including East Germany. Moreover, some of the previous studies focus exclusively on men. At the end of apprenticeship, young Germans not retained by their training company enter a well-endowed job market where, unlike the French context, they have difficulties to value their credentials. Overall, the German apprenticeship system would therefore be very good at integrating the average graduate in firms' internal labour markets but would be less decisive for what concerns low achievers.

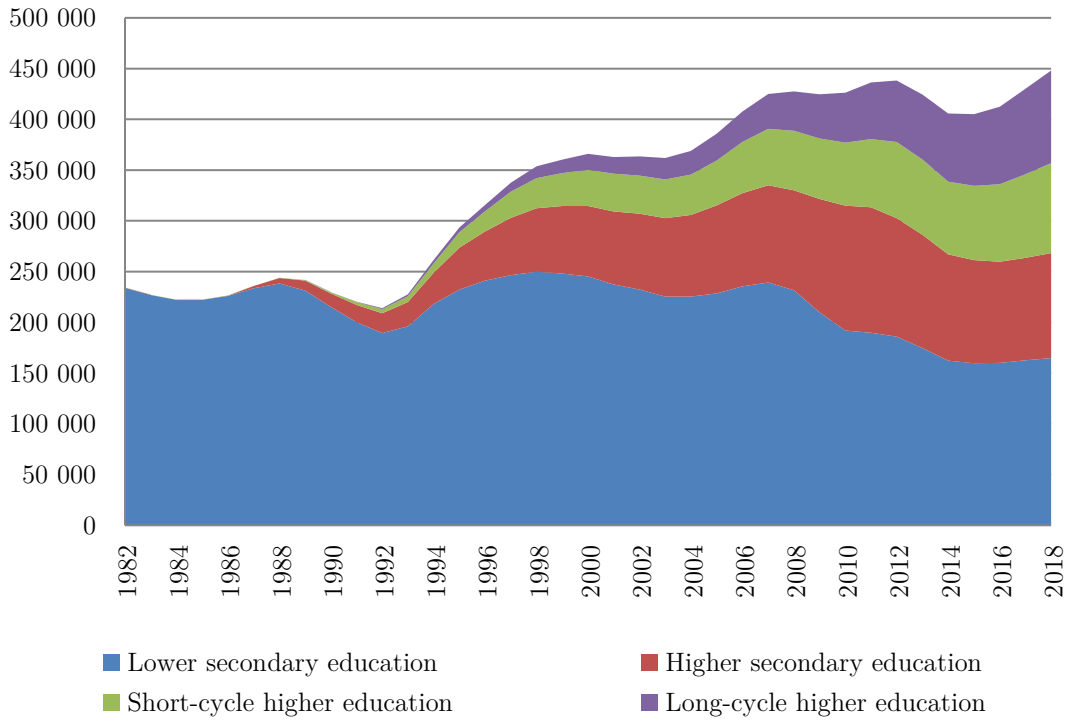
Finally, for graduates from higher education, the transition via an apprenticeship does not help integration, in both France and Germany.

The comparison offers several lessons for the French context. The study of the German context firstly suggests that too much development of apprenticeship training could be detrimental for the less academic pupils. Then, in the background, analyses reveal that investment in apprenticeships should not be made at the expense of the aim of improving integration for leavers from full-time education. Lastly, the results provide aspects in favour of shifting apprenticeship grants from higher education to secondary education. To avoid the negative impact likely to appear on retention rates (see chapter 3), shifting subsidies from higher education to secondary schools may gain to be accompanied by an increased right for labour representatives to scrutinize companies' investments in training and its quality. This principle, inspired from Germany, ensures a drop in mobility upon graduation, both on the short and medium term (Kriechel et al., 2014).

Appendix

Appendix A1: The French and German education systems.

Figure 1.3 - Stock of apprentices according to school levels



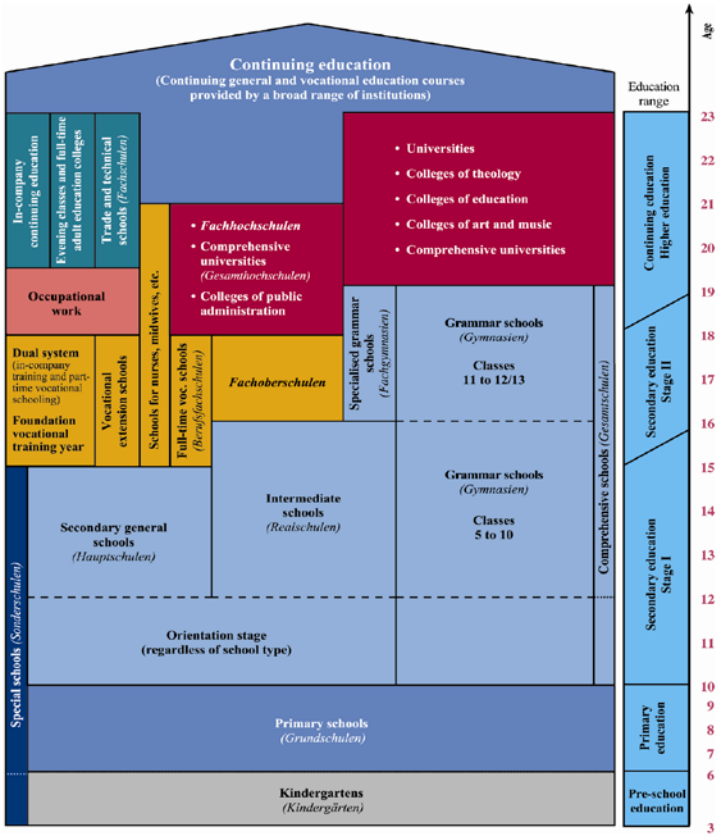
Source: Depp, enquêtes 51 and Sifa, as of December 31st, own calculations

Table 1.14 – Distribution of students leaving lower secondary education and of the whole population in Germany

	Population in 1990	Cohort graduating in 1990	Population in 2012	Cohort graduating in 2012
Hauptschule	61.6 %	24.6 %	35.6 %	18.1 %
Realschule and Oberschule	19.3 %	35.0 %	29.0 %	39.7 %
Hochschulreife and Fachhochschulreife	14.7 %	33.8 %	27.3 %	35.1 %
Drop out or other	4.4 %	2.6 %	8.1 %	7.1 %

Source: Winkelman (1996) and Destatis, own calculations

Figure 1.4 - Education in Germany



Source: Cedefop (2008)

Appendix A2: The hold-up puzzle

Why would a firm bear negative net training costs since, after graduation, apprentices can be 'poached' by external firms? Becker first answered that firms involved in the system would only pay for firm-specific human capital while costs for general and sector-specific training would fall on students or the State. As mentioned in section 1.3, the empirical literature has proven him wrong. So how to explain that firms spend money on skill formation apparently non-specific to the company? The solution comes from rigidities – non-taken into consideration by Becker in 1962.

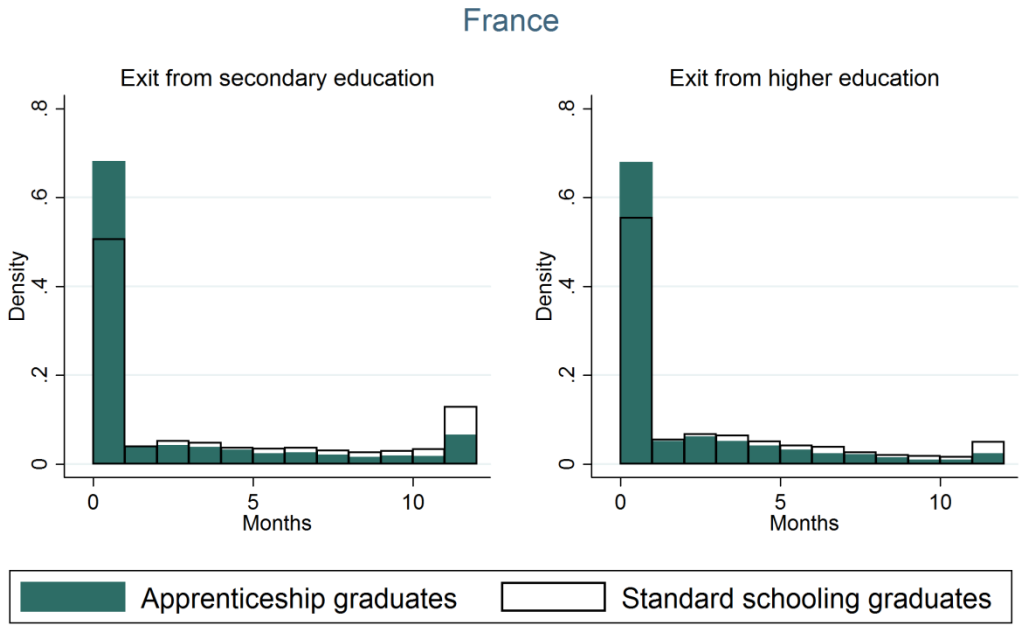
Curricula only account for the minimum contents of general and sector-specific skills training firms should provide. The rest is therefore left to firms' discretion and is unknown for external firms which have to bear an information-based cost to find the true productivity of an ex-apprentice (Katz and Tiderman, 1990). This leaves a surplus that training firms can earn out of

their investment in human capital. An asymmetry of information also occurs regarding the ability of post-apprentices. Assume a low-ability type and a high-ability type. Assume that external firms are unable to fully observe apprentices' abilities. They therefore offer similar levels of wage to both types. By offering jobs only to high-ability apprentices and paying them a small bit above the market wage, training firms manage to hire them after graduation and ensure a benefit: the apprenticeship works here as a screening device. In the end, this theoretical case provides two types of incentives to increase the share of general training during the apprenticeship. First, since general training is generally considered as a complement to ability (Acemoglu and Pischke, 1998), training firms have an incentive to invest in it in order to increase the difference between the productivity of high ability apprentices and the market wage. Second, in this setup, the market for post-apprentices free to be hired is fully composed of low-ability individuals, therefore leading external firms to train their own apprentices and provide them – according to the first argument – general skills.

On top of asymmetries of information, two major arguments can explain investment in portable skills. First, in a situation where external firms have a limited ability to 'poach' due to information asymmetry, the more compressed market wages are, the higher the firms' incentive to train is since the productivity/wage ratio increases with the skills and ability in this case (Stevens, 1994b; Acemoglu and Pishcke, 1999a). Second, the value of a given set of general and specific skills depends on the company. Firms may therefore invest in sets which are less valued by external competitors (Ryan and Wolter, 2011). In this case, trainees are less likely to be poached than in the pure and perfect competition framework: firms' monopsony power explains part of the puzzle.

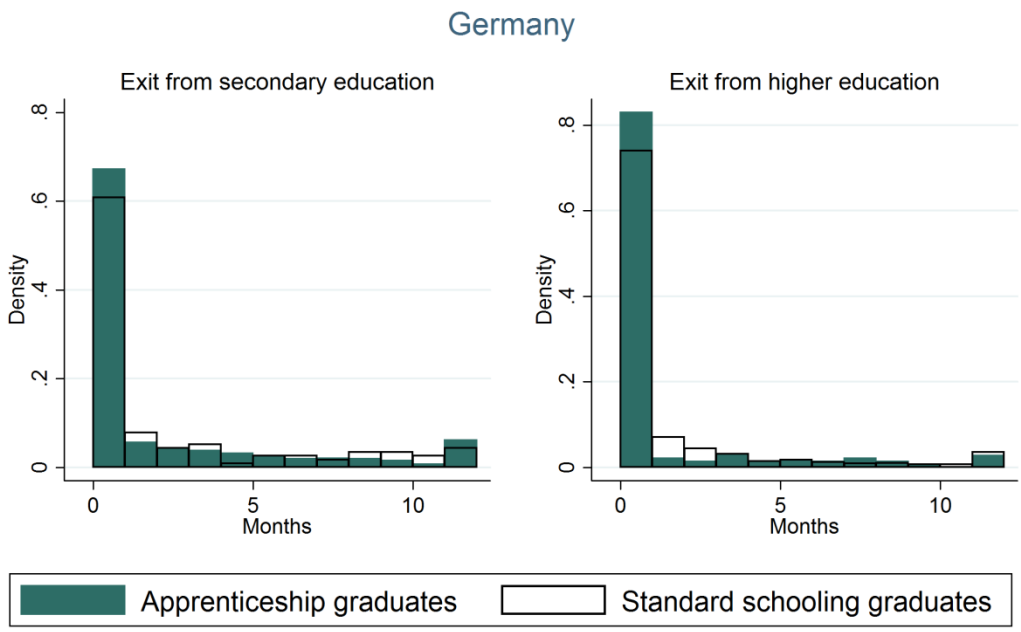
Appendix A3: Distribution of the number of months spent unemployed in the first post-exit year

Figure 1.5 : Number of months spent unemployed in the first post-exit year



Reading: 68% (resp. 68%) of apprenticeship graduates who left school after secondary (resp. higher) education experienced no month unemployed in the first year following their school exit
Source: Generation survey, own calculations

Figure 1.6 : Number of months spent unemployed in the first post-exit year



Reading: 67% (resp. 83%) of apprenticeship graduates who left school after secondary (resp. higher) education experienced no month unemployed in the first year following their school exit
Source: German Socio-Economic Panel, own calculations

Appendix A4: Descriptive statistics of the main variables

Table 1.15: Descriptive statistics of graduates leaving school upon completion of secondary education

	Graduates from French Secondary Education				Graduates from German Secondary Education			
	App. Graduates		Std Schooling Graduates		App. Graduates		Std Schooling Graduates	
	Mean	Std. dev.	Mean	Std dev	Mean	Std. dev.	Mean	Std. dev.
Dependent variables								
Short-run variables								
Number of months spent unemployed in t+1	1.88	3.50	3.34	4.35	1.81	3.41	2.14	3.57
Ratio of working time spent full-time v.s. part-time in t+1	90%	0.29	77%	0.41	92.2%	0.25	76.3%	0.39
First monthly wage observed (in log, only full-time workers)	6.98	0.24	6.98	0.25	6.94	0.37	7.06	0.29
Middle-run variables								
Share of graduates experiencing a stable employment spell of 18 month before t+4	7%8	0.41	61%	0.49	73%	0.44	62%	0.49
Number of months before experiencing a stable employment spell of 18 months	2.14	3.92	3.76	4.67	2.83	4.17	2.93	4.06
First monthly wage observed after the 18th month of stable employment (in log, only full-time workers)	7.06	0.26	7.04	0.27	7.08	0.24	7.08	0.22
Independent variables								
Age	19.62	1.85	19.42	1.48	21.41	2.30	22.59	3.23
Sex (man=1)	75%	0.43	53%	0.50	47.0%	0.49.9	28.7%	0.45.4
Type of lower secondary education or age in 6th grade								
Hauptschule					29.7%	0.46	16.5%	0.37
Realschule					56.0%	0.50	55.7%	0.50
Gymnasium					13.0%	0.34	27.0%	0.45
Unknown					1.3%	0.11	0.9%	0.09
Younger than 11 in 6th grade	2%	0.14	2%	0.13				
Older than 11 in 6th grade	33%	0.47	32%	0.46				
Father's SES								
Farmer	4%	0.21	4%	0.20	0.9%	0.09	1.7%	0.13
Craftsman, Shopkeeper or Business Owner	12%	0.33	9%	0.29	23.6%	0.42	27.0%	0.45
Manager, Engineer, Professional or Professor	8%	0.27	7%	0.26	3.4%	0.18	5.2%	0.22
Technician, Supervisor, Sales Rep, Intermediate Professions	6%	0.25	7%	0.26	8.7%	0.28	12.2%	0.33
Employee	25%	0.43	26%	0.44	4.2%	0.20	3.5%	0.18
Worker	33%	0.47	33%	0.47	42.4%	0.49	31.3%	0.47
Not Working or Retired	12%	0.32	14%	0.34	11.1%	0.31	8.7%	0.28
Unkown					5.8%	0.23	10.4%	0.31
Observations	8 296		9 921		890		115	

Reading: Graduates leaving school upon completion of an apprenticeship at the secondary level in France spend on average 1.88 months unemployed the following year against 3.34 for their counterparts from standard schooling.
Note: The table reports the mean and the std.dev. of the main variables of interest according to the level of graduation and the country.
Source: German Socio-Economic Panel and Generation Surveys, authors' calculation.

Table 1.16: Descriptive statistics of graduates leaving school upon completion of higher education

	Graduates from French Higher Education				Graduates from German Higher Education			
	App. Graduates		Std Schooling Graduates		App. Graduates		Std Schooling Graduates	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Dependent variables								
Short-run variables								
Number of months spent unemployed in t+1	1.40	2.66	2.26	3.38	0.95	2.57	1.16	2.75
Ratio of working hours spent full-time v.s. part-time in t+1	97%	0.17	87%	0.32	87.4%	0.29	86.8%	0.30
First monthly full-time wage observed (in log)	7.31	0.30	7.21	0.33	7.31	0.36	7.35	0.39
Middle-run variables								
Share of graduates experiencing a stable employment spell of 18 month before t+4	87%	0.34	77%	0.42	87%	0.33	86%	0.35
Number of months before experiencing a stable employment spell of 18 months	2.03	3.66	3.36	4.31	2.40	2.57	3.08	3.84
First monthly wage observed after the 18th month of stable employment (in log, only full-time workers)	7.47	0.32	7.36	0.35	7.51	0.25	7.49	0.31
Independent variables								
Age	22.86	1.74	23.18	2.17	29.19	3.10	27.33	3.03
Sex (man=1)	61%	0.49	47%	0.50	54.4%	50.0%	46.7%	49.9%
Type of lower secondary education or age in 6th grade								
Hauptschule					0.7%	0.08	0.2%	0.04
Realschule					30.9%	0.46	7.2%	0.26
Gymnasium					68.5%	0.47	92.6%	0.26
Unknown								
Younger than 11 in 6th grade	4%	0.20	6%	0.24				
Older than 11 in 6th grade	5%	0.23	5%	0.21				
Father's SES								
Farmer	5%	0.22	4%	0.20	1.3%	0.11	0.5%	0.07
Craftsman, Shopkeeper or Business Owner	12%	0.32	10%	0.30	40.9%	0.49	46.0%	0.50
Manager, Engineer, Professional or Professor	27%	0.45	29%	0.45	11.4%	0.32	16.5%	0.37
Technician, Supervisor, Sales Rep, Intermediate Professions	12%	0.32	10%	0.30	6.7%	0.25	7.2%	0.26
Employee	17%	0.38	17%	0.38	2.7%	0.16	2.1%	0.14
Worker	15%	0.35	14%	0.34	20.8%	0.41	13.3%	0.34
Not Working or Retired	12%	0.33	16%	0.36	4.0%	0.20	5.3%	0.22
Unkown					12.1%	0.33	9.1%	0.29
Observations	2 336		23 337		149		570	

Reading: Graduates leaving school upon completion of an apprenticeship from higher education in France spend on average 1.40 months unemployed the following year against 2.26 for their counterparts from standard schooling.
Note: The table reports the mean and the std. dev. of the main variables according to the level of graduation and the country.
Source: German Socio-Economic Panel and Generation Surveys, authors' calculation.

Appendix A5: Two possible estimation techniques to take into account the selection bias in the case of a dummy dependent variable

Formally, the estimation writes

$$\begin{cases} y_1^* = \alpha A + X_1\beta_1 + u_1 & (1) \\ y_2^* = X_2\beta_2 + u_2 & (2) \end{cases}$$

with A a dummy variable taking the value one if the individual graduated from an apprenticeship training, X_1 and X_2 two sets of covariables, y_2^* the latent variable such as $A = 1$ is equivalent to $y_2^* \geq 0$ and y_1^* the main dependent variable which can either be observed or not.

If u_1 and u_2 are further assumed to be linearly related through the expression $u_1 = \rho\frac{\sigma_1}{\sigma_2}u_2 + v$ with σ_i the standard error of residual u_i and v some noise independent from u_1 and u_2, the problem can be re-shaped as

$$y_1^* = \alpha A + X_1\beta_1 + \rho\frac{\sigma_1}{\sigma_2}\ (y_2^* - X_2\beta_2) + v$$

Which therefore leads to:

$$E(y_1^*\ /X_1, X_2, y_2^*)\ =\ \alpha A + X_1\beta_1 + \rho\frac{\sigma_1}{\sigma_2}\ (y_2^* - X_2\beta_2) \qquad (3)$$

Thus, a selection bias in the estimation of α appears when ρ is non-null. Contrarily, if ρ is zero, equation (1) can be estimated on its own.

The joint estimation of the equations by maximum likelihood requires to assume that u_1 and $u_2$follow a binormal law: $\binom{u_1}{u_2} \rightarrow N\left[\binom{0}{0}, \begin{pmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{pmatrix}\right]$ (Lollivier 2001 et 2002 ; Robin 2000). Yet, this assumption is strong and it has been proven that when it does not stand, the joint estimation leads to poorer results than a usual IV estimate (Chiburis et al, 2011).

A two-step method could therefore be preferred to relax assumptions necessary to the estimation. Without assuming the normality of v, one can show that $E(u_2/X_1, X_2, A = 1)$ and $E(u_2/X_1, X_2, A = 0)$ are two Mills' ratios (Arendt et Holm, 2006). Hence, if one sets

$$\lambda_1 = \frac{\phi(X_2\beta_2)}{\Phi(X_2\beta_2)}$$
$$\lambda_2 = \frac{-\phi(X_2\beta_2)}{1-\Phi(X_2\beta_2)}$$
$$\mu = \lambda_1 A + \lambda_2(1 - A)$$

and calls η a residual, one can write:

$$y_1^* = \alpha A + X_1\beta_1 + \rho\sigma_1\mu + \eta \qquad (4)$$

The two-step method defined in Barnow, Cain et Goldberger (1981) boils down to estimating first $\widehat{\beta_2}$ in (2), so that $\hat{\mu} = \frac{\phi(X_2\widehat{\beta_2})}{\Phi(X_2\widehat{\beta_2})}A + \frac{-\phi(X_2\widehat{\beta_2})}{1-\Phi(X_2\widehat{\beta_2})}(1-A)$ can be used as an etimand for μ in (4) to obtain an unbiased OLS estimation of α. Note that standard errors should be bootstrapped (Lee, Maddala and Trost, 1980). Bayart (2009: chap7) further explains the difference with a usual IV procedure.

Importantly enough, a limit to this later method appears when y_1^* is unobserved. Indeed, in this case, the assumption that η is normal is necessary for the estimation whereas this is not necessarily the case in (4) (Lollivier, 2012). The second stage has to be estimated by "linear least squares regression" (Barnow, Cain and Goldberger, 1981:25, sic.) which prevents the use of a probit or logit model.

Appendix A6: Effect of apprenticeship training on the type of job occupied according to gender

Table 1.17: Marginal effect of apprenticeship training on the ratio of the full-time vs. part-time work in the year following completion of studies, differentiated by gender

	Completion of secondary education			
	Germany		France	
	Men	Women	Men	Women
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Apprenticeship	0.06	0.15***	0.05***	0.13***
	(0.04)	(0.04)	(0.01)	(0.01)
Individual controls	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes	Yes
Observations	409	492	12,673	6,460

Reading: Obtaining an apprenticeship diploma, at the end of French secondary school, is associated on average with an increase of 0.05 units in the ratio of working time spent full-time vs. part-time, in the following 12 months, for men and of 0.13 units for women.
Note: *** p<1%, ** p<5%, * p<10%.
Source: German Socio-Economic Panel and Céreq Génération surveys, own calculations.

Appendix A7: Regional apprenticeship ratio and frustrated orientation

Table 1.18: Marginal effect of the apprenticeship ratio on accessing the preferred option of studies at the end of 9th grade (3eme)

	Completion of secondary education
	France
	Probit
	(1)
Apprenticeship Ratio	0.16***
	(0.05)
Individual controls	Yes
Super-region' fixed effects	Yes
Observations	4,443

Reading: At secondary level in France, an increase of 1 p.p. of the apprenticeship ratio is associated with an increase of 0.16 pp in the probability to access to the preferred option of studies upon completion of the 9th grade.
Note: Standard errors in brackets are clustered by region in the 2SLS regressions. *** p<1%, ** p<5%, * p<10%.
Source: Céreq Génération 2004 survey, own calculations.

Table 1.19: Marginal effect of the apprenticeship ratio on failure to access the preferred option of studies upon completion of 9th grade because of a preference for another field or for an apprenticeship

	Completion of secondary education
	France
	Probit
	(1)
Apprenticeship Ratio	-0.17***
	(0.03)
Individual controls	Yes
Super-region' fixed effects	Yes
Observations	4,443

Reading: At secondary level in France, an increase of 1 p.p. of the apprenticeship ratio is associated with a decrease of 0.17 pp in failure to access the preferred option of studies upon completion of the 9th grade because of a preference for another field or for an apprenticeship
Note: Standard errors in brackets are clustered by region in the 2SLS regressions. *** p<1%, ** p<5%, * p<10%.
Source: Céreq Génération 2004 survey, own calculations.

Chapter 3

The impact of apprenticeship cost on firms' propensity to train and on mobility upon graduation

Abstract

In this paper, I analyse the impact of the cost of apprenticeship training on firms' propensity to train and on apprentices' mobility upon graduation in France. French governments have invested much to develop this type of training widely considered as a solution against youth unemployment. In particular, the level of subsidies targeting employers of apprentices is very high in comparative terms. Yet growth of apprenticeships remains limited which questions the impact of these expenditures. Conversely, they may foster turnover of apprentices whereas mobility upon graduation is known to be detrimental to labour integration. The identification strategy is based on the regionalization of a large subsidy offered to employers of apprentices, the *indemnité compensatrice forfaitaire* (ICF). The law was put into force in 2005. At the time, the ICF accounted for about a quarter of all public money spent on apprenticeship training. By then, regions could decide upon the criteria of the ICF and the amounts associated, which generated large variations in the cost of apprenticeships.

Using linear regressions with firm fixed effects, I show that subsidies foster turnover strategies. Thus, I find a limited but significantly negative elasticity of the number of apprentices hired to training costs. The point estimate is -0.22. The impact however mostly plays at the intensive margin (training firms taking on more apprentices) rather than at the extensive margin (new firms entering the system). This suggests that training firms may respond to subsidies by training over their needs in skills. Confirming this interpretation, I find that the elasticity of mobility upon graduation to training cost is negative and equal to -0.40.

Introduction

The yearly unemployment rate among youth aged 15 to 24 years old in France has averaged 22% since 2000. On the same period, the yearly youth-to-adult unemployment ratio has averaged 2.8. These figures, repeatedly mentioned in the public discourse, should be nuanced: many are those in this age category still at school and these rates are therefore computed per the case of the most ill-equipped young people. When computing unemployment rates for a representative cohort of school leavers, figures therefore strongly decrease both in value and over time. Thus, the year following their school exit, French students are on average confronted to an unemployment rate about 2.3 larger than adults. The ratio then drops quickly in relative terms (1.6 as soon as the second year following school exit) (see chapter 2).

If 'over-unemployment' of the French youth would gain to be nuanced in the public discourse, it therefore remains significant on the short run after school exit. Against it, a policy has gained high levels of consensus[84]: to develop apprenticeship training per the model of Germany. There, a large coverage of apprenticeship training indeed combines with a better access to the labour market for the youth. The unemployment rate of the 15-24 indeed averaged 6.8% between 2000 and 2018, 1.5 times the one of adults.

Yet, reviving training in French firms has proved arduous. 20th century policies have indeed brought a large chunk of vocational training studies towards the school realm and the period has been marked by a deteriorating image of apprenticeship training. Illustration of the difficulties to reverse this trend is made clear by the failure to ever attain the objective of 500,000 apprentices in training repeatedly stated by different governmental majorities since 1993. Efforts made by the State to develop apprenticeship training are yet important. They are of three main sorts: advertisement aiming at families and their children as well as at firms, enactment of a right to prepare most diploma in higher education via an apprenticeship and some monetary incentives mostly targeted at employers. This paper focuses on the latter.

[84] Most political parties agree on it, including those in power over the last decades – though the radical left noticeably opposes it (see the interview of J.L Mélenchon in Le Point 2012).

France indeed distinguishes itself by the amount of public expenditures spent on apprentices and, among them, by the level of subsidies offered to employers of apprentices. According to Martinot (2015), the yearly cost of an apprentice for the French State in 2010 amounted to 9500 euros; about three times the sum spent by the German government and an amount close to what applies in French standard schooling. In particular, in 2010, subsidies to employers accounted for about 60% of all public expenditures spent on apprenticeships against 15% in Germany (ibid). What this paper does is therefore to evaluate the impact of these subsidies on employers' propensity to take on apprentices. In a second stage, the impact on mobility upon graduation is estimated.

The main intuitions are the following. The literature has shown that the elasticity of employment to labour cost is large at low-wage levels. Given the low level of apprentices' earnings one could expect the impact of subsidies on training to be important. Yet, two elements play in the opposite way. First, strong constraints apply to these contracts (training facilities, trainer availability, etc.). Their cost is not assessed in France but they can reach substantial amounts, thereby limiting the impact of subsidies. Second, theory predicts that the size of the elasticity of interest is rather low when low minimum wages apply as in the case of apprenticeships. In section 1, building on the literature, I therefore hypothesize that the elasticity of training coverage to the cost of apprenticeship training is negative but small. In section 2, a structural model further predicts that variations in costs have stronger impact on the number of apprentices hired in training firms (the intensive margin) than on the firms' likelihood to train (the extensive margin).

As for retention rates, theory predicts that mobility upon graduation can be largely predicted by the conditions applying at the start of apprenticeship contracts. Intuitively, low training costs urge firms to follow turnover strategies rather than training-to-hire ones. This mechanism plays positively on the size of the elasticity of mobility to training cost. In sections 1 and 2, using a structural model and building on the previous literature, I therefore hypothesize that the impact of a drop in the cost of apprenticeships on mobility upon graduation is strongly positive.

To test these hypotheses, I use a reform implemented in 2005 which gave regions power to change the amount and criteria of a subsidy targeting employers of apprentices called the *indemnité compensatrice forfaitaire* (ICF hereafter). At the time of the reform, the ICF amounted to a quarter of the 3 billion euros of public money spent on apprenticeship training each year (Carrez, 2002, 2003). Management of the subsidy was taken over again by the State in 2014. I computed a new dataset gathering all regional reforms from 16 of the 22 French metropolitan regions between 2005 and 2014[85]. They show large variations in the criteria and amounts offered.

Three other sources of administrative data are used in the paper: the database Ari@ne, the DADS and FICUS-FARE. The former provides information on more than 80% of the apprenticeship contracts signed in France between 2000 and 2014. The second gives account of working contracts of all wage earners employed in the private sector, to the exception of private individuals' employees before 2009. The latter is constructed for fiscal reasons and gives details on active firms each year. Combining these four sources of data makes it possible to compute the average hourly cost for about 145 000 contracts signed each year.

Controlling for the potential relation between regional reforms and the pre-existent structure of apprenticeship training in the regions, I can therefore identify the impact of the labour cost of apprenticeship training on firms' propensity to train as well as on the likelihood for apprentices to be hired (retained) in their training firm upon graduation. The main finding is to show that subsidies foster turnover strategies. Thus, I measure a limited but significantly negative elasticity of the number of apprentices hired to training costs. The point estimate is -0.22. However, the impact mostly plays at the intensive margin (training firms taking on more apprentices) rather than at the extensive margin (new firms entering the system). This suggests that training firms may respond to subsidies by training over their needs in skills.

[85] The remaining regions are, on one hand, Picardie and Bourgogne which could not find back the history of regulations since 2005 and, on the other hand, Alsace, Lorraine and Champagne-Ardenne as well as Corsica where specific legislations on training apply.

Confirming this interpretation, I find that the elasticity of mobility upon graduation to training cost is negative and equal to -0.40.

The rest of the paper goes as follows. I first review the literature related to this research. I then build a structural model to clarify the hypotheses to test. Next, I present in more details how apprenticeship training is funded in France and I give information on the institutional setting of the *indemnité compensatrice forfaitaire*. After describing the data, I finally explain the strategy of identification and detail the results. I discuss them and conclude in the last section.

1 The literature

This research relates to two streams of literature. One deals with the impact of labour costs on employment, the other focuses more specifically on apprenticeships and on the reasons why firms train.

1.1 The elasticity of employment to labour costs

1.1.1 When policies target standard workers

A wide literature has studied the elasticity of employment with respect to labour costs. Its main theoretical result is the prediction of a negative correlation between this elasticity and wages (in absolute terms) in countries with a relatively high statutory minimum wage.

There are three main reasons for that (L'Horty et al., 2019). First, across sectors, the share of labour cost in the total production costs and the degree of substitution between capital and labour both decrease with the average level of wages. Labour cost is therefore expected to be a stronger determinant of the level of employment at the bottom of the wage distribution than at the top. Second, a given amount of public money will drop costs more strongly in relative terms if targeting low-wage employment. Even if the elasticity of labour demand to cost were constant across the wage distribution, the impact of a given budget would be maximized if limited to low-wage employment. Third, drops in labour costs can be passed to employees through rising wages

which undermines the objective of employment. In countries with high statutory minimum wages, targeting subsidies to minimum wage workers is expected to limit this side impact. In these countries, the minimum wage is indeed often thought to be above the market wage of a large chunk of employees (Cahuc et al., 2014).

The empirical literature has only partly validated these predictions. A large number of articles has used variations in payroll and corporate taxes as a source of identification. I first detail those dealing with the French context before extending to other countries. Kramarz and Philipon (2001), Crépon and Desplatz (2001) and Malgouyres (2019) have evaluated the first employer payroll tax cuts in France which were implemented in the mid-1990s. It applied to workers paid between 1 and 1.3 minimum wages. The three papers find a positive impact of the reform on employment and measure an elasticity of about -1.5. A further range of employer payroll tax cuts have been implemented in France since the late 1990s. With time, they targeted less and less low-wage workers and had a decreasing impact on employment. Bunel et al. (2009) have evaluated one of them which targeted workers up to 1.6 minimum wages. They find a smaller elasticity than in the aforementioned literature: -0.5. Research was finally made on a recent drop in corporate taxes which is granted proportionally to the number of workers earning less than 2.5 minimum wages in the firm. Gilles et al (2017) and Carbonnier et al (2018) find that this measure had nearly no impact on employment. The last reform defers from the previous ones in accounting terms which may reduce its impact on employment (Bozio et al., 2018). Nevertheless, in France overall, it seems that the impact of drops in labour costs on employment is negatively correlated with the wage of targeted workers.

Effects comparable to the French ones are found for general drops in payroll taxes in Belgium (Goos and Konings, 2007), but not in Sweden, (Bohm and Lind, 1993; Bennmarker et al., 2009), Norway (Johansen and Klette, 1997; Gavrilova et al., 2015) nor Finland (Korkeamäki and Uusitalo, 2008). Some have interpreted these results as being compatible with the theoretical prediction that the impact of labour cost on employment depends on the presence of a high statutory minimum wage (Cahuc et al., 2014). This imports for us because the minimum wage applying to apprentices in France is very

low which could therefore limit the impact of a drop in the cost of apprenticeships on training. Yet, the statement should be nuanced[86]. In particular, specific analyses of a payroll tax cut targeting the youth in Sweden find negative elasticities[87] while most of the sample is paid much above the sectoral minimum wages (Egebark and Kaunitz, 2014; Saez et al., 2019).

A second stream of research has analysed the impact of hiring credits on employment. In a review, Neumark (2013) shows that hiring credits in the US are not efficient when targeting the disadvantaged. In that case, they stigmatize beneficiaries and foster turnover. Conversely, Neumark and Grijalva (2017) find a limited but positive impact of broader programs enforced in the aftermath of the Great Recession in the US. Cahuc, Carcillo and Le Barbanchon (2014) also focus on a French hiring credit implemented in the wave of the Great Recession. It was targeted at small firms and low-wage employment. They find a strong impact of the policy on employment.

Overall, these results validate the prediction according to which drops in labour cost have a stronger impact on employment when targeting low-wage workers. Whether the drop in costs stems from a hiring credit or a drop in payroll taxes seems only secondary as soon as the treated group remains large enough not to be stigmatized. Conversely, the role of the statutory minimum wage remains to be properly tested.

1.1.2 When policies target apprentices

The aforementioned literature brings several intuitions for our case. The fact that apprentices generally earn small wages in France should positively impact the elasticity of employment (of training) with respect to labour cost. Yet, other elements are likely to counterbalance this effect. First, a specific

[86] Most of the research led on the Nordic countries uses a variation in payroll taxes applying across all the wage distribution or up to large wage levels. One notable exception can be noted: Huttunen et al (2013) find no impact on employment of a drop in payroll taxes applying to old low-wage workers. This population is however quite specific.

[87] Although they are limited (between -0.20 and -0.30).

and very low minimum wage applies to these contracts[88]. Although it remains to be properly tested empirically, the theory on the role of minimum wages persists and suggests that low minimum wages for apprentices should limit the size of the elasticity of interest. Second, the value of the hiring credit exploited hereafter depends on very specific parameters. Following Neumark (2013), it is therefore possible that employers show reluctance in hiring the small groups receiving the largest amounts. Third, the apprenticeship contracts entail elements likely to negatively affect the size of the elasticity of training to cost: (i) trainees spend part of their time at school, which some employers may consider to be too strong of a constraint; (ii) a tutor (the apprenticeship master) must be nominated and should spend some non-productive time to train the apprentice; (iii) requirements to train apprentices also generally imply to invest money into facilities which fixed-costs are independent from the 'monetary cost'[89] of trainees.

Before turning to the thin empirical literature dealing with the impact of cost on training, it should be said that a drop in cost is likely to generate some externalities themselves playing on the level of labour demand as evidenced in the training literature. I give two examples here to show that they can play in both ways. First, the endogenous growth theory (Lucas, 1988) has predicted that workers' human capital has a positive external effect on the productivity of their colleagues. As a result, if a drop in costs fosters hiring of apprentices – and therefore raises the general level of education – the resulting increase of productivity of the average apprentice should itself accelerate hiring as a response. Second, part of the drop in cost may be offset by increased expenditures to fill vacancies. Indeed, in the case where a hiring credit would increase firms' propensity to train, competition to find good apprentices would then be fostered. This would, in turn, increase training cost (Muehlemann et al., 2010), thereby limiting the initial impact of public expenditures on the

[88] In France, the minimum wage of apprentices depends on the age and the seniority. It varies between 25% and 78% of the normal statutory minimum wage.

[89] I define the 'monetary cost' of an apprentice as her gross wage minus the public subsidies and tax credits targeted towards apprentices or received alike all other employees. The gross training cost is obtained by adding the cost of training facilities and the cost for the master's time. The net training cost deduces the value of the apprentice's output to the gross cost.

extensive margin of training. Other externalities could be mentioned (Moretti, 2004); overall their impact on the elasticity of interest is ambiguous.

The literature dealing with the impact of apprenticeship costs on employment is tiny and natural experiments are very seldom. It focuses on Germany, Switzerland and Denmark where this form of training is the most developed. The main conclusions of this research stream confirms that the cost elasticity of firms' propensity to train is rather limited. It also suggests that it depends on representatives' power resources.

Three papers have measured the impact of apprenticeship cost on employment in the case of Denmark and Switzerland. Note that the minimum wage applying to apprentices is higher in Denmark. In the early 1980s, in a period of shortage of apprenticeship offers, a subsidy was given to Danish employers for each marginal apprentice they hired on the condition that their stock of trainees would not be lower than two years before. Westergård-Nielsen and Rasmussen (1997) study its impact and find a differentiated effect on firms' propensity to train according to the sector. It is significant (and positive) only in manufacturing, offices and trade. In another paper, Weatherall (2009) evaluates a subsidy conditional on hiring apprentices older than 25. The partial equilibrium impact for this population is limited: positive and significant for male apprentices but non-significant for women. In Switzerland, Muehlemann et al. (2007) have taken advantage of a cost-benefit survey led on training firms to predict training costs for any firm and measure its impact on both the extensive and the intensive margins of training[90]. They find that the elasticity of the probability to train with respect to the cost of apprenticeships is of - 0.45 at the average value of regressors, but find no effect on the intensive margin. Note that there are reasons to think that these measures are over-estimated[91] and should be seen as an upper bound. Overall,

[90] The extensive margin accounts for firms' probability to take on apprentices; the intensive margin measures the number of trainees per firm.

[91] It is likely than firms actually training have some comparative advantage regarding costs or face specific needs for their workforce in comparison with other companies. The authors use a measure of the shortage in skilled labour to take this into account but it may not be sufficient.

it therefore seems that the elasticity of training to labour cost is rather limited in the case of apprenticeship training and that minimum wage for apprentices – which strongly differ between Switzerland and Denmark – does not seem to play a strong role at first glance.

Comparison of Germany and Switzerland helps to understand the role of representatives. The literature has shown that German unions and works councils have strong enough power to limit the use of apprentices in productive tasks, which is not the case in Switzerland (Wolter et al., 2006; Dionisius et al., 2009; Ryan et al., 2013; Kriechel et al., 2014). As a result, training behaviour in Switzerland is mostly explained by the output firms are able to get from apprentices while, in Germany, the gross cost (see note 89) has a better explanatory power[92] (Wolter et al., 2006; Muehlemann et al., 2010). The elasticity of training to the gross cost of apprentices is therefore expected to be stronger in Germany than in Switzerland. In France, labour representatives have very little power to limit the use of apprentices on productive tasks as in Switzerland (Léné, 2018). The elasticity of interest should therefore not be larger than in the Swiss case – where the value -0.45 probably constitutes an upper bound.

In the end, in France, the impact of a drop in apprenticeship cost on firms' propensity to train is expected to be negative but much more limited than the effect of drops in payroll taxes for minimum-wage standard workers. Hence the following hypothesis:

H1: In France, the elasticity of training coverage to the cost of apprenticeship training is negative but small.

In that case, a negative selection bias would persist and the real value for the estimated elasticity should be closer to zero than the estimated one.

[92] In each country, the capacity to use apprentices on productive tasks and the gross cost of apprentices depend on firms' characteristics such as the sector, the size, …

1.2 The impact of apprenticeship cost on mobility upon graduation

The second independent variable of interest is the likelihood for apprentices to remain in their training firm (retention rates). This variable matters because, on a developed market of apprentices, non-retained graduates integrate less well on the labour market (Brébion, 2019). Decision of mobility upon completion of an apprenticeship contract is shared between the apprentice and her employer. Yet, overall, "[f]irms seem to play a more structuring role in the apprentices' immediate mobility" (Lene and Cart, 2018: 22)[93].

Theoretically, training firms are generally said to follow two ideal-typical strategies. Building on Lindley (1975) one can model them as a productive strategy and an investment strategy. In the first case, the firm takes advantage of the low-cost feature of apprenticeships and takes on trainees with no intention of subsequent hiring. In the second case, the firm plans to hire a skilled worker and decide to train in-house rather than to 'buy' skilled labour on the external market. Reasons for the latter strategy are many (see appendix A2 of chapter 2) and will not be discussed here. What imports for us is to see that retention rates are likely to be much larger in the second case. As such, they are likely to reflect the level of investment firms put into training.

What impact to expect from a drop in the cost of apprenticeships? Theoretically, the answer is ambiguous. At equilibrium, all firms to which one of the two strategies brings positive expected profit train. If the cost of apprenticeship decreases, the expected profit of both strategies increases for all firms. Non-training firms who were close to the binding condition for either one strategy or the other therefore enter the system. But, among them, there is no reason why the share of firms expecting a positive profit through the first strategy would be different than the share of firms applying this strategy at the pre-existent equilibrium – both taken relatively to the second strategy.

[93] Conversely, deferred mobility would be more often the choice of the graduate (Lene and Cart, 2018).

To my knowledge, the only literature on the matter is a cross-country research based on the 'firms' cost and benefit of apprenticeship training' surveys led in Germany and Switzerland. It shows that both retention rates and labour costs are stronger in Germany (Dionisius et al., 2009)[94]. Training firms differ between Germany and Switzerland, but this literature confirms that the decision to retain an apprentice is already – and largely – initiated at the very start of the apprenticeship contract. It further suggests that retention rates are strongly correlated with labour cost. Hence the following hypothesis:

H2: In France, the elasticity of mobility upon graduation to the cost of apprenticeships is negative

2 A simple theoretical framework

In this section, I develop an illustrative model in discrete time. It allows me to clarify employers' incentives (i) to train; (ii) to hire several apprentices instead of one; (iii) to retain apprentices upon graduation. The model is firstly constructed to clarify hypothesis *H1*[95] by distinguishing between the cost elasticity at the extensive and the intensive margins. At the same time, it reinforces hypothesis *H2*.

Consider first a continuum of firms F_k where $k \in [0,1]$. Each of them must pay a firm-specific fixed cost to adapt the workplace to receive apprentices. These fixed cost are $FC(\lambda, n)$, where $\lambda \in [0;1]$ accounts for the technology intensiveness of the sector[96] and n is the number of apprentices trained in the firm. The function for fixed costs is convex in the first parameter. This means that: (i) the more technology incentive a sector is, the larger the fixed cost; (ii) the speed at which fixed costs rise as technology intensiveness grows is positive. Further we set $\lim_{\lambda \to 1} FC(\lambda, n) = +\infty$: we expect that sectors the most intensive in technology will not train. As for the second parameter, we

[94] Interestingly, no difference in training quality is found between the two countries.

[95] H1: In France, the elasticity of training coverage to the cost of apprenticeship training is negative but small.

[96] λ relates to determinants such as the space required to receive an apprentice or the working time of the apprentice master.

have $FC_2^{'}(\lambda, n) > 0$. Then, FC_2'', the second derivative with respect to n, is defined by segments which depend on λ. On each interval $[n_{i,\lambda;} n_{i+1,\lambda}[$, we have $FC_2''(\lambda, n) < 0$. These elements mean that: (i) fixed costs increase with the number of trainees; (ii) on each segment $[n_{i,\lambda;} n_{i+1,\lambda}[$ there are positive returns to scale as the number of apprentices grow; (iii) the cost jumps for all apprentices when the number of trainees goes from $n_{i,\lambda} - 1$ to $n_{i,\lambda}$.[97].

Consider now that there are two types of apprentices available $\{T_0; T_1\}$. Their respective productivity after training is respectively p_0 and p_1, with $p_0 < p_1$. The employer is aware that there are several types of students but she must pay a cost C ex-ante to select candidates of type 1. Alternatively, the employer can blindly hire a candidate and observe her type during the apprenticeship. Independently of their type, the monetary cost of apprentices sums to w_{app} over the time of training. Their total production during training is p_{app}.[98]. Training lasts for two years. Once trained, their yearly cost grows to w_s which is the one of a junior skilled worker.

Note that the firm can also turn to the external labour market and hire a senior worker to fill the vacancy. In that case, a cost α should be paid to select the worker (cost to review CVs, lead the interviews, etc.). Senior workers are more productive than junior skilled workers. Their productivity is $p_2 = p_1 + \delta$, with $\delta > 0$. Their yearly cost is $w_s + \gamma$ each year, with $\gamma > 0$. γ accounts for the bargaining power senior workers have which allows them to be paid according to their work experience and productivity.

A few assumptions are taken to simplify the setting:

1) Regarding apprentices:
   - We set $p_0 < w_s$ so that employers will never retain an apprentice of type T_0.

[97] Apprenticeship masters who can only supervise two apprentices at a time in France are a good example to understand the last element. If a firm is willing to take on a third apprentice it must therefore recourse to a second worker entitled to train. The firm must accept masters' demand for training to improve teaching skills which has a cost. In the end, the third marginal apprentice has a stronger impact on training costs computed for all apprentices than the second one. Conversely, the impact of the second marginal apprentice is lower less than the first one.

[98] Apprentices' production during training does not depend on their type because both types have the productivity of an unskilled worker before graduation.

- Apprentices do not drop out and are all willing to remain in the firm upon graduation.

2) Regarding the firm:
   - The firm has no risk aversion
3) Regarding contracts:
   - Workers hired on standard contracts remain in the firm until period T.

In period 0, firms know they will need a skilled worker trained to the workplace specificities for period 2. They can take three different routes to fill the expected vacancy. Different discounted levels of expected profits π_k, where k is the type of firm, are associated to each of them. The discount parameter is β.

1) Select and hire a candidate of type 1 for apprenticeship, train her during two years and offer her a standard contract upon graduation.

$$\pi_k = p_{app} - w_{app} - C - FC(\lambda_k, 1) + \sum_{t=2}^{T} \beta^t (p_1 - w_{s,t})$$

2) Hire n apprentices without selecting them, train them during two years and retain one apprentice of type 1 if available. The type of each apprentice is $type_i$ which is randomly and independently selected in $\{T_0; T_1\}$.

$$\pi_k = n * (p_{app} - w_{app}) - FC(\lambda_k, n) + p\left(T_1 \subset \bigcup_{i=1}^{n} type_i\right) * \sum_{t=2}^{T} \beta^t (p_1 - w_{s,t})$$

Because there are only two types of apprentices here, $p\left(T_1 \subset \bigcup_{i=1}^{n} type_i\right) = 1$ as soon as n reaches 2. The function can therefore be written as:

$$\pi_k = n * (p_{app} - w_{app}) - FC(\lambda_k, n) + \sum_{t=2}^{T} \beta^t (p_1 - w_{s,t}), \qquad if\ n > 1$$

3) Hire a skilled worker from the external market in period 1.

$$\pi_k = -\beta * \alpha + \sum_{t=1}^{T} \beta^t (p_1 + \delta - w_{s,t} - \gamma)$$

In the end, the employer will choose to train if $(*)$ is larger than $(**)$:

$$(*) \qquad \max\left(p_{app} - w_{app} - C - FC(\lambda_k, 1);\ \max_{n>1}(n * (p_{app} - w_{app}) - FC(\lambda_k, n))\right)$$

$$(**) \qquad \beta * ((\delta - \gamma) * \left(\tfrac{1-\beta^T}{1-\beta}\right) + p_1 - w_{s,1} - \alpha)$$

In that case, choice to train several apprentices instead of one will be taken if:

$$\max_{n>1}\ ((n-1) * (p_{app} - w_{app}) - FC(\lambda_k, n)) > -C - FC(\lambda_k, 1)$$

In the case where $p_{app} - w_{app} < 0$, the choice comes down to taking one or two apprentices. Conversely, if $p_{app} - w_{app} > 0$, the firm may take a larger number of apprentices – which size depends on the behaviour of $FC(\lambda_k, n)$.[99] – if the condition applies.

This structural model therefore leads us to be more specific on the hypotheses to test: the cost elasticity at the extensive margin (whether firms train) is expected to be smaller than the cost elasticity at the intensive margin (the number of apprentices in training firms). Indeed, as formalized in the model, fixed costs to adapt the workplace to apprentices can rapidly reach large levels in some sectors. In these sectors, we can therefore expect fixed costs to largely exceed the monetary cost of trainees given the low levels of minimum wages for apprentices. The model tells us that in that case, the cost elasticity at the extensive margin should be limited:

H1.1: The cost elasticity at the extensive margin is limited

Conversely, a firm which is training at equilibrium is likely to exhibit relatively low fixed costs to adapt its workplace. If their concavity with respect to the number of apprentices in the firms is strong enough between $n = 1$ and $n = 2$, the decision to train several apprentices instead of one should mostly rely on the relation between the selection cost and the monetary training costs. Given that Kramarz and Michaud (2010) have shown that hiring costs are limited in France, they should be small in comparison to the

[99] This number will be just under than of the $n_{i,\lambda}$ previously defined.

total monetary cost of apprenticeships. As such, public policies decreasing the the latter are expected to have a substantial impact on the number of apprentices per training firm. The impact of these policies should be even stronger for firms where trainees' production is larger than their monetary cost. In these firms, a drop in the monetary cost can bring them to jump training from one apprentice to a large number (which exact size depends on the behaviour of fixed costs when the number of trainees rises).

H1.2: the cost elasticity at the intensive margin is larger than at the extensive margin and reaches a substantial size.

Note that the combination of *H1.1* and *H1.2* is of course compatible with hypothesis *H1*.

Finally, the relation between cost and mobility is expected to go in the same line as the cost elasticity at the intensive margin. This reinforces *H2*:

H2: The elasticity of mobility upon graduation to the cost of apprenticeships is negative

3 The ICF and the cost of apprenticeship training

Hypotheses *H1.1*, *H1.2* and *H2* are tested in the case of France on the period 2000-2014. The variation in cost is driven by variations in a subsidy called *Indemnité compensatrice forfaitaire* (ICF) and targeted at employers of apprentices. Before turning to the data and estimations, I bring institutional elements regarding the funding of French apprenticeships.

3.1 National and regional policies affecting the cost of apprenticeship training

Public resources targeting apprenticeship training have three sources in France: specific taxes levied on firms, spending from regions and funds taken from the 'general budget' of the State. At the beginning of the 2000s, the two former were exclusively channelled towards the school part of apprenticeships. Funds from the 'general budget' of the State were directed towards employers. They included two types of spending: (i) an exoneration in payroll taxes for firms with less than 11 workers or with an activity in the craft industry and (ii) a subsidy (the *Indemnité compensatrice forfaitaire*, ICF).

The exoneration in payroll taxes was implemented in 1979 (law 79-13, January 3rd 1979). The only evolution along the period of study 2000-2014 is a law in 2008 which restored a few (and small) payroll taxes for firms exonerated until then. The ICF was created in 1996 to simplify the different financial incentives directed to employers (law 96-376, May 6th 1996). At the time, it included two components: a one-time hiring credit[100] (915€) and a yearly subsidy to cover part of the training expenses (1525€). The latter was topped up for underage apprentices (+305€/year) or if hours of schooling were large enough (+7.62€/hour, maximum of 1524€/year). In 2002, a reform was voted to transfer the payment of the ICF to regions. It applied to contracts signed after January, 1st 2003. By 2005, regions could as well decide upon the criteria of the ICF and the amounts associated, on the condition that a firm would receive between 1,000 and 5,000€ a year for each of its apprentices (decree n° 2004-551, June 15th 2004). The two policies remained active until 2014, year of repealing of the ICF (see section 3.4).

Three other types of public spending were set up between 2000 and 2014 to specifically target apprenticeship training. Their conditions all prevail at the national level. The first one is a tax credit on the pay bill of apprentices, implemented for some firms in 2005, and generalized in 2006. It amounts to 1600€ per year of apprenticeship or 2200€ if the apprentice is disabled. The

[100] Limited to apprentices with low levels of diploma in 2001

tax credit was progressively removed from 2013 on. The second is a subsidy granted to firms increasing their stock of apprentices in the aftermath of the crisis, between 2009 and 2011. It roughly sums up to 1800€ for small firms and to 1000€ for larger ones. Finally, a national bonus-malus policy based on the number of apprentices according to the firm size was implemented in 2010. It affects the pay bill of all employees in the firm.

On top of these public expenditures specifically targeting employers of apprentices, other national and general policies have of course impacted the cost of apprentices over the period. They are of three types: (i) changes in the minimum wage, on which apprentices earnings are indexed; (ii) changes in the level of payroll taxes; (iii) a corporate tax credit (CICE) implemented in 2013.

Between 2000 and 2014, the regional laws changing the value and criteria of the ICF from 2005 to 2014 therefore constituted the only source of variation in the 'monetary cost' of apprentices, given their characteristics, the hiring time and the characteristics of the training company.

3.2 The regional regulations

Regions have taken advantage of their entitlement to reform the ICF to different extent. I collected the regional texts of law for 16 of the 22 metropolitan regions between 2005 and 2014. Table 3.1 shows the date of application of each change in regulation and the total number per region. Regions are classified according to the date of their first regulation.

To cover their expenses, regions received a yearly dotation for this new expenditure. In 2003[101], it equated the actual spending borne by the State in 2002 and updated according to the yearly evolution in the number of apprentices. Then, the yearly amount evolved at the same pace as all endowment funds granted by the State to the regions. The dynamic of the dotation was therefore independent from the evolution in the number of apprentices trained in the region and, more generally, from the evolution in the actual expenditures of each region. For instance, in 2011, the State

[101] Regions were in charge of expenditures by 2003 but could only change regulations by 2005.

endowed regions with 801 million euros per the ICF (IGF and IGAS, 2013). This represents an increase of 6.8% with regards to what the State spent in ICF in 2001 while the number of apprentices grew by 11.5% in the meanwhile. Importantly, regions can use their endowment on other purposes than the ICF as long as they provide each employer a minimum of 1000€ per apprentice and per year. In 2011, at a time when all regions had changed the original criteria of the ICF, they spent on average about 75% of their ICF endowment on this purpose (IGF and IGAS, 2013; see Figure 3.6 in Appendix A1).

Table 3.1 - Timing and number of changes in regulations relative to the ICF according to the region

	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total number of changes
Rhône-Alpes	01/06			01/06					01/06	3
Pays de la Loire	01/07	01/07	01/07				01/07	01/07		5
Haute-Normandie		01/01						01/11		2
Poitou-Charente		01/06			01/06	01/06	01/06	01/07		5
Centre		01/06				01/06				2
Bretagne		01/07			01/07					2
Île-de-France		01/07					01/06			2
Languedoc-Roussillon			01/06		01/06					2
Nord-Pas-de-Calais			01/06				01/06			2
Limousin			01/06				01/06			2
Basse-Normandie				01/06			01/06			2
Provence-Alpes-Côte d'Azur				01/07				01/07		2
Franche-Comté					01/01		01/01	01/06		3
Aquitaine					01/01					1
Midi-Pyrénées					01/06					1
Auvergne					01/09			01/07		2

Source: own treatment of regional regulations.
Dates are formatted as DD/MM.

3.3 The regional variation in the cost of apprenticeship training

Taking into account all sources of cost and revenues previously mentioned, I can plot the monetary cost of any contract. In this part, for the sake of

simplicity, I choose three typical examples of contracts in region Ile-de-France (outside of Paris):

(1) A firm of 8 workers, of which one is an apprentice, hires a new apprentice aged 16, who just graduated from lower secondary education (b*revet des collèges*) and prepares a 2-year c*ertificat d'aptitude professionnelle* (vocational training diploma taken at secondary school) involving 450 hours of class per year.

(2) A firm of 220 workers, of which 2 are apprentices, and which is not part of the craft industry, hires another apprentice aged 24 preparing a 1-year *licence professionnelle* (3rd and last year of short-cycle higher education) involving 600 hours of class per year.

(3) A firm of 270 workers, of which 10 are apprentices, and which is not part of the craft industry, hires another apprentice aged 24 preparing a 1-year *licence professionnelle* (3rd and last year of short-cycle higher education) involving 600 hours of class per year.

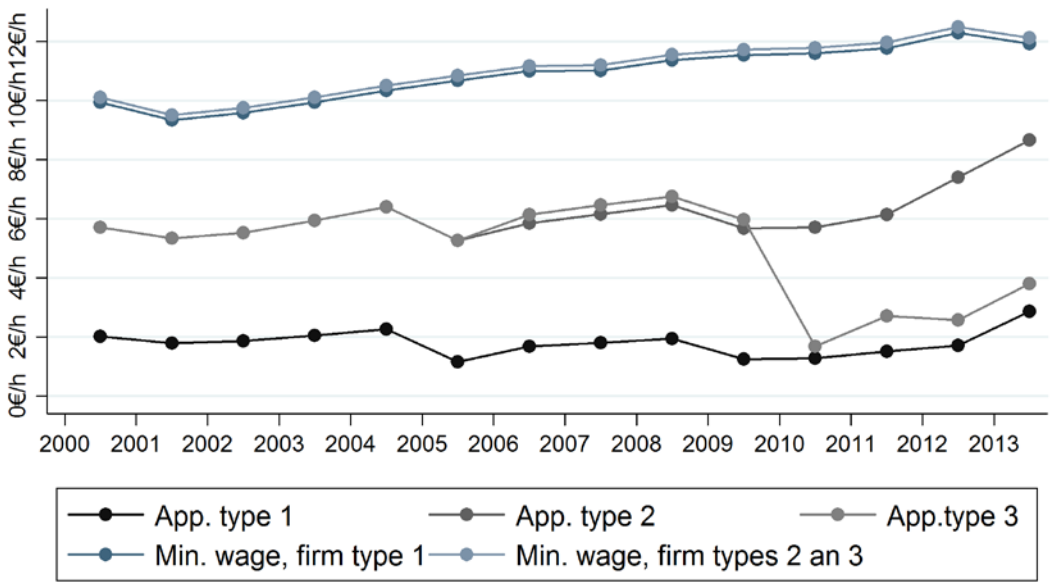
I specify other characteristics applying to all types in appendix A2. In particular, the working time of each apprentice is equal to the difference between the normal amount of yearly hours and the number of hours spent at school.

In Figure 3.1, I display the hourly cost of these contracts according to the year of hiring in region in Ile-de-France. Each of them begins on September, 1st. The cost of a non-fixed term contract of equivalent length paid at the minimum wage is also showed. In all cases, the cost is calculated at the conditions applying at the time of signature. This means that changes in legislation taking place after the beginning of the contract are not taken into consideration in the computation though they actually applied in reality.

The main take-away points are the following. The monetary interest in hiring an apprentice instead of a 'standard' worker appears clearly, including in the case when the apprentice has already graduated from a two-year diploma in higher education (types 2 and 3). The value of apprentices of type

1 oscillates between 1.15€/hr and 2.85€/hr. This seems to be small enough to ensure that, taking into account the cost of training facilities, the master's time and the apprentice output, the net training cost is negative (see note 89). Finally, three year-to-year changes in cost for a given type stand out. The drop between 2004 and 2005 results from the instauration of the national tax credit for hiring an apprentice. The drop between 2009 and 2010 for type 3 stems from the fact that hiring a new apprentice brings the firm above one of the thresholds set up in the bonus-malus law. This brings a drop in the payroll taxes for the whole wage bill of the firm. I integrate the gain for the employer into the apprenticeship cost. Last, the sharp increase in cost taking place for all types between 2011 and 2013 is explained by a combination of factors: the end of the post-crisis specific subsidies, a change in the regional regulation of the ICF in Île-de-France and the end of the national tax credit received for hiring an apprentice.

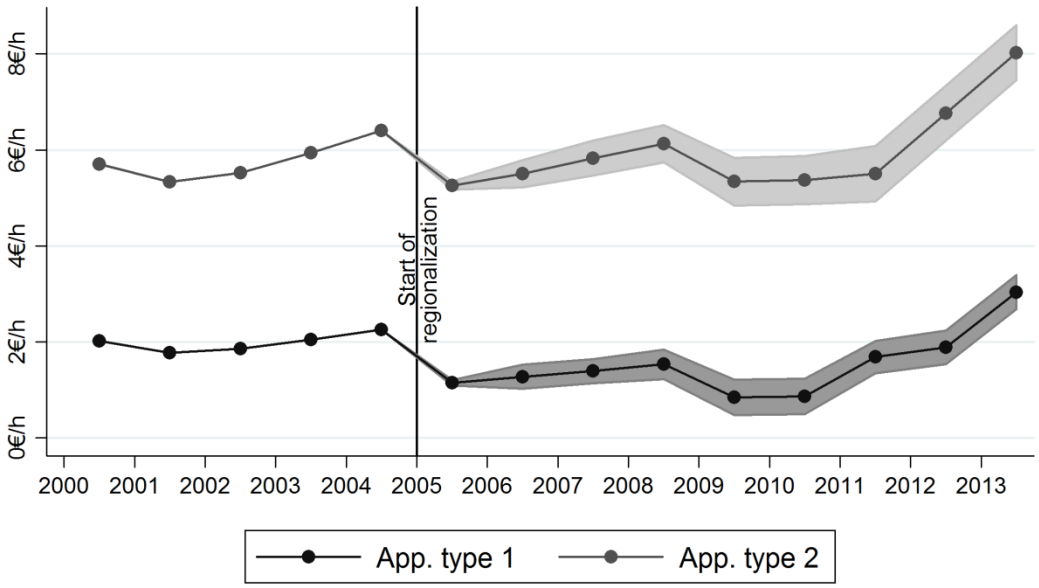
Figure 3.1 - Hourly cost of an apprenticeship contract in Ile-de-France according to the type of contract



Note : The hourly monetary cost of a non-fixed term contract paid at the minimum wage in the same firm is given for information. It does not differ between types 2 and 3.
The date of signature is September, 1st for each year.

In Figure 3.2, I focus more specifically on the regional dispersion in the apprenticeship cost stemming from the variation in the ICF. The figure focuses on types 1 and 2. Type 3 is indeed very particular, few are the apprentices allowing firms to reach one of the thresholds set in the bonus-malus law. Comparing them at the regional level therefore brings little information. The two lines of Figure 3.2 are built according to the same principle as Figure 3.1 with the exception that the value of ICF granted to each contract is computed using the national regulation applying before any regional reform. This means that the amount of ICF used to compute the hourly cost displayed in the two lines is constant for each type over time. For each type and year, I then compute the actual distribution of the hourly cost across regions. In each region, this is computed using the pre-reform amount of ICF only until enactment of the first regional regulation. Afterwards, levels of ICF are computed according to the regional rule applicable. The shaded area of Figure 3.2 displays the spread between the 'placebo' value +/- one standard deviation of the actual distribution of regional apprenticeship costs. Since regions could implement regulations by 2005, this standard deviation is null before then and the shaded area empty.

Figure 3.2 - Hourly cost of typical apprenticeship contracts computed with the national value of the ICF prevailing in 2000 and actual dispersion of costs over regions



Note : Shaded areas show the spread between the cost of a placebo contract bringing a value of ICF defined by the reform national regulations +/- 1 standard deviation of the distribution in the actual cost applying over regions
The vertical line shows the timing of the reform.
The date of signature is September, 1st for each year.

3.4 The repealing of the ICF

Announcement of the suppression of the ICF took place on July, 17th 2013. It was fully unexpected and the reactions opposing it were so strong that, the following day, the government announced the creation of a new subsidy directed towards small firms. Both changes were enacted in 2014 and applied to contracts signed after January, 1st 2014. Contracts signed before benefitted from a transitory plan. Because the change in legislation was not smooth and took place in the middle of the main period of hiring for apprentices (July-September), the analysis will focus on the introduction rather than the suppression of the ICF.

3.5 Other considerations

It should be said that the subsidy is not granted if the contract is broken before the end of the trial period. Moreover, until 2009 the part of the ICF which is offered yearly was conditional on the fact that the contract would not be broken before the end of the school year. Afterwards, this part got distributed to the prorata of the year spent under contract. Given these conditions, no specific action is needed from the firm to receive the ICF: registration of a contract before the administration is a necessary and sufficient condition to be entitled to and to receive the subsidy.

4 Data

The paper relies on four sources of data: the regional regulations of the ICF, an administrative database bringing information on apprenticeship contracts (Ari@ne) and two general administrative databases with information on employment spells (DADS) and on fiscal characteristics of firms (FICUS FARE).

4.1 Regional regulations

Information on regional regulations has been collected from regional services for apprenticeship training. Requests and reminders were sent by

phone and electronic mails over about a year. In many cases, contacts with the regional archive services were needed and, in a few instances, my demands were transmitted to retired workers as a last resort to find the required documents. To ensure that all reforms were covered in the documentation sent by each region, extensive reading of proceedings of regional meetings on the matter of apprenticeship training was made. When documentation on a reform proved inexistent in regional archives, I searched the website webarchive.org to find relevant documentation around the expected timing of missing reforms. In the end, for 2 regions out of the 18 I contacted, the regional services could not find the whole history of regulations for the ICF (Picardie and Bourgogne) and I could not recover it vita webarchive. Champagne-Ardenne, Lorraine and Alsace were left aside because specific conditions for apprenticeship training and payroll taxes apply there. Corsica is also not considered here.

In the 16 remaining regions[102], each text of regulation provides information on: (i) the date of application; (ii) the value of the different subsidies composing the ICF and their conditions in terms of firms' and apprentices' characteristics; (iii) requirements in terms of school attendance and minimal duration of the contract; (iv) the potential exclusion of contracts signed as an extension of a previous one. Appendix A3 shows a summary of the regulation applying in Ile-de-France for contracts signed between July, 1st 2006 and June, 1st 2011. The national regulation applying before is also given for information.

4.2 Ari@ne, the administrative database of apprenticeship contracts

Information on apprenticeship contracts is taken from an administrative database called Ari@ne. The data comes from the paperwork signed at the time of the contract. It provides information on the apprentice (including both his stock of diploma and some socio-demographic characteristics), on the firm

[102] They are: Rhône-Alpes, Pays de la Loire, Haute-Normandie, Poitou-Charente, Centre, Bretagne, Île-de-France, Languedoc-Roussillon, Nord-Pas-de-Calais, Limousin, Basse-Normandie, Provence-Alpes-Côte d'Azur, Franche-Comté, Acquitaine, Midi-Pyrénées, Auvergne.

(including an identifying number, its size and sector) and on the contract itself (length, date of signature...). Note that subsequent events are not registered[103].

The database therefore offers most of the information necessary to compute the value of the ICF for each contract between 2000 and 2014. Among the information lacking to evaluate it precisely, the most redundant include: (i) whether the share of girls (resp. boys) engaged in the track at the regional level is low enough to give entitlement to gender diversity bonuses when applicable; (ii) whether the master responsible for the apprentice has followed the training courses offered by the region when applicable. Note that the latter generally last for very short time and require little involvement. Following a rule of thumb, I therefore impute the value of subsidies for masters to all contracts but the value of gender diversity bonuses to none.

The database is not exhaustive. Coverage goes from 80% in 2000 to 96% in 2014 and the DARES – who produces the data – has only used the data to evaluate the yearly number of new apprentices in the country since 2012. Data collection goes as follows: after signing a contract, the employer has 5 weekdays to get it stamped by the school where its apprentice is registered and send it to the appropriate consular chamber (based on the sector of occupation, number of workers and place of work). Consular chambers then transmit contracts to the regional government via an online system of information. The database Ari@ne is constructed with this information. It appears that Chambers were not ready to use the computer system when it was first set up. For this reason, it took time for some of them to organize a routine to send the paperwork to regional governments.

The lack of exhaustiveness of the data is an issue for the first-stage estimation – namely, the analysis of the impact of apprenticeship cost on firms' propensity to train. Identifier for Chambers are only available from 2012 on, but circumvolution of the problem is still possible using the geographic condition linking firms to consular Chambers. They are of 4 main types in France. For each of them, and within each city (postcode), I consider that

[103] In the last years, information on contract termination is given, but, according to the DARES who produces the database, this should be handled cautiously since all breaks are not reported.

contracts were correctly sent to the regional government if at least one contract per year was registered by a firm of its scope. City × type groups which do not respect this rule are dropped. This procedure is only used to build the sample of the first-stage analysis. As for the second stage – namely the impact of cost on mobility upon graduation – there is no reason why the time variation in registration by consular chambers would be systematically correlated with the variation in the level of retention.

Further selection is led to focus on contracts planned over at least two consecutive years, for at least 6 months and for less than 4 years, in the private sector and involving apprentices younger than 28. I drop contracts extended because of a failure at an exam or taking over a first contract broken between the apprentice and another employer. At that point the database is composed on average of a bit more than 200,000 contracts signed each year between 2000 and 2012. Of these, I can compute the average hourly monetary cost applying over the time of the contract for about 150,000 apprentices starting each year between 2000 and 2012[104]. As previously mentioned, the difference stems mainly from the fact that legislations relative to the ICF are available for only 16 regions.

4.3 DADS, the administrative database for social contributions

The database Ari@ne has three main limitations for this research. First, firm size is self-declared. Yet this is one of the main criteria ruling the level of ICF offered to each firm and its computation is not straight-forward: some workers should not be included in the count (apprentices for instance) and, for multi-plant firms, manpower in all plants should be taken into consideration. It is therefore likely to be noisy. I could not obtain clear information on whether regional services use this measure anyway or rather the real value computed from another administrative database. Second, the identification strategy I follow in section 6.1 necessitates information on firms in years when

[104] The minimum national conditions are applied. In particular, this means that branch-level minimum wages for apprentices are not taken into account.

they do not take on apprentices – namely whether the firm is still active and its size if so. These are not available in Ari@ane. Third, the database does not provide information on the labour outcomes of trainees after their contract. In particular, it is unknown whether the training firm offers its apprentice a regular contract upon graduation which constitutes the dependent variable in the second-stage analysis.

For these two reasons, I first recourse to the DADS, which is a database used by the administration to compute social contributions. It covers all wage earners in France since 2009. Before that, employees working in the public sector or for private individuals were not covered. The database is constructed at the individual × plant × year level. This means that all contracts between a worker and an establishment in a given year are gathered together, including in cases when a break took place between two contracts. Yearly information on the nature of the main contract of an individual in an establishment is available in the DADS – the main contract being defined as the one which brought the largest earnings to the worker. In particular, while apprenticeship contracts are not identified directly by employers in the paperwork, the producer of the database provides the information by word-search in the job title. Though noisy, the measure is good enough to be used in our case.

I also use the database FICUS FARE, computed by the administration for fiscal reasons. It is constructed at the year × firm level and provides information on sales among other things. This is used to recover firms in years when they are active but have no worker.

4.4 Merging the databases

Two types of merge are led according to the dependent variable. The analysis of the impact of the training cost on firms' propensity to train only requires yearly data at the firm level from the DADS and FICUS FARE. I therefore match the two databases with Ari@ne on the unique firm identifier, available in the three sources of information. About 6% of the selected sample in Ari@ne is not found back in the DADS or in FICUS FARE. Training cost can be measured for an average of about 145 000 contracts starting each year when firm size is computed from these databases. These contracts constitute

the basis of the sample for the first-stage analysis – hereafter called sample A. It will be panelised at the plant level in section 6.1 and then called sample A'.

Second, in the analysis of second stage, I study the impact of training cost on the probability for an apprentice to be hired in her training firm upon graduation. It is therefore necessary to identify each trainee in the DADS upon completion of apprenticeships between 2002 and 2012[105]. The merging procedure between Ari@ne and the database of contracts retrieved as apprenticeships by the INSEE in the DADS is led on the following variables: firm identifier, region of employment, trainees' sex and age, termination date of the contract, first day of training the year preceding contract termination.

Matching is done approximately for the two latter variables. Regarding the former, graduation often takes place before contractual termination[106] and it is known that many apprentices break their contract upon completion of studies if not offered further employment in their training firm. By law, trainees even benefit from particular facilities to do so. These observations must not be lost. I therefore keep matches if the contractual termination date in Ari@ne does not exceed the real termination date in the DADS by more than 93 days. An apprentice will be considered as retained if, in the DADS, it is observed in the same establishment 2 months after contractual termination of the apprenticeship (see section 6.2). As for the starting date, I allow a maximum differential of 31 days between the two databases to limit the impact of mismeasurement. Finally, it should be added that plant identifiers (NIC5) are also available, but they cannot be used because of their poor quality in Ari@ne.

Table 3.11 in appendix A4 shows how well the second matching procedure does. About 45% of the contracts selected in Ari@ne (see section 4.2) with contractual termination between 2002 and 2012 are not found back in the DADS. Yet, it is known that about a third of apprenticeship contracts are broken before their term. I therefore fail to identify only about 15p.p. of real

[105] The database Ari@ne includes contracts beginning after January, 1st, 2000. The first significant yearly sample of contract terminations is therefore 2002.

[106] While graduation takes place between May and July in most cases, about 90% of sample A have a contractual termination between July and September.

contract terminations. For the rest, about 45% of the contracts selected in Ari@ne are matched to only one DADS position while about 10% are merged with several DADS positions[107]. The latter case is overrepresented among large firms. The second-stage analysis will therefore only be led on the 1 to 1 matches – skimmed of some observations, see section 6.2. This represents a sample of about 55 000 contracts completed each year between 2002 and 2012 – hereafter named sample B.

5 Descriptive statistics

In this part, I present a few descriptive statistics on samples A and B. Columns (1) and (3) of table 3.2 describe the average number of apprentices per region and their average cost in sample A. The respective standard errors are given in columns (2) and (4). Column (5) gives information on the average retention rate of apprentices according to the termination year in sample B. Its standard error is available in column (6). Each of these values are computed yearly.

The upward trend in the number of apprentices (see column (1)) is both due to the development of apprenticeship training over the years (see appendix A1.1 of chapter 2) and to the increasing coverage of contracts in Ari@ne. The main variations in training cost over years have already been discussed in section 3; variation across regions are due both to differences in cost and in composition. As for the retention rate, it is equivalent to what was found in chapter 2 using the surveys *Génération* (about 40%). Yet, the latter focused only on apprentices who left school for at least a year after graduation while part of those in sample B are going back to school upon graduation while others do not graduate. The figure estimated here therefore slightly overestimate the real value.

[107] For the 1-to-n matches, n strongly rises in 2009 at the time when the scope of the DADS grows.

Table 3.2 - Descriptive statistics across region × year cells

	(1) Average number of new contracts per region	(2) Standard deviation of col. (1)	(3) Average cost of contracts beginning in...	(4) Standard deviation of col. (3)	(5) Average retention rate upon graduation per region	(6) Standard deviation of col. (5)
	Sample A				Sample B	
2000	7,641	5,163	3.16	0.19		
2001	7,812	5,435	2.84	0.20		
2002	7,752	5,399	2.96	0.21	0.44	0.03
2003	7,356	5,015	3.18	0.21	0.45	0.02
2004	8,271	5,686	3.51	0.22	0.46	0.03
2005	8,563	6,004	2.43	0.22	0.45	0.02
2006	9,079	6,504	2.91	0.45	0.44	0.03
2007	8,829	5,648	3.06	0.40	0.42	0.02
2008	10,484	9,888	3.58	0.63	0.42	0.02
2009	10,091	8,658	3.28	0.61	0.41	0.02
2010	11,453	10,509	3.47	0.68	0.40	0.02
2011	11,990	11,085	4.10	0.58	0.40	0.02
2012	12,102	11,391	4.50	0.54	0.39	0.02

Sources: Ari@ne and DADS, own calculations

In what follows, I use the fact that four regions[108] ("regions of control" hereafter) implemented their first law relative to the ICF in 2009 to graphically evaluate the relation between training costs and recourse to apprenticeships in the other regions ("treated regions" hereafter) between 2000 to 2008. The idea is to compare the evolution in the number of contracts which cost increased (or decreased / remained stable) in a treated region which legislated on the ICF, with similar contracts in the regions of control.

Giving a practical example before formalizing the process may be useful. Consider a contract of type 1 (such as defined in section 2.3) and signed in Île-de-France on September, 1st 2005. The employer is entitled to 3,965€ of ICF over the time of the contract resulting in a total monetary cost for the apprenticeship of 2,273€. Region Île-de-France legislated over the ICF for contracts beginning after July, 1st 2006. It appears that a contract of type 1

[108] Franche-Comté, Aquitaine, Midi-Pyrénées, Auvergne

signed on September, 2006 would only bring 3,000€ to the same firm. Everything else equal, its cost would therefore sum to 3,238€ (= 2,273 + 3,965 - 3000) over the time of the contract. This represents a yearly rise of 42%. I then compare the evolution in the number of contracts of type 1 signed between July, 1st and June, 30th every year in region Île-de-France and in the four regions of control where the ICF remains equal to 3,965€ until 2009[109]. For a given contract, the ICF is the only source of variation in cost across regions. The evolution in this difference therefore gives hints on the impact of a rise in labour cost on firms' propensity to train.

To gain in generality, the process is not led on the sole contracts of type 1. Thus, I group contract types according to their evolution in each treated region: (i) drop larger than 10%; (ii) limited change in price ([−10%; 10%]); (iii) rise larger than 10%. A few steps are finally taken to ease presentation of the difference of evolution in the number of contracts in each of these groups between Île-de-France on one side and Franche-Comté, Aquitaine, Midi-Pyrénées, Auvergne on the other side.

Formally, the process comes down to the following steps in each of the twelve treated regions:

(1) I focus on the impact of the first regional regulation on the matter of the ICF (in year $t_{0,r}$) and drop contracts signed after the second regional regulation.

(2) In year $t_{0,r} - 1$, I group contracts according to the impact the first regulation would have on their cost, were they signed the subsequent year. Three groups are constructed as follows:

   (i) Contracts signed in $t_{0,r} - 1$ which cost would decrease by more than 10% if receiving the level of subsidies applying to their case after the new regulation.

[109] The second regional reform in Île-de-France took place in 2011.

(ii) Contracts signed in $t_{0,r} - 1$ which cost would remain stable (within the interval $[-10\%;\ 10\%]$).

(iii) Contracts signed in $t_{0,r} - 1$ which cost would increase by more than 10%.

(3) In the remaining years, I identify contracts which characteristics are the same as at least one contract signed in $t_{0,r} - 1$.

(4) I assign these contracts to the group where contracts signed in $t_{0,r} - 1$ with similar characteristics were allocated.

(5) Similarly to steps (3) and (4), I allocate all contracts from the four regions of control to the three groups according to their characteristics

(6) I separately normalize to 1 the number of apprentices in each group in the treated region as well as in the four regions of control in $t_{0,r} - 1$.

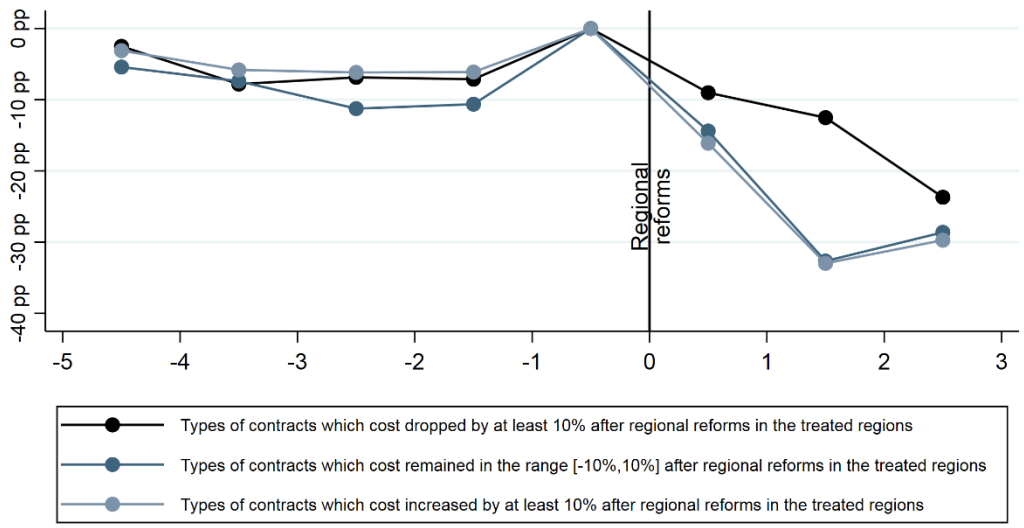
(7) Each year, I finally compute the group-specific difference between the normalized number of apprentices in the treated region and the normalized number of apprentices in the regions of control. I then detrend this difference based on the group-specific trends estimated before $t_{0,r}$.

The resulting group-specific variables are plotted over time for each treated region in appendix A5. The date of regional enactments over the ICF is standardized to 0. To ease presentation, I then average the results from the eight treated regions for which the most common window $[t_{0,r} - 5; t_{0,r} + 2]$ is observable. Figure 3.3 shows that, given their respective trend before each regional regulation, the number of apprentices in all groups of contracts evolve slower in the treated regions after a regional regulation than at the same time in the regions of control. Yet, contracts which costs decreased thanks to regional regulation of the ICF are less affected than those which cost remained stable or increased. Figure 3.3 therefore brings a first hint towards validation

of hypothesis *H1* since it suggests that the elasticity of training to costs is negative.

Note that, to the exception of the year preceding the reform, all values in the figure are below 0. This means that, on average in the treated regions, the number of apprentices increased more in the pre-reform year than in the preceding years in comparison with the regions of control. This suggests that regional reforms may have been implemented to respond to regional specific paths in apprenticeship training. It would be a threat to be treated in our identification strategy (see section 6) if the difference plotted in figure 3.3 and applying in each group followed different trajectories before the implementation of each regional reform. At first glance, it does not seem to be the case.

Figure 3.3 - Detrended difference in the normalized number of contracts signed each year in the treated regions and the regions of control

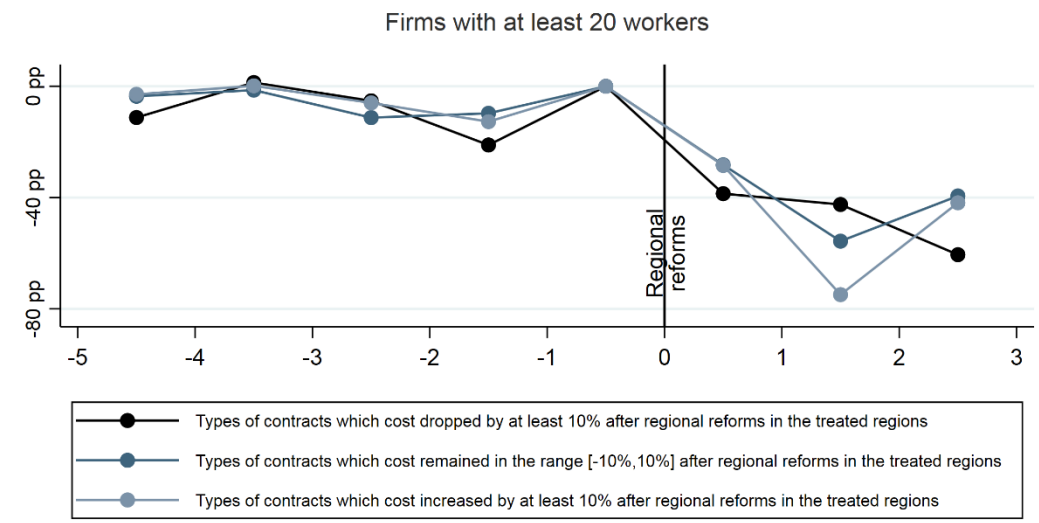


Note: The graph maps the normalized difference between (i) the number of yearly conctracts grouped according to changes in their cost implied by regulations on ICF in eight treated regions and (ii) the number of similar matches in four control regions.
Groups are constituted according to the evolution in cost the year before regional reforms and the year after in the treated regions.
The treated group includes regions who implemented their first regulation between 2005 and 2007 with no second regulation in the following two years;
The control group includes regions who did not enact any regulation on ICF before 2009. See text for details.

Reading: The year following implementation of regional regulation on ICF (t=0), the number of contracts which saw their cost decrease by more than 10% increased by .pp quicker in the treated regions than in the regions of control in comparision with their respective stock a year before. As for the contracts which saw their cost increase by more than 10% in the treated regions, the path was .pp quicker than in the regions of control.

Some heterogeneity in this elasticity should be emphasized. Figure 3.4 plots similar lines but this time limiting the sample to firms with at least 20 workers while Figure 3.5 uses its complementary. The former is noisier because of the lesser number of contracts in each regional group. It still clearly appears that small firms respond more strongly to the stimulus. It is however not possible to disentangle whether this comes from a difference in responsiveness of firms given the type of apprentice or whether this is driven by a difference in the composition of trainees between firms. Large firms indeed hire older apprentices who prepare more advanced diploma and cost more. Thus, figures 3.19 and 3.20 in appendix A6 show that training cost and recourse to apprenticeship seem uncorrelated for apprentices older than 18 to the contrary of underage trainees.

Figure 3.4 - Detrended difference in the normalized number of contracts signed each year in the treated regions and the regions of control



Note: The graph maps the normalized difference between (i) the number of yearly conctracts grouped according to changes in their cost implied by regulations on ICF in eight treated regions and (ii) the number of similar matches in four control regions.
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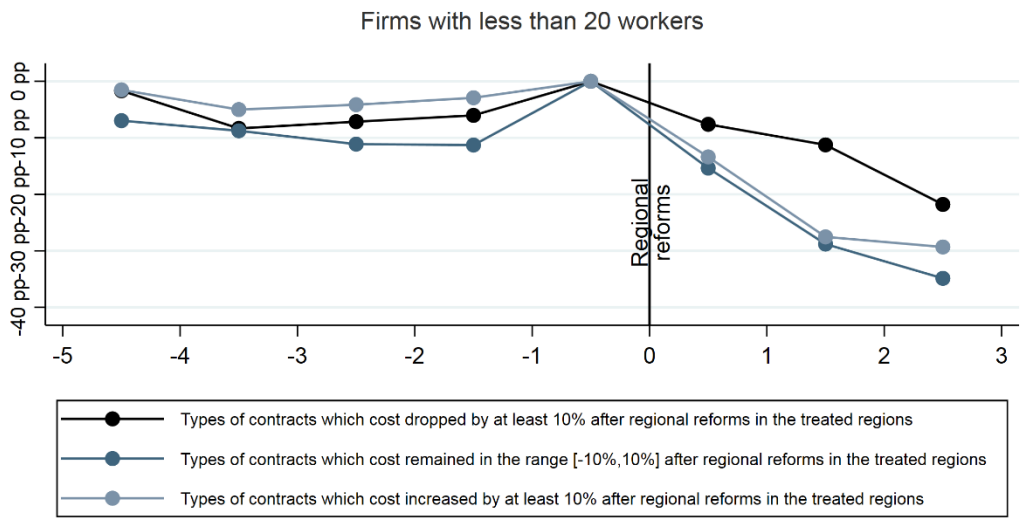
The control group includes regions who did not enact any regulation on ICF before 2009. See text for details.

Reading: The year following implementation of regional regulation on ICF (t=0), the number of contracts which saw their cost decrease by more than 10% increased by .pp quicker in the treated regions than in the regions of control in comparision with their respective stock a year before. As for the contracts which saw their cost increase by more than 10% in the treated regions, the path was .pp quicker than in the regions of control.

Figure 3.5 - Detrended difference in the normalized number of contracts signed each year in the treated regions and the regions of control



Note: The graph maps the normalized difference between (i) the number of yearly conctracts grouped according to changes in their cost implied by regulations on ICF in eight treated regions and (ii) the number of similar matches in four control regions.
Groups are constituted according to the evolution in cost the year before regional reforms and the year after in the treated regions.
The treated group includes regions who implemented their first regulation between 2005 and 2007 with no second regulation in the following two years;
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Reading: The year following implementation of regional regulation on ICF (t=0), the number of contracts which saw their cost decrease by more than 10% increased by .pp quicker in the treated regions than in the regions of control in comparision with their respective stock a year before. As for the contracts which saw their cost increase by more than 10% in the treated regions, the path was .pp quicker than in the regions of control.

6 The results

6.1 The impact of apprenticeship cost on firms' propensity to train

6.1.1 Calculation of the main independent variable

To analyse the impact of the hourly cost of apprenticeship training on firms' propensity to train, dataset A is panelised in a dataset A' at the level of plants. In the regressions, this allows me to take into account their unobserved characteristics if constant over time. The impact of interest is therefore identified through the variation of cost applying over time to each plant. Note that plants can be followed over time in FICUS-FARE and the DADS[110] as

[110] Firms employing no worker a given year are not covered in the DADS. Yet they can be identified as such if found in FICUS-FARE the same year with a positive value of sales.

long as they exhibit positive values of sales and that their identifier does not change.

To be able to control for pre-trends, only the first legislation relative to the ICF is studied in each region (more details hereafter). The time window therefore depends on the region: it goes from 2000 to the year preceding the second law in each region (i.e. to 2012 for the last regions). This includes the four regions which waited 2009 to enact their first regulation and were used as controls in section 5. In fine, the unbalanced panel A' is composed of about 260 000 firms which signed at least one of the contracts identified in sample A (see section 4.4) over the selected years. Each firm is observed on average over 8.5 years. Results are stable to dropping years 2011 and 2012 where firms in regions Aquitaine and Midi-Pyrénées only are covered (see table 3.1).

To introduce the identification strategy, it should be recalled that apprenticeship costs depend on a wide range of firm-specific and trainee-specific characteristics. The intersection of all legislative conditions over the period 2000-2012 therefore constitutes tens of thousands of groups[111]. This fact as well as the interrelation between the preference of a firm for a type of apprentice and the cost of other types make it difficult to estimate an equation at the level of each type of potential contract. In other words, it is necessary to work at an aggregate level where, for each firm in a given year, the potential matches and their cost would be taken into consideration in a sole observation.

[111] This large number comes from the variety of variables used in regional and national legislations as well as from the variety of thresholds for each variable. Thus, to evaluate the cost of an apprenticeship starting in a firm between 2000 and 2012 and taken randomly, one needs to know :
(1) about the trainee: (i) whether she is disabled; (ii) her age; (iii) her 'stock' of diploma; (iv) the diploma she prepares; (v) her professional/schooling situation before the apprenticeship.
(2) about the firm: (vi) the region of employment; (vii) whether it belongs to the craft industry; (viii) its size when training begins; (ix) its monthly size in the last 3 years; (x) whether it took trainees in the last 3 years.
(3) about the contract itself: (xi) the starting month; (xi) its length in years; (xii) the number of schooling hours.
As mentioned, different thresholds can be used for the same variable. For instance, in their ICF criteria between 2005 and 2013, regions set up 6 different thresholds relative to trainees' age.

To do so, I compute a variable measuring the cost that, each year from 2001 on, firms should pay to hire the average apprentice fitting their 'preferences'. 'Preferences' are estimated per subgroup of firms at the national level in 2000. They are proxied by the relative weight that each type of apprentice represents in the total number of apprentices hired by the subgroup of firms in 2000. Computed as such, 'preferences' are exogenous to regional regulations taking place at least 5 years later. The probability for a firm to take an apprentice a subsequent year is then regressed on the updated weighted cost computed as mentioned (+ controls and fixed effects). In details, I stick to the following procedure:

(1) Each year, firms are separated into groups[112] according to all criteria relative to firms' characteristics found in the legislations relative to apprenticeship cost between 2000 and 2012. 42 groups are constituted. Within a region and a group and given the time of hiring, the cost of a given trainee is therefore invariable across firms: it depends only on its own characteristics and on the characteristics of her school track.

(2) Firms with less than 10 workers being over-dominant, I further separate them into three groups so that firms with no employee, firms with 1 to 5 employees and firms with 6 to 10 employees are treated separately. Note however that everything else equal, a given trainee will cost firms of these 3 groups the same amount if working in the same region and hired at the same time.

To ensure that results in the following regressions are not driven by small groups of firms, those with less than 1000 apprentices over the period are dropped. Hereafter, subscript f accounts for the 24 remaining groups of firms.

[112] The criteria are (i) whether it belongs to the craft industry; (ii) its size when training begins sorted in 5 categories – [0; 10[, [10; 20[, [20; 50[, [50; 250[, [250; …[; (iii) whether its size was larger than a threshold during 12 months in the last three years – thersholds are 20 and 250. Note that the intersection of these categories is often empty, hence the only 42 resulting groups.

(3) I evaluate the structure of apprenticeship contracts in each group of firms at the national level in 2000 (i.e. firms' preferences). Specifically, I compute the share W_{gf} that each group of apprentices g accounts for in the total number of apprentices hired in 2000 in firms of group f. Groups of apprentices g are defined according to the intersection of the national and regional legislative criteria based on the characteristics of apprentices and of their school track. There are $G = 4501$ groups[113]. At a given time of hiring and in a given region, all apprentices of a group g would therefore cost the same to all firms of a group f.

By construction, $\sum_{g=1}^{G} W_{gf} = 1$ for any f.

(4) Each of the following years, I compute a weighted cost WCO_{frt} by applying each weight W_{gf} derived in (3) to the cost C_{gfrt} of a 'fictive' contract signed on September, 1st of year t between an apprentice of group g and a firm of group f in the region r.

i.e. $WCO_{frt} = \sum_{g=1}^{G} W_{gf} * C_{gfrt}$.

The bottom and top 1% of the weighted cost is dropped in all regression samples.

The yearly average and standard deviation of WCO_{frt} are given in table 3.3. The construction of the independent variable of interest implies two main assumptions. First, preferences in terms of types of apprentices g are assumed to be homogenous within each group of firms f[114]. Second, they should be stable over time within each group f at the national level.

[113] Note that the 4501 groups all include an apprentice hired in 2000. Relaxing this constraint would strongly inflate the number of groups.

[114] One could be willing to relax a bit this assumption by creating smaller f groups. For instance, one could be tempted to separate between sectors more systematically than done here (craft-industry v.s. the rest). Yet, this reduces the final sample size in the estimations because I drop contracts of type $f \times g$ signed after 2000 if no contract of the same type was signed in the country in 2000.

Table 3.3 - Summary table of weighted costs W_{frt}

	Average value of weighted costs W_{frt} (€/h)	Standard deviation	Number of observations
2000	3.05	0.61	167,075
2001	2.73	0.60	180,598
2002	2.84	0.62	193,637
2003	3.09	0.66	207,231
2004	3.38	0.70	222,434
2005	2.21	0.67	238,846
2006	2.54	0.79	226,641
2007	2.82	0.86	225,663
2008	3.04	0.92	189,196
2009	2.27	1.00	151,927
2010	2.33	1.00	131,362
2011	3.27	0.81	59,807
2012	3.38	0.77	23,719

Sources: Ari@ne and DADS, own calculations

6.1.2 The impact of costs on firms' likelihood to train

If enactments of regional laws are independent of the pre-existent training behaviour of each firm group (sequential exogeneity), the impact of apprenticeship cost on firms' likelihood to train can be estimated with no bias. The impact is measured by β in the following equation:

$$P_{ifrt} = \alpha_i + c_t + \zeta_f + \mathrm{T}X_{it} + \beta WCO_{frt} + \epsilon_{ifrt} \tag{1}$$

where, in each region, t goes from 2001 to the year preceding the second regional law on the ICF. The dependent variable P_{ifrt} is a dummy taking the value 1 if firm i from the group of firms f located in region r hired an apprentice in t. X_{it} is a matrix of time dependent characteristics of the firm (size and number of apprentices in the workforce in t-1, t-2 and t-3). Because one would expect yearly shocks to differently affect regions, equation (2) may be preferred:

$$P_{ifrt} = \alpha_i + \rho_{rt} + \zeta_f + \mathrm{T}X_{it} + \beta WCO_{frt} + \epsilon_{ifrt} \tag{2}$$

Whether the error term and the main independent variable are sequentially exogenous should of course be questioned. There are many reasons why the average behaviour of firms in a group $f \times r$ in $t-1$ could affect regional decisions, and thereby costs applying to this group in t. Among other things, if, in a region r, employment of apprentices in a group of firms $f_1 \times r$ has been steadily rising before 2005 to the contrary of firms of group $f_2 \times r$, the regional government may decide to shift subsidies towards $f_2 \times r$ when entitled to do so in 2005. Conversely, the regional government could also put money on the group of apprentices g the most hired in firms of $f_1 \times r$ per the reasoning that these are the most employable students in the region. The first regional behaviour would upwardly bias β while the second would generate a downward bias.

To test the assumption of sequential exogeneity, I estimate whether the trend in the dependent variable P_{ifrt} between 2000 and the year T_r of the first regional law applying in region r is significantly associated with the evolution in cost applying to the firm afterwards (i.e. $WCO_{frT} - WCO_{frT-1}$). This comes down to estimating the following equations:

$$P_{ifrt} = \alpha_i + \rho_{rt} + \zeta_f + \mathrm{T}X_{it} + \delta_{fr} * t + \nu_{ifrt} \ , \qquad t < T_r \tag{3}$$

$$WCO_{frT_r-}WCO_{fr(T_r-1)} = \kappa_r + \mu_{fr} \tag{4}$$

$$\widehat{\mu_{fr}} = \theta . \widehat{\delta_{fr}} + \lambda_{fr} \tag{5}$$

In these equations, $\widehat{\delta_{fr}}$ gives us the trend in firms' likelihood to train in group $f \times r$ before the implementation of a regional regulation relative to the ICF. In each region, $\widehat{\mu_{fr}}$ gives us the variation in cost, specific to each firm group, implied by a change in regional regulation, once taken out the average evolution in cost in each region. There is sequential endogeneity if the two variables are correlated; i.e. if θ is significantly different from 0. In that case, the following equation should be preferred to equations (1) and (2):

$$P_{ifrt} = \alpha_i + \rho_{rt} + \zeta_f + \delta_{fr} * t + \mathrm{T}X_{it} + \beta WCO_{frt} + e_{ifrt} \tag{6}$$

Estimation of equations (1), (2), and (6) are provided in table 3.4. They are computed with clustered standard error at the level of the group of firm in a region (i.e. $f \times r$). They show that, when trend is not taken into consideration, the relation between cost and recourse to apprenticeship training appears positive against hypotheses *H1.1*. Yet, as displayed in table 3.5 estimation of equation (5) rejects the test for sequential exogeneity. Thus, when updating the law relative to the ICF, regions target subsidies toward groups of firms which are decreasingly hiring – which implies targeting the types of apprentices they hire the most. Coefficient β in equation (2) is therefore biased upwards. When taking this trend into account, it appears that the impact of training cost on the likelihood that a firm trains is non-significantly different from 0. The point estimate corresponds to an elasticity of training to cost of -0.08[115]. The 95% confidence interval (CI) of this elasticity is $[-0.24; 0.08]$. Hypothesis *H1.1* is therefore validated.

A specific element of the method should be mentioned here. The model incorporates a plant fixed effect in order to capture plants' unobservable characteristics. This setting brings a lot to the analysis but it evacuates firms who never train out of the sample. By definition, the variation in costs observed over the period had no impact on the training behaviour of these firms. This means that the elasticity of cost to firms' likelihood to train is even more centred on 0 than the one estimated.

Finally, given the graphical evidence from section 5, one would expect to find a positive relation between the size of the elasticity of interest and the size of firms. The method however lacks power to validate this conclusion. It does point towards such relation[116] but estimates are not statistically significant. The standard errors indeed increase too sharply when sample A' is separated between large and small firms. Results are displayed in tables 3.12 and 3.13 in appendix A7.

[115] Average values of WCO_{frt} and P_{ifrt} are respectively 2.77 and 0.27.

[116] The point estimate for firms with less than 20 workers corresponds to an elasticity of training likelihood to cost of -0.18

Table 3.4 - Effect of apprenticeship cost on firms' likelihood to train

	(1)	(2)	(3)
	Equation (1)	Equation (2)	Equation (6)
Weighted Cost WCO_{frt}	0.021*	0.069***	-0.008
	(0.012)	(0.014)	(0.008)
Firm Fixed Effects	Yes	Yes	Yes
Group of Firms Fixed Effects	Yes	Yes	Yes
Time * Region Fixed Effects	No	Yes	Yes
Specific Trend per Firm Group * Region	No	No	Yes
Observations	2,045,420	2,045,420	2,045,420
Adjusted R-squared	0.167	0.169	0.170

Note: The average probability to train P_{ifrt} in the sample is 0.27
Model: OLS
Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

Table 3.5 - Responsiveness of regional policies to pre-trends in region*firms group's training behaviour

	(1)
	Equation (5)
θ	5.152***
	(1.042)
Observations	359
R-squared	0.064

Model: OLS
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

What is therefore the cost to bring a firm into training *via* regional hiring credits in our sample A'? Let's consider the hypothetical case where, in its 2006 reform, region Île-de-France (IDF) would decide to offer an extra 1000€ per contract on top of the changes which actually occurred. The top-up would equate to an average drop of about 0.55 units of $\overline{WCO_{IDF,2007}}$ according to the structure of firms in sample A'. This can be read as a drop of 0.55€/h in the cost of the average apprentice that firms of sample A' are willing to hire in the region in 2007. The sample gathers 47,344 plants in IDF. The number of

plants in sample A' hiring apprentices in IDF in 2007 because of the top-up ("compliers" hereafter) would be 208 – which is the centre of the following 95% CI: [−208 ; +624].[117].

For which cost? Given that 14,209 apprentices started a contract in the private sector that year in sample A', the cost of the measure would reach about 14.4M€. Therefore, the amount of ICF spent to bring one more firm into training in sample A' is about 70,000€[118].

6.1.3 The impact of training costs on the yearly number of apprentices hired in each plant

The previous development focused on the extensive margin, namely: the impact of training cost on firms' likelihood to train (at least one apprentice). As modelled in section 2, training cost can also play a role at the intensive margin of training: firms who plan to train a given year can adjust the number of trainees they actually hire according to their cost. In this part, I estimate the elasticity of firms' propensity to train to costs taking into account both the intensive and the extensive margins. The sample remains the same (i.e. A') to the exception that I drop firms who hired more than 50 apprentices a given year. This is the top 99.999% of the distribution among firms taking on apprentices. The decision is taken to avoid results to be driven by outliers. Results are however stable if the whole sample A' is used. Equation (7) to estimate is similar to equation (6):

$$N_{ifrt} = \alpha_i + \rho_{rt} + \zeta_f + \delta_{fr} * t + \mathrm{T}X_{it} + \beta WCO_{frt} + e_{ifrt} \tag{7}$$

In particular, independent variables are the same and the setting takes into account the fact that sequential endogeneity applies in our case. The

[117] The centre of the confidence interval (C.I.) is computed as follows: 47344*-0.008*-0.55. The first figure accounts for the number of plants, the second for the point estimate from equation (6) and the last from the average variation in cost $\overline{WCO_{IDF,2007}}$ stemming from the top-up. The bounds of the C.I. are computing using bounds of the CI of estimation of equation 6 (i.e. [-0.024;0.008]) rather than the point estimate.

[118] This equates $\big((14209 + 208) *\ 1000\big)$ € / 208.

independent variable is a count variable accounting for the number of apprentices hired by firm i from the group of firms f located in region r in year t. Its distribution is given in Figure 3.21 of appendix A8. Standard errors are still clustered at the level $f \times r$.

The equation is estimated via a method of Poisson pseudo maximum likelihood (PPML). This model is well suited in the case of nonnegative data with many zeros (Correia et al., 2019a: 2). It has however a major constraint: the existence of maximum likelihood estimates is not always guaranteed – though standard softwares sometimes still compute them and provide wrong results in these cases (Santos Silva and Tenreyro, 2010; Correia et al., 2019b: 5). Note that the risk increases with the share of zeros – which is fairly large in our case, see figure 3.21 in appendix A8. A new command giving the possibility to estimate a PPML model with high dimensional fixed effects and taking into account the aforementioned risk was recently made available on Stata (Correia et al., 2019a). This is the one I use to compute results which are displayed in table 3.6. Note that the number of observations has dropped. This is because singletons created by the intersection of control variables and fixed effects are automatically removed from estimation by the command.

Table 3.6 - Marginal impact of apprenticeship cost on the yearly number of apprentices hired by each firm

	(1)
	Equation (7)
Weighted Cost WCO_{frt}	-0.034***
	(0.012)
Firm Fixed Effects	Yes
Group of Firms Fixed Effects	Yes
Time * Region Fixed Effects	Yes
Specific Trend per Firm Group * Region	Yes
Observations	1,813,269
Pseudo R-squared	0.242

The average number of apprentices N_{ifrt} in the sample is 0.43
Model: Poisson pseudo maximum likelihood
Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

Estimates in table 3.6 tell us that a one standard deviation decrease in the cost of apprenticeships increases the number of apprentices in training firms by 3.2%[119] of a standard deviation. The elasticity of the number of contracts to training cost is negative and equates -0.22 with a 95% CI of [-0.37;-0.07].

As in the previous section, I focus now on a practical example. Here as well, I assume that region Île-de-France (IDF) increased the ICF for each contract by an extra 1000€ on top of all changes implemented in the 2006 reform. Although the sample has evolved a bit, on average, this still equates to a drop of 0.55€ in $\overline{WCO_{IDF,2007}}$. The sample used in table 3.6 gathers 41,544 firms from region IDF. Therefore, the aforementioned reform would result in the creation of 773 new apprenticeships (95% CI: [236; 1311])[120].

Here as well, a cost-benefit analysis can be provided. 13,851 apprentices actually signed a contract in 2007 in one of the firms of table 3.6 situated in region IDF. The overall cost of the top-up would therefore reach about 14.6€[121]. This is equivalent to about 18,900€ per contract generated. Importantly, this should not be read as the public cost for these contracts. It is rather the surplus in cost that region IDF would bear on top of all other public expenditures normally budgeted per apprenticeship contract. These include subsidies but also tax credits or schooling expenditures. The CNEFOP estimates that the State and regions have spent about 3,300M€ on apprenticeship matters in 2007 which amounts to about 7,800€ per apprentice and per year[122]. The average length of an apprenticeship contract is 1.8 years in the sample of interest. In the end the total amount of public expenditures spent each year on each of the contracts generated by the rise in ICF therefore equates 18,300€. If one applies similar calculations for each bound of the 95% CI of the estimate of interest of equation (7), this amount varies between [14,200; 41,000].

[119] The standard deviation of the weighted cost is 0.87 while the standard deviation of the number of apprentices taken on per firm is 0.92 in the sample of table 3.6.

[120] The calculation is the following: -0.55*-0.034*41,554

[121] (13,851+773)*1000€

[122] The stock of apprentices equated 425,000 in 2007. The sum obviously significantly varies across regions. I use the average number for simplification.

Combining results of sections 6.1.2 and 6.1.3, we can now conclude on the impact of monetary training costs on firms' propensity to train. It appears that the cost elasticity at the extensive margin (i.e. whether firms train or not) is non-significantly different from 0. It is precisely estimated: the lower bound of the 95% CI is only -0.24. Conversely, the elasticity of the number of apprenticeship contracts to training costs is significantly negative. But its size remains limited: the 95% CI is [-0.37;-0.07]. Monetary training costs therefore have no impact on the extensive margin of training with a significant but very limited impact on the intensive margin of training. Hypotheses *H1.1* and *H1.2* are therefore mostly validated.

It is interesting to compare these results with those found by Muelhemann et al. (2007) for Switzerland. The point estimate of the cost elasticity at the extensive margin exhibited in this chapter equates 17.5% of theirs. Several elements can explain the difference. First, as mentioned is section 1.1.2, the elasticity computed in Muelhmann et al. is probably overestimated given the difficulty to take into account firms' selection into training. Second, Muelhmann et al. use the net training cost rather than the monetary cost[123] and the former may be relatively inelastic to the latter. If they are low enough, monetary costs can weight little in the net cost on apprentices. In particular, costs for training facilities and for masters' time could rise to infinite if the firm has no worker or space available. In these cases, our model predicts that variations in fixed costs are more likely to foster training than variations in monetary costs. Firms may also compensate variations in subsidies via the productive work of apprentices. Particular focus on fixed training costs and on apprentices' productivity during training should therefore be taken in future research.

As for the cost elasticity at the intensive margin, it is non-significant in Muelhemann et al. (2007) while the combination of results from sections 6.1.2 and 6.1.3 suggest that it is negatively significant in mine. Precision of estimations in Muelhemann et al. (2007) is however weaker than in my estimations.

[123] As mentioned in note 89, to compute the net training cost, one takes into consideration the monetary cost but also the value of the apprentice's output, the cost of training facilities and the cost of the master's time.

6.2 The impact of cost on retention rates

The previous section suggests that firms who plan to train may partly decide on the number of apprentices to take on according to their price. The theoretical model set up in section 2 predicts that trainees taken on because of their low cost may not be retained upon graduation. I test this hypothesis in this section.

Mobility upon graduation is measured as not being working in the training firm 2 months after the contractual term of the apprenticeship contract. Note that for data reasons[124], contracts finishing after October, 1st each year cannot be used. They account for 8% of the total number of contracts of sample B – which was selected according to the procedure described in section 4.4. Once removed, the sample of interest includes about 50,000 yearly contracts termination between 2002 and 2012.

The main difficulty in estimating the impact of training cost on mobility is the risk of reverse causality: firms who 'train to retain' are more likely to hire costly apprentices. The estimation strategy therefore consists in aggregating data at the level of firm groups f and to use as a main independent variable the weighted costs WCO_{frt} previously computed. The analysis thereby comes down to evaluating the impact of the cost of the average apprentice on the average retention rate within each group of firm between 2003[125] and 2012. The equation to estimate is therefore the following:

$$\overline{RE_{frt}} = \rho_{rt} + \xi_{fr} + \tau_{\mathrm{ft}} + \beta WCO_{frt} + u_{frt} \tag{8}$$

where $\overline{RE_{frt}}$ is the average retention rate of contracts signed in t by firms of

[124] Many firms in France pay earnings accounting for the month of December N in January N+1 ("*décalage de paie*"). In wave N of the DADS, workers affected will therefore appear as quitting the establishment at the end of November N. It is not possible to get information back on the transition between years N and N+1 if variables from year N-1 are also needed – which is the case in this paper.

[125] As in section 6.1, the weighted cost is computed using the structure of hiring in 2000. I then drop contracts starting that year. Most of them end in 2002. This constrains me to estimate equations (7) to (9) using the remaining contracts ending after 2002.

group f in region r. This equation is demanding in terms of fixed effects and could be relaxed using equation (8) or, further, (9)

$$\overline{RE_{frt}} = \rho_{rt} + \xi_{fr} + \beta WCO_{frt} + u_{frt} \quad (9)$$

$$\overline{RE_{frt}} = \rho_{rt} + \omega_f + \beta WCO_{frt} + u_{frt} \quad (10)$$

These equations are estimated via weighted least squares where weights are group size rather than via ordinary least squares (Angrist and Pischke, 2008). Results are displayed in table 3.7. The impact of cost on retention rates is not significant per the estimation of equation (8). But, as mentioned, it is very demanding and, when relaxing the estimating constraints, the parameter of interest becomes significantly positive. The impact according to equation (9) is the following: a one standard deviation decrease in the (weighted) cost of apprenticeships decreases the probability of retaining apprentices upon graduation by 88% of a standard deviation on average[126]. The elasticity of retention rates to cost is about 0.40.

These results are in line with hypothesis *H2*. As suggested in the comparative literature on the Swiss and German case, it appears that the impact of training cost on mobility is large.

Table 3.7 - Effect of apprenticeship cost on retention of apprentices

	(1)	(2)	(3)
	Equation (8)	Equation (9)	Equation (10)
Weighted Cost WCO_{frt}	-0.001	0.061***	0.062***
	(0.037)	(0.013)	(0.013)
Time * Region Fixed Effects	Yes	Yes	Yes
Firm Group * Region Fixed Effects	Yes	Yes	No
Firm Group * Time Fixed Effects	Yes	No	No
Firm Group Fixed Effect	No	No	Yes
Observations	2,659	2,666	2,674
Adjusted R-squared	0.672	0.650	0.614

The average value of retention rates $\overline{RE_{frt}}$ in the sample is 0.44
Model: Weighted least square where weights are group size.
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

[126] The standard deviation of the weighted cost is 0.87 while the standard deviation of the retention rates is 0.061 in the sample of table 3.6.

Conclusion

In this paper, I analysed the impact of the cost of apprenticeship training on firms' propensity to train and on mobility upon graduation in France. This research is motivated by the difficulties experienced in the country to develop apprenticeship training despite strong public investments to revive it. The strategy of identification takes advantage of the regionalization of a subsidy targeting employers of apprentices. By 2005, regions could change its criteria and the amounts offered, which generated large variations in the cost of apprentices.

I find that the elasticity of the number of apprentices to cost is significantly negative and equals -0.22. The fairly limited effect goes mostly via the intensive margin (i.e. the number of apprentices in training firms): the cost elasticity at the extensive margin is indeed zero. As predicted in the structural model, I then find that the impact of training costs on mobility upon graduation is negative. The corresponding elasticity amounts to -0.40.

These results therefore suggest that firms can be in two types of situations. In the first case, non-monetary costs are binding and firms are not able to train no matter the size of the subsidy. For instance, in some environments, the value of investments in training facilities or the trainer's teaching time can be much larger than firm's expected returns to training. The extreme case takes place when no working space or training master is available to host the trainee. In the second situation, non-monetary costs are low enough for the firm to engage into training. In this case, the firm has a given number of standard jobs to fill – which can be zero – upon graduation of her apprentices. She can however decide to take on a larger number of students if their cost is low enough. In that case, the extra trainees are taken to bring profits during their apprenticeship with no goal of retention upon graduation.

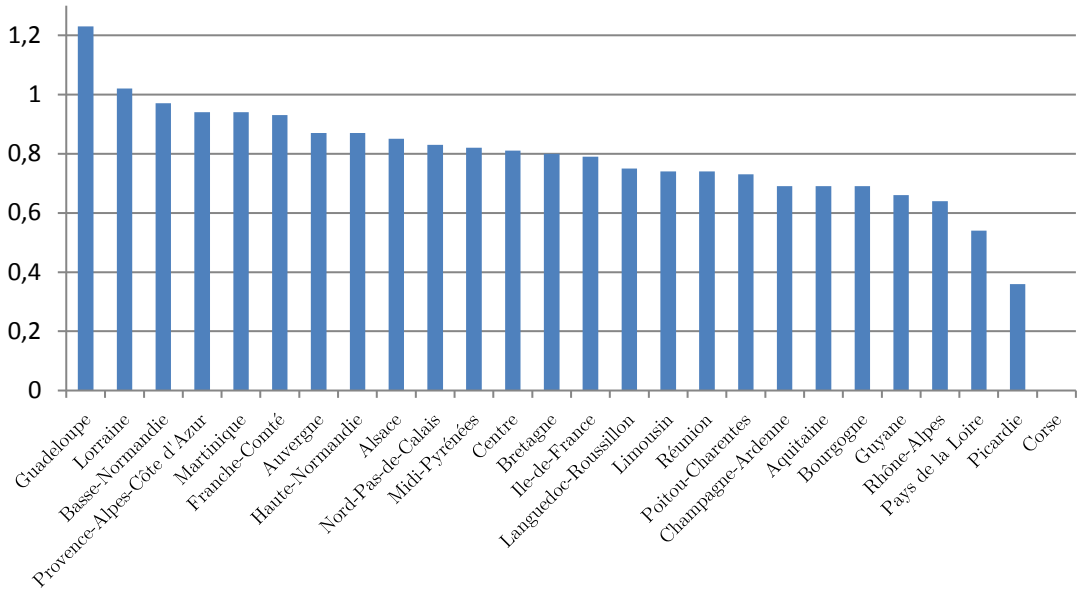
These conclusions should be read in relation with the two main findings of the second chapter on apprenticeships in secondary education. First, comparing France and Germany suggests that apprenticeships can benefit low school achievers as long as the system remains limited in size. When developed as in Germany, competition to find a contract as well as the bad signal sent upon graduation from low-quality apprenticeships would be detrimental to low

achievers. Second, in France, school graduates experience most of their difficulties in entering the labour market the first year following their school exit. Efforts should therefore be put towards gains in training quality rather than towards a rise in the number of contracts. Reducing the drop-out rate – which spikes at one third of apprentices – therefore seems primordial. Ensuring low constrained mobility upon graduation probably comes second in line. Accordingly, subsidies to apprenticeship training seem counterproductive. They aim at quantities with detrimental impact on retention rates and therefore, expectedly, on training quality.

Appendix

Appendix A1 – Regional expenditures on the matter of the ICF relatively to their endowments

Figure 3.6 - Ratio between the regional endowments and expenditures relative to the ICF in 2011



Source: IGF and IGAS, 2013
Reading: In 2011, region Ile-de-France spent in ICF about 80% of its endowment on this matter

Appendix A2 – Complementary information on the three types of contracts on which figures 3.1 and 3.2 are based

The three types of contracts used in Figure 3.1 and Figure 3.2 are the following.

(1) A firm of 8 workers, of which one is an apprentice, hires a new apprentice aged 16, who just graduated from lower secondary education (b*revet des collèges*) and prepares a 2-year c*ertificat d'aptitude professionnelle* (CAP – vocational training diploma taken at secondary school) involving 450 hours of class per year.

(2) A firm of 220 workers, of which 2 are apprentices, and which is not part of the craft industry, hires another apprentice aged 24 preparing a 1-year *licence professionnelle* (3rd and last year of short-cycle higher education) involving 600 hours of class per year.

(3) A firm of 270 workers, of which 10 are apprentices, and which is not part of the craft industry, hires another apprentice aged 24 preparing a 1-year *licence professionnelle* (3rd and last year of short-cycle higher education) involving 600 hours of class per year.

On top of these characteristics, all firms: (i) are from a private sector (excl. professionals) where boys and girls are both well represented among apprentices; (ii) do not pay any extra contribution on top of the compulsory ones; (iii) are subject to the VAT (and therefore do not pay the *taxe sur les salaires*); (iv) have not signed any agreement reducing working time per the plan Aubry before 2002; (v) pay their workers twice the minimum wage on average; (vi) are not subject to a branch-specific minimum wage for apprentices; (vii) pay contributions for transportation applying in the department Essonne; (viii) close their accounts for the financial year on March, 31st; (ix) have already hired an apprentice in the three previous years; (x) have had the same number of employees in the last 3 years and the same number of apprentices in the last 2 years.

Furthermore, the person in charge of the apprentice in the firm (the apprenticeship master) takes part in training set up by the region if applicable[127]. The apprentice is not disable and was at school the year before starting her apprenticeship.

[127] These are generally very short and require little involvement.

Appendix A3 – Summary of the ICF regulation applying nationally before the reform and of the first regional regulation in Ile-de-France.

Table 3.10: Criteria and amounts of the ICF prevailing before the first regulation in each region and after the first regulation in Île-de-France

	Contracts …		Conditions on firms		Conditions relative to the apprentice at the time of signature	Condition on the diploma prepared	Condition on the contract	Condition on school assiduity	Amount	Frequency	Parts of the ICF not taken into account in the graphs and regressions
	… signed after	… signed before	F1	F2	G1	D1	C1	S1			
National values applying before the reform	/	the first regional regulation	It should not be part of the non-industrial or commercial public sector					Some conditions on school assiduity apply	1 525 €	Yearly	
					Older than 18				305 €	Yearly	
							> 600 hours of classes per year		7,62 € max 1524	Per hour of class	
				Monthly size has not exceeded 20 workers in 12 months of the last 3 years	No diploma higher than grade 9		The contract exceeds the trial period & the contract is not extending after failure at the exam		915 €	Once	
Île-de-France	July, 1st 2006	June, 1st 2011	It should not be part of the non-industrial or commercial public sector					The ICF is capped at 1000€ if assiduity at school is insufficient	1 200 €	Yearly	
				250 workers max					300 €	Yearly	
					Older than 18	Professional diploma from higher secondary education			500 €	Yearly	
					Older than 20	"Baccalauréat" (grade 12)			500 €	Yearly	
					Older than 22	Professional diploma from higher education			500 €	Yearly	
					Girl	Less than 25% of girls engaged in this track			500 €	Yearly	X
					Disable				600 €	Yearly	
						Part of the track is followed abroad			40 €, max 1200 €	Per day spent abroad	X

Source: own treatment of the national and regional regulations provided by the regional services for apprenticeship

Reading: a large firm (say 1000 workers) signing a 2-year apprenticeship contract with an overage apprentice who spends 750 hours at school each year before July, 1st 2006 in Île-de-France will receive 5946 euros in ICF (=1525*2+305*2+min(1524;7,62*150)*2) over the time of the contract, if the apprentice attends school and if the contract is not broken before its end.

Appendix A4 - Quality of the merging procedure led to obtain sample B

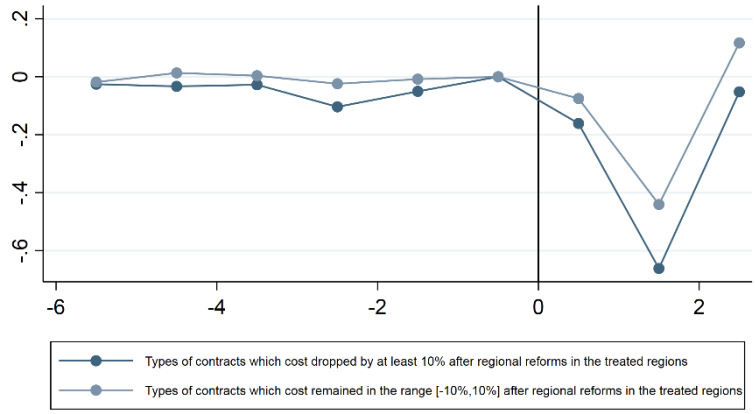
Table 3.11 - Quality of the merging procedure between Ari@ne and the DADS, according to the year of contractual termination

	(1)	(2)	(3)	(4)	(5)
	Total number of selected contracts for which cost can be computed	Share of contracts not found in the DADS (1 to 0 matches)	Share of contracts merged to only one DADS position (1 to 1 matches)	Share of contracts merged to several DADS positions (1 to n matches)	Average number of DADS positions merged to in '1 to n matches'
	(sample A)		(sample B)		
2002	117302	51%	43%	6%	3
2003	124516	53%	41%	6%	4
2004	123317	53%	41%	6%	4
2005	124893	50%	43%	7%	4
2006	134168	46%	46%	8%	4
2007	141462	42%	49%	9%	4
2008	142686	42%	48%	10%	4
2009	151876	36%	51%	13%	6
2010	165033	36%	51%	13%	7
2011	162115	39%	48%	13%	8
2012	185990	40%	47%	13%	8

Note: the merging variables are: the firm identifier, the region of employment, the sex and age of the apprentice, the ending date of contracts (+/- 93 days) and the first day of work in the preceding year (+/-31 days). About a third of all contracts are broken before termination and cannot be found in the DADS per the merging variables. By construction, they are included in the count of '1-0 matches'.
Figures displayed here include contracts in the 16 regions for which information regarding the ICF is available.
Reading: of the 185,990 apprenticeship contracts with contractual termination year in 2012 for which cost could be computed, 40% were not retrieved in the DADS by the merging procedure (including contracts broken before completion), 47% were matched to only one contract in the DADS and 13% were matched to several DADS positions (8 on average).

Appendix A5 – Relation between regional training costs and recourse to apprenticeships across regions

Figure 3.7 - Region Île de France - All apprentices

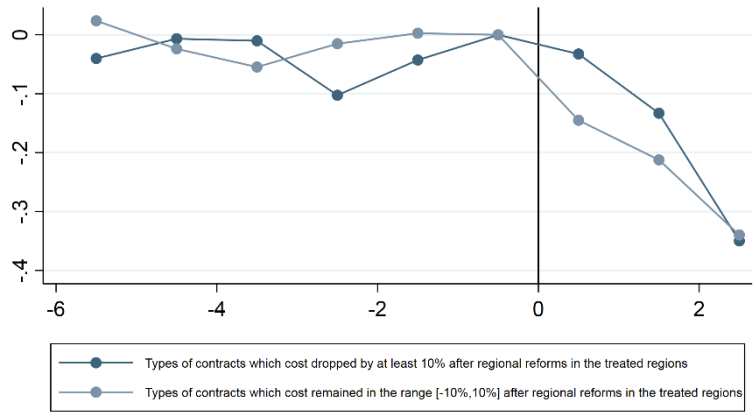


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [-0.10,0.10]: 1.74€/h, 2.85€/h, 3.70€/h, 4.58€/h, 6.17€/h
... [0.10,...]: 0.82€/h, 1.25€/h, 2.23€/h, 3.53€/h, 5.61€/h

In t=-1: number of observations in regions of control ; [-0.10,0.10]=1309; [0.10,...]=9397
In t=-1: number of observations in the region of treatment; [-0.10,0.10]=3101; [0.10,...]=13832

Figure 3.8 - Region Haute-Normandie - All apprentices

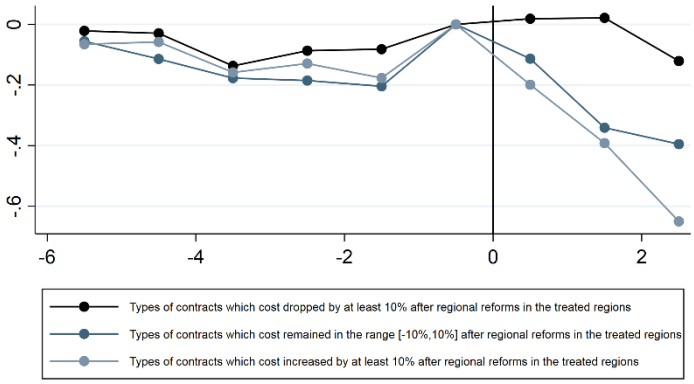


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [-0.10,0.10]: 0.79€/h, 1.15€/h, 2.00€/h, 2.70€/h, 4.53€/h
... [0.10,...]: 0.65€/h, 0.68€/h, 1.36€/h, 1.42€/h, 2.58€/h

In t=-1: number of observations in regions of control ; [-0.10,0.10]=9265; [0.10,...]=1273
In t=-1: number of observations in the region of treatment; [-0.10,0.10]=4555; [0.10,...]=591

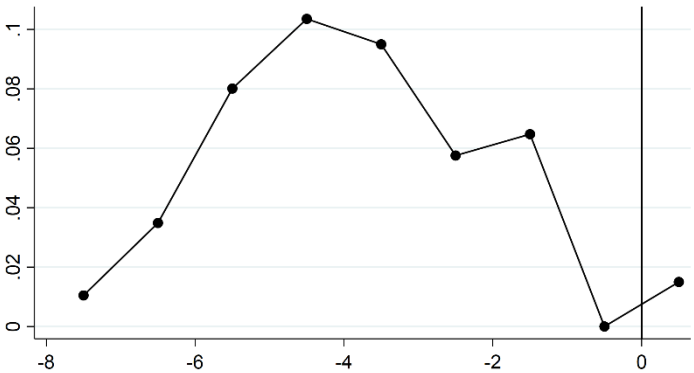
Figure 3.9 - Region Centre - All apprentices



Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...
... [...,-0.10]: 0.68€/h, 0.82€/h, 1.16€/h, 1.20€/h, 2.08€/h
... [-0.10,0.10]: 1.53€/h, 2.00€/h, 2.32€/h, 2.70€/h, 4.06€/h
... [0.10,...]: 0.65€/h, 1.66€/h, 2.32€/h, 3.46€/h, 5.61€/h

In t=-1: number of observations in regions of control ; [...,-0.10]=6118; [-0.10,0.10]=1511; [0.10,...]=2526
In t=-1: number of observations in the region of treatment; [...,-0.10]=3335; [-0.10,0.10]=894; [0.10,...]=1836

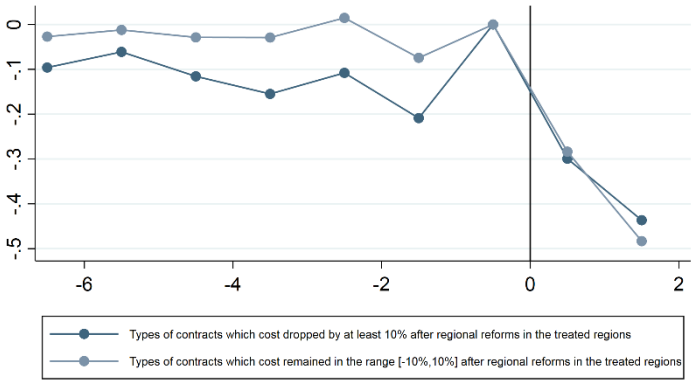
Figure 3.10 - Region Basse-Normandie - All apprentices



Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...
... [...,-0.10]: 1.01€/h, 1.39€/h, 1.66€/h, 2.56€/h, 4.10€/h

In t=-1: number of observations in regions of control ; [...,-0.10]=10601
In t=-1: number of observations in the region of treatment; [...,-0.10]=3163

Figure 3.11 - Region NPDC - All apprentices

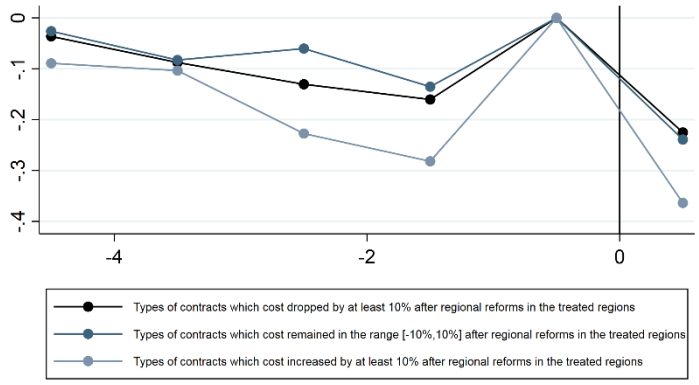


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [-0.10,0.10]: 0.94€/h, 1.33€/h, 2.24€/h, 3.59€/h, 5.14€/h
... [0.10,...]: 0.80€/h, 1.51€/h, 2.24€/h, 2.76€/h, 3.26€/h

In t=-1: number of observations in regions of control ; [-0.10,0.10]=6842; [0.10,...]=2667
In t=-1: number of observations in the region of treatment; [-0.10,0.10]=3608; [0.10,...]=1468

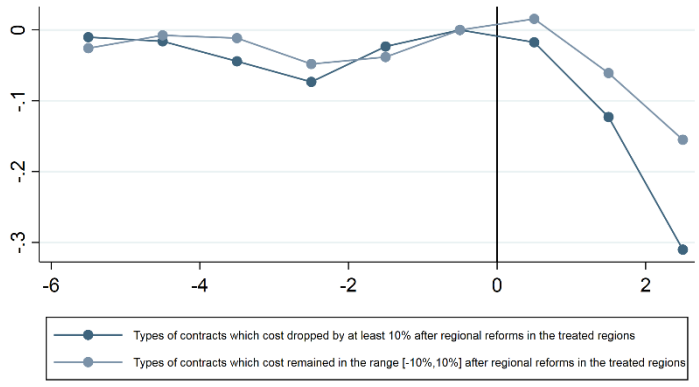
Figure 3.12 - Region Pays de la Loire - All apprentices



Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...
... [...,-0.10]: 0.88€/h, 1.84€/h, 1.84€/h, 1.84€/h, 3.50€/h
... [-0.10,0.10]: 2.00€/h, 2.36€/h, 2.58€/h, 3.41€/h, 4.85€/h
... [0.10,...]: 2.59€/h, 3.93€/h, 4.89€/h, 5.80€/h, 6.19€/h

In t=-1: number of observations in regions of control ; [...,-0.10]=418; [-0.10,0.10]=7611; [0.10,...]=455
In t=-1: number of observations in the region of treatment; [...,-0.10]=497; [-0.10,0.10]=8352; [0.10,...]=947

Figure 3.13 - Region Bretagne - All apprentices

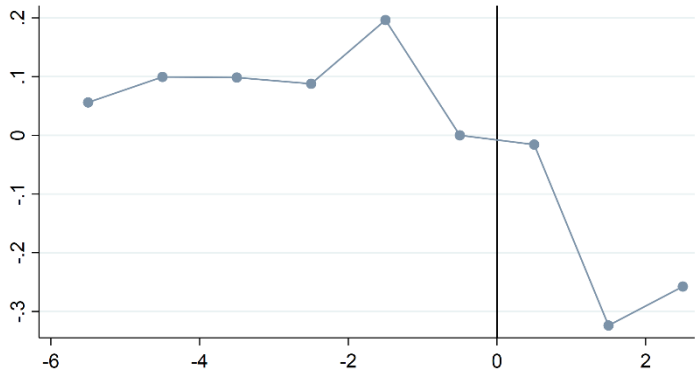


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [-0.10,0.10]: 0.79€/h, 1.15€/h, 1.20€/h, 2.59€/h, 4.24€/h
... [0.10,...]: 0.65€/h, 1.36€/h, 2.23€/h, 2.32€/h, 3.03€/h

In t=-1: number of observations in regions of control ; [-0.10,0.10]=7683; [0.10,...]=2712
In t=-1: number of observations in the region of treatment; [-0.10,0.10]=4178; [0.10,...]=1420

Figure 3.14 - Region Poitou-Charentes - All apprentices

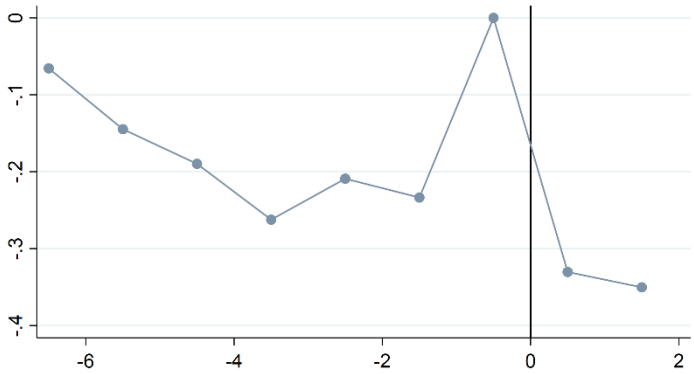


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [0.10,...]: 0.82€/h, 1.20€/h, 1.42€/h, 2.32€/h, 4.03€/h

In t=-1: number of observations in regions of control ; [0.10,...]=5524
In t=-1: number of observations in the region of treatment; [0.10,...]=3583

Figure 3.15 - Region Limousin - All apprentices

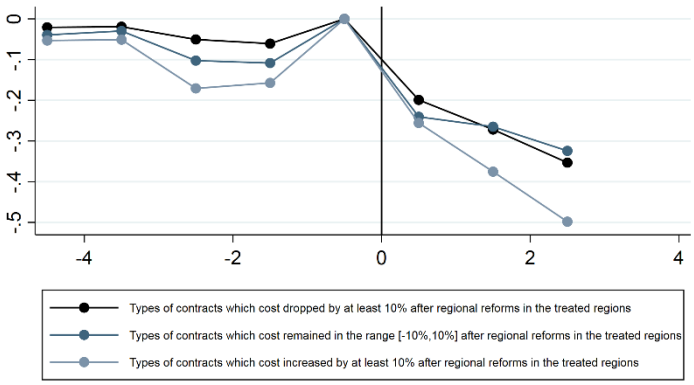


Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [0.10,...]: 0.90€/h, 1.27€/h, 1.75€/h, 2.49€/h, 4.45€/h

In t=-1: number of observations in regions of control ; [0.10,...]=7218
In t=-1: number of observations in the region of treatment; [0.10,...]=498

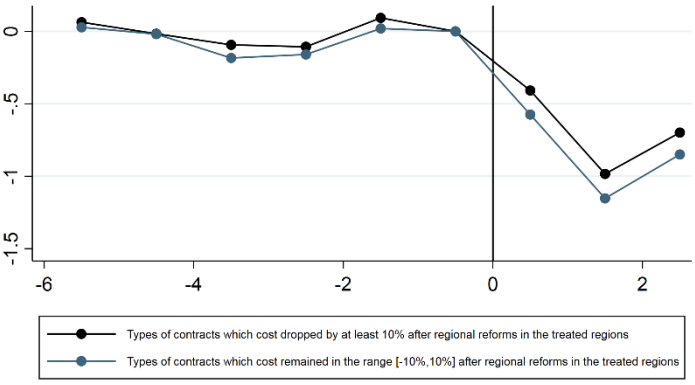
Figure 3.16 - Region Rhône-Alpes - All apprentices



Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...
... [...,-0.10]: 1.91€/h, 2.00€/h, 2.50€/h, 3.41€/h, 4.49€/h
... [-0.10,0.10]: 1.84€/h, 2.26€/h, 2.43€/h, 3.19€/h, 5.02€/h
... [0.10,...]: 2.54€/h, 3.61€/h, 3.94€/h, 5.36€/h, 7.04€/h

In t=-1: number of observations in regions of control ; [...,-0.10]=2983; [-0.10,0.10]=5916; [0.10,...]=1210
In t=-1: number of observations in the region of treatment; [...,-0.10]=2688; [-0.10,0.10]=5292; [0.10,...]=2157

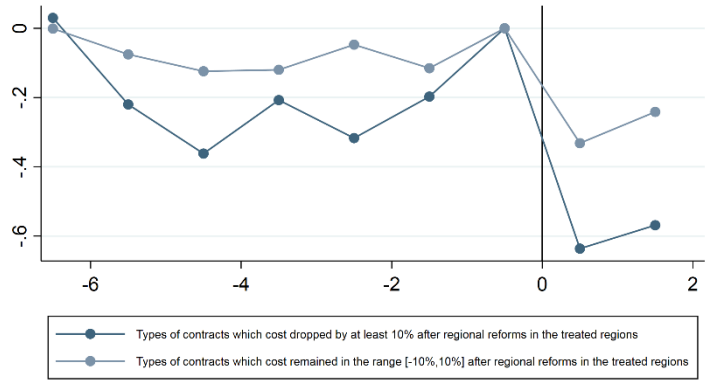
Figure 3.17 - Region Languedoc-Roussillon - All apprentice



Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...
... [...,-0.10]: 0.68€/h, 1.15€/h, 1.15€/h, 2.00€/h, 2.08€/h
... [-0.10,0.10]: 2.23€/h, 2.23€/h, 2.59€/h, 3.32€/h, 3.68€/h

In t=-1: number of observations in regions of control ; [...,-0.10]=7048; [-0.10,0.10]=2128
In t=-1: number of observations in the region of treatment; [...,-0.10]=1548; [-0.10,0.10]=661

Figure 3.18 - Region Provence-Alpes-Côte d'Azur - All apprent



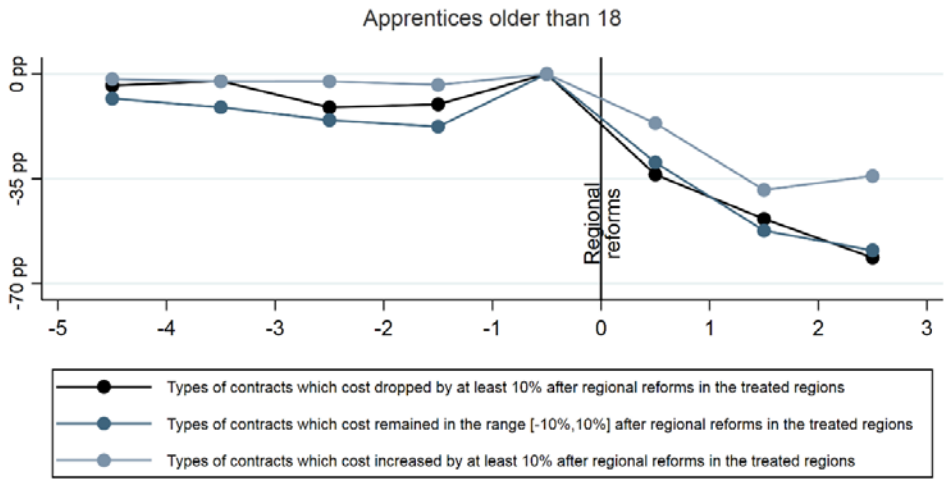
Distrib. of hourly costs (resp. p5, p25, p50, p75, p95) in the treated region in t=-1 in the group...

... [-0.10,0.10]: 2.27€/h, 3.80€/h, 4.27€/h, 4.27€/h, 5.26€/h
... [0.10,...]: 0.90€/h, 1.27€/h, 2.10€/h, 2.76€/h, 4.75€/h

In t=-1: number of observations in regions of control ; [-0.10,0.10]=197; [0.10,...]=10369
In t=-1: number of observations in the region of treatment; [-0.10,0.10]=390; [0.10,...]=8852

Appendix A6 – Relation between regional training costs and recourse to apprenticeships according to the age of apprentices

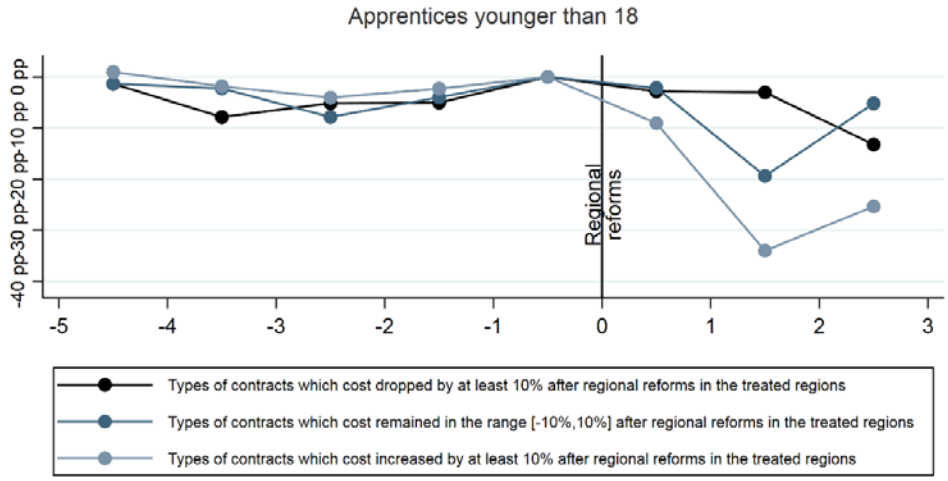
Figure 3.19 - Detrended difference in the normalized number of contracts signed each year in the treated regions and the regions of control



Note: The graph maps the normalized difference between (i) the number of yearly conctracts grouped according to changes in their cost implied by regulations on ICF in eight treated regions and (ii) the number of similar matches in four control regions.
Groups are constituted according to the evolution in cost the year before regional reforms and the year after in the treated regions.
The treated group includes regions who implemented their first regulation between 2005 and 2007 with no second regulation in the following two years;
The control group includes regions who did not enact any regulation on ICF before 2009. See text for details.

Reading: The year following implementation of regional regulation on ICF (t=0), the number of contracts which saw their cost decrease by more than 10% increased by .pp quicker in the treated regions than in the regions of control in comparision with their respective stock a year before. As for the contracts which saw their cost increase by more than 10% in the treated regions, the path was .pp quicker than in the regions of control.

Figure 3.20 - Detrended difference in the normalized number of contracts signed each year in the treated regions and the regions of control



Note: The graph maps the normalized difference between (i) the number of yearly conctracts grouped according to changes in their cost implied by regulations on ICF in eight treated regions and (ii) the number of similar matches in four control regions.
Groups are constituted according to the evolution in cost the year before regional reforms and the year after in the treated regions.
The treated group includes regions who implemented their first regulation between 2005 and 2007 with no second regulation in the following two years;
The control group includes regions who did not enact any regulation on ICF before 2009. See text for details.

Reading: The year following implementation of regional regulation on ICF (t=0), the number of contracts which saw their cost decrease by more than 10% increased by .pp quicker in the treated regions than in the regions of control in comparision with their respective stock a year before. As for the contracts which saw their cost increase by more than 10% in the treated regions, the path was .pp quicker than in the regions of control.

Appendix A7 – Differentiation of the size of the elasticity of firm's propensity to train to training costs according to the size of firms

Table 3.12 - Effect of apprenticeship cost on firms' likelihood to train - according to the size of firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Small Firms			Large Firms		
	Equation (1)	Equation (2)	Equation (6)	Equation (1)	Equation (2)	Equation (6)
Weighted Cost WCO_{frt}	-0.016*	-0.023	-0.019	0.040***	0.061***	0.008
	(0.008)	(0.024)	(0.018)	(0.017)	(0.011)	(0.010)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Group of Firms Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time * Region Fixed Effects	No	Yes	Yes	No	Yes	Yes
Specific Trend per Firm Group * Region	No	No	Yes	No	No	Yes
Observations	1,700,781	1,700,781	1,700,781	185,179	185,179	185,179
Adjusted R-squared	0.153	0.154	0.155	0.273	0.280	0.282

Model: OLS
Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

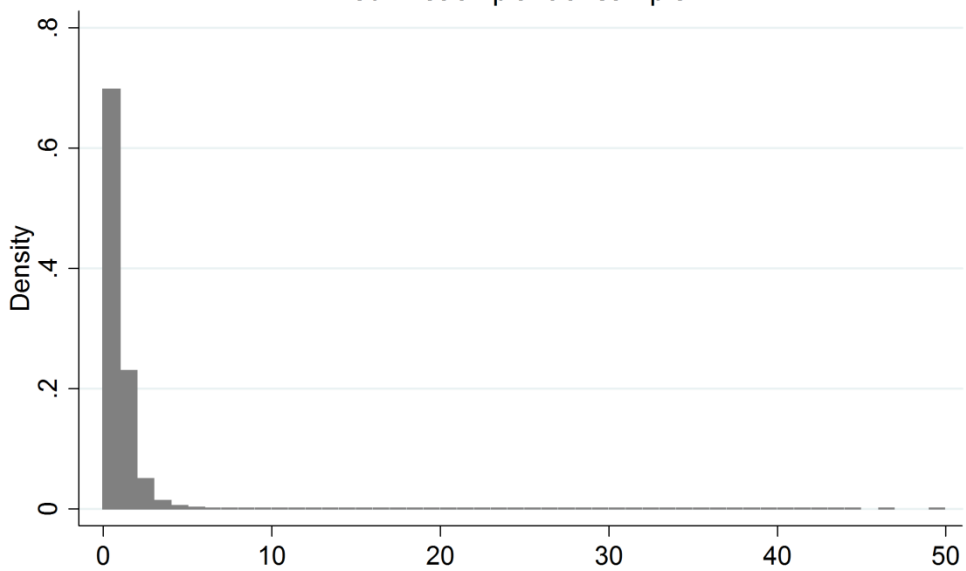
Table 3.13 - Responsiveness of regional policies to pre-trends in region*firms group's training behaviour - according to the size of firms

	(1)	(2)
	Small Firms	Large Firms
	Equation (5)	Equation (5)
θ	2.345*	0.975
	(1.243)	(1.057)
Observations	112	153
R-squared	0.031	0.006

Model : OLS
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source : Ari@ne, DADS and Ficus Fare, own calculations

Appendix A8 – Distribution of firms' likelihood to train and of the number of apprentices hired in each firm.

Figure 3.21 - Distribution of the yearly number of apprentices hired in each plant of sample A'



Reading: in 70% of the yearly observations, plants of sample A' did not train.
In 23% of the yearly observations, they hired only one apprentice.
Source: Ari@ne, DADS and Ficus Fare, own calculations

Main conclusion

This PhD thesis proposes three essays in labour economics. In a comparative fashion, they analyse key institutions of the French and German political economies. The chapters successively estimate the size of discrimination towards works councilors, the effect of apprenticeship training on labour integration and the impact of subsidies offered to develop this form of training. The main results are analysed from both the perspectives of France and Germany.

Contributions and policy implications

The quality of cooperation between employers and workers' representatives

Absent from traditional neoclassical models, labour-employer bargaining is now a core parameter in most models predicting output, employment or wages. The bargaining power of each party is generally the factor of interest: economists try to estimate its impact on covered firms and their average worker. The process of bargaining therefore remains a black box which economists have rarely opened. In particular, the fact that negotiations are led by collective organisations composed of heterogeneous actors with particular preferences is often kept silent.

The first chapter of this PhD thesis proposes to enter this black box via an analysis of wage trajectories of German works councilors. This outcome, I claim, offers a good way to analyse the functioning of bargaining in the country. I find proofs that some strategic discrimination towards works councilors takes place in Germany. In the manufacturing sector, being elected to the works council causes a rise in labour income. Conversely, in the private

service sectors[128], entering office negatively impacts wages. In both sectors, the size of these impacts on yearly pay rise is of about 1 to 2 pp. I further show that unionized and politically inclined councilors receive most of the (negative or positive) premium in both sectors. For them, the size of the impact is close to 3 pp.

My results suggest that the strong cooperative feature once embedded in German institutions have much evolved. In the manufacturing sector, recent rights to deviate from branch-level agreements have fostered employers' will to negotiate on the shop-floor with works councils. My results suggest that works councilors were rewarded for their cooperation despite the general scepticism on the side of labour (Haipeter, 2011b). Firm-level agreements may nevertheless have benefited German manufacturing core workers. Most-recently, they facilitated recovery from the Great Recession which impacts on the sector in terms of employment has remained limited in comparative terms. As for the private service sectors, my results are very close to what Breda and Bourdieu (2016) found for the French case on average. They suggest that representative-busting strategies are widespread in the service sector in Germany as they are in France overall. These findings therefore bring new evidence to the political economy literature which has described some convergence in labour-employer cooperation across countries (Baccaro and Howell, 2011; Baccaro and Benassi, 2014). In the German service sector, the decentralization of collective bargaining induced a concentration of powers in the hands of employers rather than a development of shop-floor cooperation. Against most labour organisations, employers were able to impose strong wage austerity.

In one of the most cited recent research on these issues, Dustmann et al (2014a) argue that the source of the resurgence of the German economy is to be found in the wage austerity led in the service sector. They therefore urge European countries to "decentralis[e] bargaining to the firm level while keeping workers' representatives involved to secure that employees benefit again when economic conditions improve" (2014b). The preceding development suggests that these two elements may not be compatible. We

[128] From which I excluded banking and insurance which exhibit very specific models of bargaining.

have shown that wage austerity in the service sector was employer-led and went hand in hand with the repeal of cooperation in firms covered with a works council. It is also detailed in the chapter that the plummeting coverage rates of works council across firms further facilitated wage austerity to the cost of an undermined cooperation. This trend is not an easy one to reverse when times get better. Now that Germany has become an "economic superstar" (ibid), the authors count on representatives to ensure that labour gets its share. However, at a time of full employment and after 10 years of growth, the sluggish rhythm of pay rises currently experienced in the German service sector questions their ability to do so[129]. Settlement of a statutory minimum wage in 2015 appears as a potential solution to wage stagnation. Yet, it brings new issues – among which the retrenchment of subsidiarity to which German actors are attached[130] and which is still equally praised by foreign actors. Further, more pragmatically, its average yearly rise between 2015 and 2020 amounts to 2%, about the size of the sum of yearly increases in productivity and consumer prices. Germany may therefore be lacking some automatic counter-acting mechanisms for high-cycle periods ensuring either that works councils gain in powers in the aforementioned sectors or, more easily, that branch-level cooperation becomes central again.

This development on the German case is full of lessons for the many countries which engaged on a path of decentralization of collective bargaining. This is the case of France where, in the last decades, the State has tried to foster labour-employer negotiations via a growing repeal of the hierarchy of norms combined with efforts to increase representativeness of labour organisations. The most recent step in this process is the current debate on the recourse to administrative extensions of branch-level collective agreements (Labour law, Article L2261-27-1; OECD, 2017). Widely used in France, the

[129] The WSI has measured the increase in agreed pays across branches in nominal terms in 2018. It stands at 3.0% on average and shows strong heterogeneity. Most subsectors of the manufacturing sector do better – with a peak at 4.3% in the metalworking and electrical industry. Conversely, food service and chain catering constitute the only subsector of the service sector to show a higher rate of increase in agreed pays.

[130] As evidenced by the early opposition of IG Metall and IG BCE (unions representing workers in the metalworking industry and the mining, chemical and energy industry) to the implementation of a statutory minimum wage (Marx and Starke, 2017).

mechanism explains why nearly all workers are covered by collective agreements despite very low unionization rates and a weak culture of labour-employer coordination. The present analysis tells us that, this further retrenchment of centralized collective bargaining may fail to foster labour-employer cooperation given the low level of organisation on the side of labour. As evidenced in the case of Germany in the 2000s, it could bring positive outcomes for growth and employment in low-cycle periods thanks to the expected gains in flexibility. But, absent any mechanism fostering back cooperation in high-cycle periods, rents may end up being less well distributed.

Apprenticeship training in France and Germany

The second and third chapters deal with apprenticeship training in France and Germany between 1998 and 2013. Chapter 2 compares how well apprenticeship training helps open the door to the labour market in France and Germany. It shows that, on average, apprentices do better in both countries than standard students upon completion of secondary or higher education. This is true both on the short- and medium-run. In terms of the unemployment rate in the year after education, the difference between the two countries is equivalent to about 6.75 pp more for France. Turning to causal claims, I find that apprenticeships advantage low school achievers leaving school upon completion of secondary education in France. The opposite applies in Germany. Explanation for this result is twofold. First, standard students (i.e. the control group) in Germany do much better than their counterparts in France. Second, mobility upon graduation is about double in France but non-retained graduates still benefit from the good signal of their diploma on the external market which is not the case of their German counterparts. I finally find no causal impact of the track on the integration of student's exiting school after higher education.

The literature in education research has shown that the methods of dual tracks are best suited to low achievers. The impact of apprenticeships for these students is not positive in Germany because they suffer from strong competition, both to find a good apprenticeship at entrance to the system and to value their credentials on the external market upon graduation. This takes particular meaning in a context where high skills are increasingly demanded

by firms who are tempted to privilege candidates with an upper-secondary degree (Gymnasium). While the development of apprenticeships in higher education may be a way to avoid shrinkage of a training model at the core of the German political economy, pupils left behind find themselves with little avenues to recover from their often low social background. Pre-vocational education tracks are increasingly set up to channel those students towards apprenticeship training. Yet, as shown by Caliendo et al, (2011) they are not efficient to increase outcomes on the labour market.

The chapter brings several policy implications for France. In short, the absence of effect of apprenticeship at higher education levels urges to channel public expenditures towards secondary tracks. These conclusions are further discussed after presentation of chapter 3 which specifically deals with the French system.

Chapter 3 evaluates the impact of a large hiring credit – the *Indemnité Compensatrice Forfaitaire* – offered to employers of apprentices in France and which got regionalized between 2005 and 2014. At the time of its regionalization, it accounted for about a quarter of all public money spent on apprenticeships. France has indeed chosen to limit firms' cost to foster their propensity to train. In comparative terms, the country spends about 3 times more per apprentice than Germany and, among these expenditures, 60% target employers against 15% in Germany.

Chapter 3 finds deceiving impacts of the subsidy of interest which is shown to foster turnover strategies. Thus, I find a limited but significantly negative elasticity of the number of apprentices hired to training costs. The point estimate is -0.22. The impact however mostly plays at the intensive margin (training firms taking on more apprentices) rather than at the extensive margin (new firms entering the system). This suggests that training firms may respond to subsidies by training over their needs in skills. Confirming this interpretation, I find that the elasticity of mobility upon graduation to training cost is negative and equal to -0.40.

Chapter 2 and 3 therefore bring several policy implications for France. First, they show that apprenticeships in higher education have no strong

impact on labour market integration, both on the short- and medium-run. Public money should therefore target secondary apprenticeships. The positive impact of secondary apprenticeships on labour market integration indeed urges to concentrate efforts at this level. Given the results of chapter 2 and 3, I however claim that these efforts should aim at raising training quality rather than at increasing the number of contracts.

First, results found in Germany indicate that a system too wide may be harmful for low achievers. The French system is of course far from the German one in terms of numbers, but this result suggests that there may be a tipping point after which apprenticeship can be too developed – and attractive – to benefit these students. This is problematic because they are the ones who have the most to gain from the combination of theoretical and applied work according to the literature in education science. Second, pragmatically, French governments have for long struggled to boost firms' and trainees' involvement into the apprenticeship system. Three main tools have been used: (i) advertisement aiming at families and their children as well as at firms; (ii) enactment of a right to prepare most diploma in higher education via an apprenticeship; (iii) some monetary incentives mostly targeting employers. Chapter 3 teaches us that dropping monetary cost does not bring new firms to train. It only fosters turnover strategies in firms already training which is detrimental to training quality. As for the strong development of dual tracks in higher education, it has not fostered apprenticeships in secondary education[131]. We are left with advertisement which, in itself is surely insufficient. As mentioned along the 3 chapters, there may be other avenues to develop apprenticeships. Among them, a rising grasp of works councilors on these matters may prove useful. But overall, because apprenticeship training is not part of the societal coherence of French institutions, its development seems more than arduous. Rather than focusing on the number of contracts, chapters 2 and 3 of this PhD thesis therefore emphasize quality as the main vector of improvement for the French apprenticeship system.

Reducing drop-out rates – which spike at one third of contracts – seems primordial. Ensuring low constrained mobility upon graduation probably

[131] To the contrary, if anything, apprenticeship tracks in secondary and higher education are substitutes rather than complements.

comes second in line. Mobility upon graduation is mostly the fact of employers rather than of apprentices (Lene and Cart, 2018). As such, it reflects firms' willingness to substitute unskilled workers by cheap trainees rather than to train to hire. This phenomenon is widespread in France where mobility upon graduation is twice larger than in Germany and it is harmful for the integration of trainees on the labour market. Thus, chapter 2 shows that apprentices' difficulties to find a job are largely concentrated during the first twelve months following school exit. Chapter 3 has shown that subsidies to train foster turnover and are therefore detrimental to retention rates. Channelling public expenditures from these subsidies towards hiring credits offered to employers retaining their apprentices may therefore be a good avenue.

Limitations and future extensions

Despite the numerous results presented in this dissertation, it suffers from several limitations which should be mentioned. I describe some of them and provide ideas to tackle them.

In Chapter 1, estimations of the impact of works council membership are led separately between the manufacturing sector and the private service sectors. To gain in generality and focus on the specific role of branch-level collective bargaining agreements (CBAs), I would like to gather all sectors in one regression where the variable of interest would be the interaction between works council membership and coverage of branch-level CBAs. Data on the latter is available at the IAB. It has been released in several publications from Peter Ellguth and Susanne Kohaut. Yet classification of sectors depends on the year and, most importantly, differs to the one used in the SOEP. Building an equivalence table to merge it with the SOEP proved arduous and I could not gain much of the data in the end. It would therefore be helpful to spend some time at the IAB to build a database of sectoral coverage of CBAs according to the sectoral classification found in the SOEP.

Second, a theoretical framework would certainly ease the presentation of the main intuitions in chapter 1. I build some hypotheses from Breda's model of strategic discrimination (2011). In this model, representatives' premium

depends on their vehemence in negotiations with their employer on behalf of the workforce. I also base the empirical work on another type of intuitions according to which representatives' premium depends on the size of the surplus that labour-employer cooperation could generate. These two frameworks would gain to be formalized via a single model.

Finally, both in Germany and in the general case, we still know very little on who labour representatives are (for the French case, see Pignoni, 2019). In future research, I would like to analyse trajectories leading workers to run for mandates of councilors or of union delegates. We know quite a lot on the determinants of trade union membership (among others, see Schnabel and Wagner, 2005), but willingness to engage into labour-employer negotiations is likely to build on different characteristics.

The main limitation of chapter 2 is the limited size of the sample for Germany. Yet, to my knowledge, no other database provides information on graduates from both apprenticeships and standard vocational tracks with a sufficient time window to be comparable with the French surveys Générations.

Further, the chapter remains silent on apprenticeship training in higher education in Germany. Development of these tracks is indeed recent and observations were too few in the GSOEP database. Further research on the matter would yet be interesting. The German capacity to develop good apprenticeship tracks in higher education is indeed presented as clue to avoid the repeal of dual tracks on the long run. The French case however shows that apprenticeships in higher education bring no clear positive outcomes as for labour integration and evaluation in Germany would be a good extension to chapter 2.

Chapter 3, in combination with chapter 2, urge us to turn the emphasis away from the number of contracts to foster on training quality instead. This includes retention rates – which are largely treated in the two chapters – but also drop outs. About a third of all contracts signed each year are broken before termination. We know a lot on the determinants of these events: contracts are more often broken in secondary education than in higher education, in small training firms and in the sector of personal services (Cart et al., 2007). But we know much less on their consequences for both training firms and apprentices. I therefore just started a new research using the same

databases as in chapter 3 to shed light on this question. Part of the identification strategy takes advantage of plant closures to evaluate the impact of contract termination for students.

Last, while working on apprenticeship training in secondary education, I could notice that very little work has been done on standard vocational training. Yet, while labour market outcomes do not differ much between German and French ex-apprentices, there is a huge gap between German and French graduates from standard vocational tracks at secondary level. Widening my research focus to these tracks would therefore be interesting.

Conclusion générale

Cette thèse de doctorat propose trois essais en économie du travail. Ils analysent de manière comparative des institutions clés des économies française et allemande. Les chapitres s'intéressent successivement à l'ampleur des discriminations à l'égard des représentants du personnel, à l'effet de l'apprentissage sur l'insertion professionnelle et à l'impact des subventions offertes aux employeurs pour développer cette forme de formation. Les principaux résultats sont analysés du point de vue de la France et de l'Allemagne.

Contributions et implications en termes de politiques publiques

La qualité de la coopération entre employeurs et représentants du personnel

Absent des modèles néoclassiques traditionnels, la négociation entre employeurs et salariés est désormais un élément central dans la plupart des modèles de prévision de la production, de l'emploi ou des salaires. Le pouvoir de négociation de chaque partie est généralement le facteur d'intérêt : les économistes tentent d'estimer son impact sur les entreprises et leur salarié moyen. Le processus de négociation reste donc une boîte noire que les économistes ont rarement ouverte. En particulier, le fait que les négociations soient menées par des organisations collectives composées d'acteurs hétérogènes avec des préférences spécifiques est souvent gardé sous silence.

Le premier chapitre de cette thèse propose d'ouvrir cette boîte noire via une analyse des trajectoires salariales des représentants du personnel allemands. Cette étude apporte un nouvel éclairage sur la façon dont fonctionne la négociation dans ce pays. Nous montrons qu'il existe en Allemagne une discrimination stratégique à l'égard des représentants du personnel. Dans le secteur manufacturier, être élu au comité d'entreprise

apporte une augmentation des revenus du travail. Inversement, dans le secteur des services, la prise de fonctions a un effet négatif sur les salaires. Dans les deux secteurs, l'ampleur de ces impacts sur l'évolution annuelle des salaires est d'environ 1 à 2 points de pourcentage. Nous montrons en outre que ce sont les conseillers syndiqués et politiquement impliqués qui reçoivent la majeure partie de la prime (négative ou positive) dans les deux secteurs. Pour eux, l'ampleur de l'effet est proche de 3 pp.

Mes résultats suggèrent que le fort caractère coopératif qui était autrefois ancré dans les institutions allemandes a beaucoup évolué. Dans le secteur manufacturier, l'approfondissement récent du droit de déroger aux accords de branche a stimulé la volonté des employeurs de négocier à un niveau décentralisé avec les comités d'entreprise. Mes résultats suggèrent que, malgré le scepticisme général des salariés envers ces négociations (Haipeter, 2011b), les représentants du personnel se sont montrés coopératifs et auraient été récompensés pour cela. Les accords au niveau de l'entreprise pourraient néanmoins avoir profité aux travailleurs du secteur manufacturier allemand. Récemment, ils ont accéléré la reprise suite à la Grande Récession dont l'impact en termes d'emploi sur le secteur est resté limité comparativement aux autres pays. En ce qui concerne le secteur des services privés, mes résultats sont très proches de ceux trouvés par Breda et Bourdieu (2016) pour le cas français pris dans sa globalité. Ces résultats suggèrent que les stratégies de répression envers les représentants sont largement répandues dans le secteur des services en Allemagne de la même manière qu'elles le sont globalement en France. Ils apportent donc de nouvelles preuves à la littérature d'économie politique qui a décrit une convergence dans les niveaux de coopération entre employeurs et salariés à travers les pays (Baccaro et Howell, 2011 ; Baccaro et Benassi, 2014). En Allemagne, dans le secteur des services, la décentralisation de la négociation collective a entraîné une concentration des pouvoirs entre les mains des employeurs plutôt qu'un développement de la coopération avec les représentants du personnel. En opposition à la plupart des organisations représentatives de travailleurs, les employeurs ont pu imposer une forte austérité salariale.

Dans l'une des recherches récentes les plus citées sur ces questions, Dustmann et al (2014a) affirment que l'origine de l'expansion économique allemande est à chercher dans cette austérité salariale menée dans le secteur

des services. Ils invitent donc les pays européens à « décentraliser la négociation au niveau de l'entreprise tout en maintenant impliqués les représentants du personnel pour s'assurer que, lorsque les conditions économiques s'amélioreront, les salariés puissent à nouveau en bénéficier » (2014b). Le développement qui précède suggère que ces deux éléments pourraient ne pas être compatibles. Nous avons montré que l'austérité salariale dans le secteur des services était tirée par les employeurs et allait de pair avec le recul de la coopération dans les entreprises couvertes par un comité d'entreprise. Il est également détaillé dans le chapitre que l'effondrement de l'incidence des comités d'entreprise dans les firmes a facilité l'austérité salariale au détriment de la coopération employeurs-salariés. Cette tendance n'est pas facile à inverser lorsque la conjoncture s'améliore. Maintenant que l'Allemagne est devenue une « superstar économique » (ibid.), les auteurs comptent sur les représentants du personnel pour s'assurer que le facteur travail obtienne sa part. Cependant, en période de plein emploi et après 10 ans de croissance, la faiblesse actuelle des augmentations de salaires en Allemagne dans le secteur des services remet en cause la capacité des représentants à y parvenir[132]. L'établissement d'un salaire minimum national en 2015 apparaît comme une solution potentielle à la stagnation des salaires. Pourtant, elle soulève de nouvelles questions - parmi lesquelles le recul de la subsidiarité à laquelle les acteurs allemands sont attachés[133] et qui est toujours aussi bien perçue par les acteurs étrangers. De plus, de manière plus pragmatique, l'augmentation annuelle moyenne du salaire minimum légal entre 2015 et 2020 s'élève à 2 %, soit à peu près la somme des augmentations annuelles de la productivité et des prix à la consommation. Il pourrait donc manquer à l'Allemagne un mécanisme automatique qui, dans les périodes hautes du cycle, permettrait aux comités d'entreprise de récupérer du pouvoir dans les secteurs

[132] Le WSI a mesuré le niveau d'augmentation du salaire nominal inscrit dans les accords de branches en 2018. Il s'établit à 3,0 % en moyenne et présente une forte hétérogénéité. La plupart des sous-secteurs du secteur manufacturier s'en tirent mieux, avec un pic à 4,3 % dans l'industrie métallurgique et électrique. Inversement, la restauration constitue le seul sous-secteur du secteur des services à afficher un taux d'augmentation plus élevé dans ses accords de branche.

[133] Comme en témoigne l'opposition spontanée d'IG Metall et d'IG BCE (syndicats représentant les travailleurs de l'industrie métallurgique et de l'industrie minière, chimique et énergétique) à l'instauration d'un salaire minimum national (Marx et Starke, 2017).

des services ou, plus simplement, redéfinirait la branche comme le niveau central des négociations.

Ce développement sur le cas allemand est riche d'enseignements pour les nombreux pays qui se sont engagés sur la voie de la décentralisation de la négociation collective. C'est le cas de la France où, au cours des dernières décennies, l'État s'est efforcé de favoriser les négociations entre les partenaires sociaux en faisant reculer la hiérarchie des normes et en tâchant d'accroître la représentativité des organisations syndicales. L'étape la plus récente de ce processus est l'ouverture du débat sur une éventuelle réduction du recours aux extensions administratives des accords collectifs de branche (article L2261-27-1 du Code du travail ; OCDE, 2017). Largement utilisé en France, ce mécanisme explique pourquoi la quasi-totalité des travailleurs est couverte par des accords collectifs malgré des taux de syndicalisation très faibles et une faible culture de coopération entre les partenaires sociaux. L'analyse proposée nous indique que ce nouveau recul de la négociation collective centralisée risque de ne pas engendrer le regain de coopération attendu entre travailleurs et employeurs, étant donné la faiblesse de la culture d'organisation collective décentralisée chez les premiers. Comme on l'a vu dans le cas de l'Allemagne dans les années 2000, cette évolution pourrait avoir des effets positifs sur la croissance et l'emploi dans les périodes de cycle bas grâce aux gains de flexibilité attendus. Mais, en l'absence de tout mécanisme favorisant le retour de la coopération en période de cycle haut, les surplus pourraient s'en trouver moins bien répartis.

La formation par apprentissage en France et en Allemagne

Les deuxième et troisième chapitres traitent de l'apprentissage en France et en Allemagne. Le chapitre 2 compare l'effet des études en apprentissage sur l'accès au marché du travail, en France et en Allemagne, entre 1998 et 2013. Il montre qu'en moyenne, les apprentis réussissent mieux dans les deux pays en sortie d'études secondaires ou supérieures que les étudiants de la voie scolaire standard. Cela est vrai tant à court qu'à moyen terme. En termes de taux de chômage l'année suivant la sortie d'études, le bénéfice est environ 6.75 p.p. plus important en France qu'en Allemagne. L'analyse causale fournit les résultats principaux. Nous montrons que l'apprentissage favorise les élèves en

difficulté scolaire qui quittent l'école à la fin de leurs études secondaires en France. Ce n'est pas le cas en Allemagne. L'explication de ce résultat est double. Tout d'abord, les étudiants de la voie scolaire standard (i.e. le groupe de contrôle) en Allemagne réussissent beaucoup mieux que leurs homologues français. Ensuite, la mobilité en fin de contrat est près de deux fois plus forte en France. Les apprentis non conservés par leur firme de formation à la fin de leur cursus bénéficient cependant du bon signal de leur diplôme sur le marché extérieur, ce qui n'est pas le cas de leurs homologues allemands. Enfin, à la sortie du supérieur, dans les deux pays, l'apprentissage n'apporte pas d'avantage sur le marché du travail.

La littérature dans le domaine de la recherche en éducation a montré que les méthodes de l'alternance conviennent mieux aux élèves les moins scolaires. L'impact de l'apprentissage pour ces étudiants n'est pas positif en Allemagne parce qu'ils souffrent d'une forte concurrence, à la fois pour trouver un bon apprentissage à l'entrée dans le système et pour valoriser leurs qualifications sur le marché externe une fois diplômés. Cela revêt une signification particulière dans un contexte où les entreprises recherchent de plus en plus des candidats hautement qualifiés et se tournent donc de manière croissante vers les titulaires d'un diplôme d'études secondaires supérieures (Gymnasium). Si le développement de l'apprentissage dans l'enseignement supérieur peut permettre d'éviter le déclin du modèle de formation au cœur de l'économie allemande, cela ne laisse guère de possibilités aux élèves en difficulté pour remonter l'échelle sociale – d'où ils partent d'un niveau souvent bas. De manière croissante, des filières de pré-apprentissage sont mises en place pour orienter ces étudiants vers la formation en apprentissage. Mais, comme le montrent Caliendo et al (2011), elles ne sont pas efficaces pour améliorer les perspectives sur le marché du travail.

Ce chapitre apporte plusieurs implications politiques pour la France qui seront examinées plus en détail après la présentation du chapitre 3 qui traite spécifiquement du système français. En bref, l'absence d'effet de l'apprentissage au niveau de l'enseignement supérieur incite à orienter les dépenses publiques vers les filières secondaires.

Le chapitre 3 évalue l'impact d'une importante subvention offerte aux employeurs d'apprentis en France - l'Indemnité Compensatrice Forfaitaire -

qui a été régionalisée entre 2005 et 2014. Au moment de sa régionalisation, elle représentait environ un quart de l'ensemble des dépenses publiques consacrées à l'apprentissage. La France a en effet choisi de limiter le coût des apprentis pour les entreprises afin d'accroître leur recours à la formation. En termes comparatifs, le pays dépense environ 3 fois plus par apprenti et par an que l'Allemagne et, parmi ces dépenses, 60% visent les employeurs contre 15% en Allemagne.

Dans le chapitre 3, nous trouvons des effets négatifs de l'ICF, dont il est démontré qu'elle favorise les stratégies de rotation du personnel. Ainsi, on mesure une élasticité limitée mais significativement négative du nombre d'apprentis embauchés aux coûts de formation. Sa valeur est de -0,22. Toutefois, l'impact se fait surtout sentir au niveau de la marge intensive (les entreprises formatrices accueillant davantage d'apprentis) plutôt qu'au niveau de la marge extensive (de nouvelles entreprises qui commenceraient à former). Cela suggère qu'en réponse à une hausse de la prime à l'embauche, les entreprises formeraient au-dessus de leurs besoins en compétences. Confirmant cette interprétation, l'élasticité de la mobilité des apprentis en fin de contrat est négative et égale à -0,40.

Les résultats des chapitres 2 et 3 permettent donc de formuler des recommandations de politiques publiques pour la France. Premièrement, ils montrent que l'apprentissage dans l'enseignement supérieur ne favorise pas l'intégration sur le marché du travail, tant à court qu'à moyen terme. Les dépenses publiques gagneraient donc à être fléchées vers l'apprentissage du secondaire. L'impact positif de l'alternance à ce niveau sur l'accès au marché du travail incite en effet à y concentrer les efforts. Compte tenu des résultats des chapitres 2 et 3, nous défendons toutefois que l'Etat devrait chercher à améliorer la qualité de la formation plutôt qu'à augmenter le nombre de contrats.

Ainsi, tout d'abord, les résultats obtenus sur le cas allemand indiquent qu'un système trop développé peut être nocif pour les jeunes montrant le moins d'appétence pour les études académiques. Le système français est bien-sûr bien plus restreint que le système allemand, mais ce résultat suggère qu'il pourrait exister un point d'inflexion à partir duquel l'apprentissage serait trop développé - et trop attractif - pour le bénéfice de ces étudiants. Cela est

problématique car ce sont eux qui ont le plus à gagner de la combinaison des études théoriques et appliquées selon la littérature en sciences de l'éducation. Deuxièmement, d'un point de vue pragmatique, les gouvernements français ont depuis longtemps des difficultés à stimuler l'engouement des entreprises et des étudiants pour l'apprentissage. Trois outils principaux ont été utilisés : (i) des publicités destinées aux familles et à leurs enfants ainsi qu'aux entreprises ; (ii) la promulgation d'un droit à préparer en apprentissage la plupart des diplômes de l'enseignement supérieur ; (iii) des incitations financières visant principalement les employeurs. Le chapitre 3 nous apprend que la baisse du coût horaire des apprentis n'amène pas de nouvelles entreprises à former. Elle ne fait que favoriser les stratégies de rotation de main d'œuvre dans les entreprises déjà formatrices, ce qui nuit à la qualité de la formation. Le fort développement de l'alternance dans l'enseignement supérieur n'a ensuite pas stimulé l'apprentissage dans le secondaire[134]. Il nous reste la publicité, qui est certainement insuffisante. Comme mentionné dans les deux chapitres, il existe d'autres moyens de développer l'apprentissage. Parmi eux, offrir aux comités d'entreprise d'importants droits d'information et de codétermination en la matière pourrait s'avérer utile. Mais globalement, l'apprentissage ne faisant pas partie de la cohérence sociétale de la France, son développement semble difficile. Plutôt que de se focaliser sur le nombre de contrats, les chapitres 2 et 3 de cette thèse ciblent donc leur qualité comme principal vecteur d'amélioration du système français d'apprentissage.

Réduire les taux de rupture - qui atteint près d'un tiers des contrats – semble d'abord primordial. Limiter les départs involontaires des apprentis de leur entreprise de formation suite à l'obtention du diplôme vient probablement au deuxième rang. La mobilité suite à l'obtention du diplôme est surtout le fait des employeurs plutôt que des apprentis (Lene et Cart, 2018). En tant que telle, elle reflète les stratégies d'entreprises consistant à remplacer les travailleurs non qualifiés par des apprentis bon marché au lieu de les former en vue d'une future embauche Ce phénomène est répandu en France où les taux de rétention sont deux fois plus faibles qu'en Allemagne et il nuit à l'intégration des apprentis diplômés sur le marché du travail. Ainsi, le chapitre

[134] Au contraire, les filières d'apprentissage aux niveaux secondaire et supérieur sont substituts plutôt que compléments.

2 montre que les difficultés des apprentis à trouver un emploi sont largement concentrées sur les douze premiers mois suivant la sortie d'études. Le chapitre 3 a montré que les subventions pour la formation favorisent la rotation de main d'œuvre et sont donc préjudiciables aux taux de rétention. Le redéploiement de l'argent de ces subventions en prime à l'embauche offerte aux employeurs qui conservent leurs apprentis diplômés pourrait donc constituer une bonne solution.

Limites et développements futurs

Malgré les nombreux résultats présentés dans cette thèse, elle se heurte à plusieurs limites qui doivent être mentionnées. Nous décrivons certaines d'entre elles et proposons des idées pour y faire face.

Dans le chapitre 1, les estimations de l'impact d'être représentant du personnel sur les salaires sont menées séparément entre le secteur manufacturier et le secteur privé des services. Pour gagner en généralité et nous concentrer sur le rôle des accords collectifs de branches, nous voudrions rassembler tous les secteurs dans une seule régression où la variable d'intérêt serait l'interaction entre le statut de représentant et le niveau de couverture sectoriel des accords de branche. Les données sur ce dernier point sont disponibles à l'IAB. Elles sont accessibles via plusieurs publications de Peter Ellguth et Susanne Kohaut. Cependant, la classification des secteurs dépend de l'année et, surtout, diffère de celle utilisée dans le SOEP. L'élaboration d'un tableau d'équivalence pour fusionner ces données avec le SOEP s'est avérée ardue et nous n'avons pu tirer ce que nous espérions des données. Il serait donc utile de passer du temps à l'IAB pour construire une base de données de la couverture sectorielle des accords de branche selon la classification par secteur utilisée dans le SOEP.

Deuxièmement, un cadre théorique formel faciliterait certainement la présentation des principales intuitions du chapitre 1. Nous construisons des hypothèses à partir du modèle de discrimination stratégique de Breda (2011). Dans ce modèle, la prime des représentants dépend de leur véhémence dans les négociations avec leur employeur au nom de leur collègue. Nos estimations sont également fondées sur une autre intuition selon lauqelle la prime des

représentants dépendrait de l'espérance de surplus à attendre de la coopération entre employeurs et travailleurs. Ces deux cadres gagneraient à être formalisés via un modèle unique.

Enfin, tant en Allemagne que dans le cas général, on connait encore très peu de choses sur les représentants du personnel (pour le cas français, voir Pignoni, 2019). Dans nos recherches futures, nous aimerions analyser les trajectoires qui conduisent les travailleurs à se présenter à des mandats de représentant du personnel ou de délégué syndical. Nous en savons beaucoup sur les déterminants de la syndicalisation (voir entre autres Schnabel et Wagner, 2005), mais la volonté de s'engager dans des négociations avec son employeur au nom de ses collègues est susceptible de faire appel à des caractéristiques différentes.

La principale limite du chapitre 2 est la taille réduite de l'échantillon pour l'Allemagne. Cependant, à notre connaissance, aucune autre base de données ne fournit d'information sur les diplômés des filières d'apprentissage et des filières professionnelles par voie scolaire avec une fenêtre temporelle suffisante pour être comparable aux enquêtes françaises Génération.

En outre, le chapitre reste muet sur la formation en apprentissage dans l'enseignement supérieur en Allemagne. Le développement de la filière est en effet récent et les observations étaient trop peu nombreuses dans la base de données du GSOEP. De futures recherches sur la question seraient donc intéressantes. La capacité de l'Allemagne à développer de bonnes filières d'apprentissage dans l'enseignement supérieur est en effet présentée comme une solution pour éviter le déclin à long terme des filières en apprentissage. Le cas français montre cependant que l'alternance dans le supérieur n'a pas d'impact positif clair sur les perspectives professionnelles. L'évaluation du cas allemand constituerait donc une bonne extension au chapitre 2.

Le chapitre 3, en combinaison avec le chapitre 2, nous incite à mettre l'accent sur la qualité de la formation plutôt que sur le nombre de contrats. Cela implique de porter une attention particulière aux taux de rétention suite à l'obtention du diplôme – qui sont largement traités dans les deux chapitres – mais aussi aux ruptures de contrat. Environ un tiers des contrats signés chaque année sont rompus avant leur terme. On en sait beaucoup sur les

déterminants de ces événements : les contrats sont plus souvent rompus dans l'enseignement secondaire que dans l'enseignement supérieur, dans les petites entreprises de formation et dans le secteur des services à la personne (Cart et al., 2007). Mais nous en savons beaucoup moins sur leurs conséquences tant pour les entreprises de formation que pour les apprentis. Nous venons donc d'entamer une nouvelle recherche s'appuyant sur les mêmes bases de données que le chapitre 3 pour éclairer cette question. La stratégie d'identification tire parti des fermetures d'usines pour évaluer l'impact de la rupture de contrat pour les étudiants.

Enfin, en travaillant sur l'apprentissage dans l'enseignement secondaire, nous avons pu constater que les travaux menés sur la formation professionnelle par voie scolaire sont peu nombreux. Pourtant, si les perspectives sur le marché du travail diffèrent peu entre les anciens apprentis allemands et français, il existe un écart énorme entre les diplômés allemands et français sortant de ces filières au niveau secondaire. Il serait donc intéressant d'élargir le champ de nos recherches à cette population.

Bibliography

Abriac, D., R. Rathelot and R. Sanchez (2009), L'apprentissage, entre formation et insertion professionnelles, Formations et emploi, 57–74.

Addison John T., Schnabel Claus and Wagner Joachim (2004), The Course of Research into the Economic Consequences of German Works Councils, British Journal of Industrial Relations 42 (2), 255–281.

Addison, J.T., L. Bellmann, C. Schnabel and J. Wagner (2004), The reform of the German works constitution act: a critical assessment, Industrial Relations: A Journal of Economy and Society 43 (2), 392–420.

Addison, J.T., T. Schank, C. Schnabel and J. Wagner (2006), Works councils in the production process, Schmollers Jahrbuch 126 (2), 251–283.

Addison, J.T., C. Schnabel and J. Wagner (2001), Works councils in Germany: their effects on establishment performance, Oxford economic papers 53 (4), 659–694.

Addison, J.T., P. Teixeira, A. Pahnke and L. Bellmann (2017), The demise of a model? The state of collective bargaining and worker representation in Germany, Economic and Industrial Democracy 38 (2), 193–234.

Addison, J.T., P. Teixeira and T. Zwick (2010), German Works Councils and the Anatomy of Wages, Industrial and Labor Relations Review 63 (2), 247–270.

Alet, E. and L. Bonnal (2011), Vocational schooling and educational success: comparing apprenticeship to full-time vocational high-school.

Amable, B. (2005), Les cinq capitalismes. Diversité des systèmes économiques et sociaux dans la mondialisation, Université Paris1 Panthéon-Sorbonne (Post-Print and Working Papers) halshs-00310487, HAL.

Amossé, T., P. Askenazy, M. Chevalier, C. Erhel, H. Petit and A. Rebérioux (2018), Relations sociales et ajustements à la crise: une analyse microstatistique comparative franco-britannique, Revue internationale du Travail 0 (0).

Angrist, J.D. and J.-S. Pischke (2008), Mostly Harmless Econometrics: An Empiricist's Companion, Princeton University Press.

Arrighi, J.-J., C. Gasquet and J. Olivier (2009), Qui sort de l'enseignement secondaire ? Origine sociale, parcours scolaires et orientation des jeunes de la Génération 2004, http://www.cereq.fr/publications/Nef/Qui-sort-de-l-enseignement-secondaire-Origine-sociale-parcours-scolaires-et-orientation-des-jeunes-de-la-Generation-2004, retrieved 23.5.2018.

Artus, I. (2013), Precarious delegates: irregular forms of employee interest representation in G ermany, Industrial Relations Journal 44 (4), 409–424.

Baccaro, L. and Benassi (2014), Softening industrial relations institutions, hardening growth model: The transformation of the German political economy, SM, 369–396.

Baccaro, L. and C. Howell (2017), Softening Institutions, /core/books/trajectories-of-neoliberal-transformation/softening-institutions/413BBC10386762649E95137E47B0EAAB, retrieved 4.6.2019.

Baccaro, L. and C. Howell (2011), A Common Neoliberal Trajectory: The Transformation of Industrial Relations in Advanced Capitalism, Politics & Society 39 (4), 521–563.

Bajoit, G. (1988), Exit, Voice, Loyalty... and Apathy: Les réactions individuelles au mécontentement, Revue française de sociologie, 325–345.

Barnow, B.S., G.G. Cain, A.S. Goldberger and others (1980), Issues in the analysis of selectivity bias, University of Wisconsin, Inst. for Research on Poverty.

Barone, C. and H.G. van de Werfhorst (2011), Education, cognitive skills and earnings in comparative perspective, International Sociology 26 (4), 483–502.

Becker, G.S. (1962), Investment in Human Capital: A Theoretical Analysis, Journal of Political Economy 70 (5, Part 2), 9–49.

Behrens, M. (2009), Still Married after All These Years? Union Organizing and the Role of Works Councils in German Industrial Relations, ILR Review 62 (3), 275–293.

Behrens, M. and H. Dribbusch (2018), Employer Resistance to Works Councils: Evidence from Surveys amongst Trade Unions, German Politics 0 (0), 1–19.

Bennmarker, H., E. Mellander and B. Öckert (2009), Do regional payroll tax reductions boost employment?, Labour Economics 16 (5), 480–489.

Bernhard, N. (2019), Répondre aux besoins des diplômés de l'enseignement professionnel allemand : vers une perméabilité institutionnelle ?, Formation emploi. Revue française de sciences sociales (146), 129–147.

Blanchflower, D. and A. Bryson (2002), Changes over time in union relative wage effects in the UK and the US revisited, Working Paper 9395, National Bureau of Economic Research, December.

Bohm, P. and H. Lind (1993), Policy evaluation quality: A quasi-experimental study of regional employment subsidies in Sweden, Regional Science and Urban Economics 23 (1), 51–65.

Booth, A.L. and M.L. Bryan (2004), The union membership wage-premium puzzle: is there a free rider problem?, ILR Review 57 (3), 402–421.

Bourdieu, J. and T. Breda (2016), Des délégués syndicaux sous-payés : une situation de discrimination stratégique ?, Travail et emploi (145), 31–58.

Bozio, A., S. Cottet and C. Malgouyres (2018), Quels effets attendre de la transformation du CICE en réductions de cotisations employeurs ?, IPP 36, October.

Brändle, T. (2017), Flexible collective bargaining agreements: Still a moderating effect on works council behaviour?, Managerial and Decision Economics 38 (8), 1137–1153.

Brauns, H., W. Müller, S. Steinmann and others (1997), Educational expansion and returns to education. A comparative study on Germany, France, the UK, and Hungary, MZES.

Brébion, C. (2019), L'apprentissage, un meilleur « rendement » professionnel en France qu'en Allemagne, Formation emploi. Revue française de sciences sociales (146), 101–127.

Breda, T. (2014), Les délégués syndicaux sont-ils discriminés?, Revue économique 65 (6), 841–880.

Breda, T. (2011), Syndicats, négociations, ou capitalisme familial : effets sur les salaires et la protection de l'emploi.

Brzinsky-Fay, C. (2007), Lost in Transition? Labour Market Entry Sequences of School Leavers in Europe, European Sociological Review 23 (4), 409–422.

Bunel, M., F. Gilles and Y. L'horty (2009), Les effets des allégements de cotisations sociales sur l'emploi et les salaires : une évaluation de la réforme de 2003, Economie et Statistique 429 (1), 77–105.

Busemeyer, M.R. (2012), Business as a Pivotal Actor in the Politics of Training Reform: Insights from the Case of Germany, British Journal of Industrial Relations 50 (4), 690–713.

Cahuc, P., S. Carcillo and T. Le Barbanchon (2014), Do Hiring Credits Work in Recessions? Evidence from France, IZA Discussion Papers 8330, Institute of Labor Economics (IZA), July.

Caliendo, M., S. Künn and R. Schmidl (2011), Fighting Youth Unemployment: The Effects of Active Labor Market Policies, SSRN Scholarly Paper ID 1977808, Social Science Research Network, Rochester, NY, 31. December.

Carbonnier, C., C. Malgouyres, L. Py, C. Urvoy and C. Foffano (2018), Évaluation interdisciplinaire des impacts du CICE en matière d'emplois et de salaires: Rapport du Laboratoire Interdisciplinaire d'Évaluation des Politiques Publiques (LIEPP) de Sciences Po en réponse à l'appel à

évaluation de France Stratégie, Sciences Po publications info:hdl:2441/71qdj9669e8dore9fmfi4a8m42, Sciences Po, August.

Carrez, G. (2003), Rapport fait au nom de la commission des finances, de l'économie générale et du plan sur le projet de loi de finances pour 2004. Annexe n°5. Affaires sociales, travail et solidarité formation professionnelle, Assemblée Nationale 1093, 9. October.

Carrez, G. (2002), Rapport fait au nom de la commission des finances, de l'économie générale et du plan sur le projet de loi de finances pour 2003. Annexe n°5. Affaires sociales, travail et solidarité formation professionnelle, Assemblée Nationale 230, 10. October.

Cart, B., H. Ducourant, V. Henguelle, A.-S. Surelle and M.-H. Toutin (2007), Les ruptures des contrats d'apprentissage en Région Nord-Pas-de-Calais, Recherche pour le compte du C2RP – Oref, October.

Chagny, O. (2018), Optimal wage setting: four families in the economic literature – HIVA, CAWIE Research Paper 3.3.

Chiburis, R.C., J. Das and M. Lokshin (2012), A practical comparison of the bivariate probit and linear IV estimators, Economics Letters 117 (3), 762–766.

Chopin, D. (2012), Sarkozy-Hollande : deux conceptions du modèle économique allemand, 27. February.

Correia, S., P. Guimarães and T. Zylkin (2019a), ppmlhdfe: Fast Poisson Estimation with High-Dimensional Fixed Effects, arXiv:1903.01690 [econ].

Correia, S., P. Guimarães and T. Zylkin (2019b), Verifying the existence of maximum likelihood estimates for generalized linear models, arXiv:1903.01633 [econ].

Couppié, T. and C. Gasquet (2017), Apprentissage et voie scolaire: comment expliquer les différences d'insertion observées?, CÉREQ ÉCHANGES, 77.

Crépon, B. and R. Desplatz (2001), Une nouvelle évaluation des effets des allégements de charges sociales sur les bas salaires suivi de commentaires de Yannick L'Horty et Guy Lacroix, Economie et Statistique 348 (1), 3–34.

Crifo, P. and A. Rebérioux (2019), La participation des salariés., Presses de Sciences Po.

Culpepper, P.D. (2003), Creating Cooperation: How States Develop Human Capital in Europe, Cornell University Press.

Culpepper, P.D. (2001), Employers, Public Policy, and the Politics of Decentralized Cooperation in Germany and France, in: Hall, P. A. and D. Soskice (eds.), Varieties of Capitalism: The Institutional Foundations of Comparative Advantage, OUP Oxford, 275–306.

Deissinger, T. (1996), Germany's Vocational Training Act: its function as an instrument of quality control within a tradition-based vocational training system, Oxford Review of Education 22 (3), 317–336.

Dionisius, R., S. Muehlemann, H. Pfeifer, G. Walden, F. Wenzelmann and S.C. Wolter (2009), Costs and benefits of apprenticeship training. A comparison of Germany and Switzerland, Applied Economics Quarterly 55 (1), 7–37.

Dunlop, J.T. (1944), Wage determination under trade unions, Macmillan, New York.

Dustmann, C., B. Fitzenberger, U. Schönberg and A. Spitz-Oener (2014a), From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy, Journal of Economic Perspectives 28 (1), 167–188.

Dustmann, C., B. Fitzenberger, U. Schönberg and A. Spitz-Oener (2014b), From sick man of Europe to economic superstar: Germany's resurgence and the lessons for Europe.

Dustmann, C. and U. Schönberg (2007), Apprenticeship training and commitment to training provision, Economics of Education Working Paper Series (32).

Egebark, J. and N. Kaunitz (2014), Do Payroll Tax Cuts Raise Youth Employment?, SSRN Scholarly Paper ID 2369989, Social Science Research Network, Rochester, NY, 2. January.

Ellguth, P., H.-D. Gerner and J. Stegmaier (2014), Wage effects of works councils and opening clauses: The German case, Economic and Industrial Democracy 35 (1), 95–113.

Eren, O. (2009), Does Membership Payoff for Covered Workers? A Distributional Analysis of the Free Rider Problem, ILR Review 62 (3), 367–380.

Fairris, D. and P. Askenazy (2010), Works Councils and Firm Productivity in France, Journal of Labor Research 31 (3), 209–229.

FitzRoy, F.R. and K. Kraft (1990), Innovation, rent-sharing and the organization of labour in the Federal Republic of Germany, Small Business Economics 2 (2), 95–103.

FitzRoy, F.R. and K. Kraft (1987), Cooperation, productivity, and profit sharing, The Quarterly Journal of Economics 102 (1), 23–35.

FitzRoy, F.R. and K. Kraftz (1985), Unionization, wages and efficiency, Kyklos 38 (4), 537–554.

Fougère, D. and W. Schwerdt (2002), Are apprentices productive?, KONJUNKTURPOLITIK-BERLIN- 48 (3/4), 317–346.

Franz, W., J. Inkmann, W. Pohlmeier and V. Zimmermann (2000), Young and Out in Germany (On Youths? Chances of Labor Market Entrance in Germany), NBER, 381–426.

Franz, W., J. Inkmann, W. Pohlmeier and V. Zimmermann (1997), Young and Out in Germany: On the Youths' Chances of Labor Market Entrance in Germany, Working Paper 6212, National Bureau of Economic Research, October.

Freeman, R. and E. Lazear (1995), An Economic Analysis of Works Councils, NBER Chapters, National Bureau of Economic Research, Inc.

Freeman, R. B. (1976), Individual Mobility and Union Voice in the Labor Market, The American Economic Review 66 (2), 361–368.

Freeman, Richard B. (1976), Individual mobility and union voice in the labor market, The American Economic Review 66 (2), 361–368.

Gamel, C. (2000), Le diplôme, un 'signal' en voie de dépréciation?, Revue d Economie Politique 110 (1), 53–84.

Garnero (2015), Institutions and Heterogeneity in the Labour Market.

Garrouste, M., F. Kramarz and C. Zizzo (2018), L'accès à la formation en apprentissage : une question de ressources régionales ?, Formation emploi n° 142 (2), 15–33.

Gavrilova, E., F. Zoutman, A.-O. Hopland and J. Møen (2015), Who pays for the payroll tax? quasi-experimental evidence on the incidence of the payroll tax.

Gazier, B. and H. Petit (2007), French Labour Market Segmentation and French Labour Market Policies since the Seventies: Connecting Changes.

Gerlach, K. and W. Meyer (2010), Wage effects of works councils and collective agreements in Germany, Labor in the Era of Globalization, S, 295–316.

Gilles, F., Y. L'Horty, F. Mihoubi and X. Yang (2017), Les effets du CICE sur l'emploi, les salaires et l'activité des entreprises : une nouvelle évaluation ex post pour la période 2013-2015, TEPP Research Report 2017–04, TEPP.

Goos, M. and J. Konings (2007), The Impact of Payroll Tax Reductions on Employment and Wages: A Natural Experiment Using Firm Level Data, LICOS Discussion Papers 17807, LICOS - Centre for Institutions and Economic Performance, KU Leuven.

Goyer, M. (2007), Capital Mobility, Varieties of Institutional Investors, and the Transforming Stability of Corporate Governance in France and Germany, in: Hancké, B., M. Rhodes and M. Thatcher (eds.), Beyond varieties of capitalism: conflict, contradiction, and complementarities in the European economy, Oxford University Press, Oxford ; New York, 195 – 221.

Granato, M. and S. Kroll (2013), L'alternance en Allemagne : différenciation de la formation sans différenciation des diplômes ?, Cahiers de la recherche sur l'éducation et les savoirs (Hors-série n°4), 109–131.

Gürtzgen, N. (2006), The effect of firm-and industry-level contracts on wages-evidence from longitudinal linked employer-employee data.

Guyot, F. and M. Ferracci (2015), Dialogue social et performance économique, Presses de Sciences Po.

Haipeter, T. (2011a), 'Unbound'employers'' associations and derogations: erosion and renewal of collective bargaining in the German metalworking industry', Industrial Relations Journal 42 (2), 174–194.

Haipeter, T. (2011b), Works councils as actors in collective bargaining: Derogations and the development of codetermination in the German chemical and metalworking industries, Economic and Industrial Democracy 32 (4), 679–695.

Haisken-DeNew, J.P. and J.R. Frick (2005), Desktop companion to the German socio-economic panel study (GSOEP), German Institute for Economic Research, Berlin.

Hall, P. and D. Soskice (2001), An Introduction to Varieties of Capitalism, Varieties of Capitalism: The Institutional Foundations of Comparative Advantage, Oxford University Press.

Hall, P.A. and D. Soskice (2001), Varieties of Capitalism: The Institutional Foundations of Comparative Advantage, OUP Oxford.

Hancké, B. (2001), Revisiting the French model: coordination and restructuring in French industry, in: Hall, P. A. (ed.), Varieties of Capitalism: the Institutional Foundations of Comparative Advantage, Oxford University Press, Oxford, UK, 307–337.

Hassel, A. (1999), The Erosion of the German System of Industrial Relations, British Journal of Industrial Relations 37 (3), 483–505.

Heckman, J.J. (1979), Sample Selection Bias as a Specification Error, Econometrica 47 (1), 153.

Herget, H. (1997), Berufliche Perspektiven aus Sicht von Abiturienten mit dualem Berufsabschluß, in: Beicht, U., K. Berger, H. Herget and E. M. Krekel (eds.), Berufsperspektiven mit Lehre, Bielefeld, 219–246.

Hippach-Schneider, U., M. Krause and C. Woll (2007), Vocational education and training in Germany: short description, Cedefop panorama series 138, Office for Official Publications of the European Communities, Luxembourg.

Hirschman, A.O. (1970), Exit, voice, and loyalty: Responses to decline in firms, organizations, and states, vol. 25, Harvard university press.

Hübler, O. and U. Jirjahn (2003), Works councils and collective bargaining in Germany: the impact on productivity and wages, Scottish Journal of Political Economy 50 (4), 471–491.

Huttunen, K., J. Pirttilä and R. Uusitalo (2013), The employment effects of low-wage subsidies, Journal of Public Economics 97, 49–60.

IGF and IGAS (2013), Les aides financières à la formation en alternance, Rapport public N° 2013-M-017-01, Inspection générale des finances et Inspection générale des affaires sociales, June.

Issehnane, S. (2011), Le développement de l'apprentissage dans le supérieur : une évaluation empirique à partir de l'enquête Génération 2001, Travail et Emploi (125), 27–39.

Jirjahn, U. (2014), Works councils and collective bargaining in Germany: A simple but crucial theoretical extension, Working Paper 13/14, Research Papers in Economics.

Jirjahn, U. and S. Mueller (2012), Non-union worker representation, foreign owners, and the performance of establishments, Oxford Economic Papers 66 (1), 140–163.

Johansen, F. and T.J. Klette (1997), Wage and Employment Effects of Payroll Taxes and Investment Subsidies, Discussion Papers 194, Statistics Norway, Research Department, May.

Kergoat, P. (2010), Les formations par apprentissage : un outil au service d'une démocratisation de l'enseignement supérieur ?

Kinderman, D. (2005), Pressure from without, Subversion from within: The Two-Pronged German Employer Offensive, Comparative European Politics 3 (4), 432–463.

Korkeamäki, O. and R. Uusitalo (2008), Employment and wage effects of a payroll-tax cut—evidence from a regional experiment, International Tax and Public Finance 16 (6), 753.

Kraft, K. and J. Lang (2008), The causes and consequences of adopting a works council, Jahrbücher für Nationalökonomie und Statistik 228 (5–6), 512–532.

Kramarz, F. and M.-L. Michaud (2010), The shape of hiring and separation costs in France, Labour Economics 17 (1), 27–37.

Kramarz, F. and T. Philippon (2001), The impact of differential payroll tax subsidies on minimum wage employment, Journal of Public Economics 82 (1), 115–146.

Kriechel, B., S. Muehlemann, H. Pfeifer and M. Schütte (2014), Works Councils, Collective Bargaining, and Apprenticeship Training – Evidence From German Firms, Industrial Relations: A Journal of Economy and Society 53 (2), 199–222.

Lasserre, R. (2011), L'apprentissage en entreprise au cœur de la compétitivité allemande, Regards sur l'économie allemande. Bulletin économique du CIRAC (103), 13–18.

Layard, R., S.J. Nickell and R. Jackman (1991), Unemployment: Macroeconomic Performance and the Labour Market, Oxford University Press.

Léné, A. (2018), Habilitation à Diriger des Recherches - Production et valorisation des compétences dans les organisations et sur le marché du travail, 26. October.

Lene, A. and B. Cart (2018), Apprenticeships, mobility and wages an investigation on French data, International Journal of Manpower.

Lerman, R.I. and H. Pouncy (1990), The Compelling Case for Youth Apprenticeships, Public Interest.

Lewin, K., K.-H. Minks and S. Uhde (1996), Abitur-Berufsausbildung-Studium, Mitteilungen aus der Arbeitsmarkt-und Berufsforschung 29 (3), 431–454.

L'Horty, Y., P. Martin and T. Mayer (2019), Baisses de charges : stop ou encore ?, Notes du conseil danalyse economique n° 49 (1), 1–12.

Lindley, R.M. (1975), The Demand For Apprentice Recruits By The Engineering Industry, 1951-71, Scottish Journal of Political Economy 22 (1), 1–24.

Lucas, R.E. (1988), On the mechanics of economic development, Journal of Monetary Economics 22 (1), 3–42.

Macron, E. (2017), Manifesto for En Marche.

Macron, E. (2016), News.

Malgouyres, C. (2019), Coût du travail et exportations : analyses sur données d'entreprises, IPP 20, January.

Martinot, B. (2015), L'apprentissage, un vaccin contre le chômage des jeunes Plan d'action pour la France tiré de la réussite allemande, Institut Montaigne.

Marx, P. and P. Starke (2017), Dualization as Destiny? The Political Economy of the German Minimum Wage Reform, Politics & Society 45 (4), 559–584.

Maurice, M., F. Sellier and J.-J. Silvestre (1986), The social foundations of industrial power: a comparison of France and Germany, MIT Press, Cambridge, Mass.

Maurice, M., F. Sellier and J.-J. Silvestre (1979), La production de la hiérarchie dans l'entreprise: recherche d'un effet sociétal: Comparaison France-Allemagne, Revue Française de Sociologie 20 (2), 331.

Mélenchon, J.-L. (2012), L'apprentissage est une très mauvaise idée, 1. February.

Möbus, M. and P. Sevestre (1991), Formation professionnelle et emploi : un lien plus marqué en Allemagne, Economie et statistique 246 (1), 77–89.

Möbus, M. and E. Verdier (2000), Diplômes professionnels et coordination de la formation de l'emploi: l'élaboration d'un signal en France et d'une règle en Allemagne, Économie publique/Public economics (05).

Monras, J. (2019), Minimum Wages and Spatial Equilibrium: Theory and Evidence, Journal of Labor Economics 37 (3), 853–904.

Moreau, G. (2008), Apprentissage : une singulière métamorphose, Formation emploi. Revue française de sciences sociales (101), 119–133.

Moreau, G. (2003), Le Monde apprenti, La Dispute, Paris.

Moretti, E. (2004), Chapter 51 - Human Capital Externalities in Cities, in: Henderson, J. V. and J.-F. Thisse (eds.), Handbook of Regional and Urban Economics, Cities and Geography, vol. 4, Elsevier, 2243–2291.

Muehlemann, S., H. Pfeifer, G. Walden, F. Wenzelmann and S.C. Wolter (2010), The financing of apprenticeship training in the light of labor market regulations, Labour Economics 17 (5), 799–809.

Muehlemann, S., J. Schweri, R. Winkelmann and S.C. Wolter (2007), An Empirical Analysis of the Decision to Train Apprentices, LABOUR 21 (3), 419–441.

Mueller, S. (2011), Works councils and firm profits revisited, British Journal of Industrial Relations 49, s27–s43.

Müller-Jentsch, W. (2018), Seven decades of industrial relations in Germany, Employee Relations.

Müller-Jentsch, W. (1995), Germany: From Collective Voice to Co-Management in Works Councils: Consultation, Representation, and Cooperation in Industrial Relations, University of Chicago Press.

Neumark, D. (2013), Spurring Job Creation in Response to Severe Recessions: Reconsidering Hiring Credits, Journal of Policy Analysis and Management 32 (1), 142–171.

Neumark, D. and D. Grijalva (2017), The Employment Effects of State Hiring Credits, ILR Review 70 (5), 1111–1145.

Nienhueser, W. (2009), The Effects of Different Types of Works Councils on Bargaining Outcomes: Results of an Empirical Study, Economic and Industrial Democracy 30 (3), 372–400.

Oberfichtner, M. and C. Schnabel (2017), The German model of industrial relations:(Where) does it still exist?

OECD (2019), Employment Outlook - The Future of Work, Paris.

OECD (2018), L'apprentissage et l'alternance en sept questions : Leçons des expériences internationales, Examens de l'OCDE sur l'éducation et la formation professionnelles, Paris.

OECD (2017), Les extensions administratives des accords de branche en France : Effets et pistes de réformes, Editions OCDE, July.

Palier, B. and K. Thelen (2010), Institutionalizing Dualism: Complementarities and Change in France and Germany, Politics & Society 38 (1), 119–148.

Parey, M. (2012), Vocational Schooling versus Apprenticeship Training. Evidence from Vacancy Data.

Pencavel, J.H. (1977), The distributional and efficiency effects of trade unions in Britain, British Journal of Industrial Relations 15 (2), 137–156.

Pignoni, M.T. (2019), Les représentants du personnel dans l'entreprise: des salariés comme les autres?, Dares Analyses (002).

Powell, J.J.W., L. Graf, N. Bernhard, L. Coutrot and A. Kieffer (2012), The Shifting Relationship between Vocational and Higher Education in France and Germany: towards convergence?, European Journal of Education 47 (3), 405–423.

Reynaud, J.-D. (1987), Qualification et marché du travail, Sociologie du Travail 29 (1), 86–109.

Riphahn, R.T. and M. Zibrowius (2016), Apprenticeship, vocational training, and early labor market outcomes – evidence from East and West Germany, Education Economics 24 (1), 33–57.

Ryan, P., U. Backes-Gellner, S. Teuber and K. Wagner (2013), Apprentice pay in Britain, Germany and Switzerland: Institutions, market forces and market power, European Journal of Industrial Relations 19 (3), 201–220.

Saez, E., B. Schoefer and D. Seim (2019), Payroll Taxes, Firm Behavior, and Rent Sharing: Evidence from a Young Workers' Tax Cut in Sweden, American Economic Review 109 (5), 1717–1763.

Santos Silva, J.M.C. and S. Tenreyro (2010), On the existence of the maximum likelihood estimates in Poisson regression, Economics Letters 107 (2), 310–312.

Sarfati, F. (2015), Faut-il être compétent pour pouvoir développer ses compétences ? L'exemple de la sélection à l'entrée en Master 2, Formation emploi. Revue française de sciences sociales (130), 31–48.

Schnabel, C. and J. Wagner (2005), Determinants of trade union membership in West Germany: evidence from micro data, 1980–2000, Socio-Economic Review 3 (1), 1–24.

Seifert, H. and H. Massa-Wirth (2005), Pacts for employment and competitiveness in Germany, Industrial Relations Journal 36 (3), 217–240.

Silvestre, J.-J. (1990), Systèmes hiérarchiques et analyse sociétale. Une comparaison France-Allemagne-Japon., Revue française de gestion, 107–115.

Simonnet, V. and V. Ulrich (2000), La formation professionnelle et l'insertion sur le marché du travail : l'efficacité du contrat d'apprentissage, Economie et Statistique 337 (1), 81–95.

Sollogoub, M. and V. Ulrich (1999), Les jeunes en apprentissage ou en lycée professionnel, Economie et Statistique 323 (1), 31–52.

Steedman, H. (2010), The state of apprenticeship in 2010: international comparisons - Australia, Austria, England, France, Germany, Ireland, Sweden, Switzerland: a report for the Apprenticeship Ambassadors Network., http://cep.lse.ac.uk, retrieved 10.9.2019.

Störmer, S. (2010), Individual Characteristics of Work Council Members—Empirical Evidence, Management Revue, 244–262.

Streeck, W. (2009), Re-Forming Capitalism: Institutional Change in the German Political Economy, OUP Oxford.

Taylor, M.E. (1981), Education and work in the Federal Republic of Germany., Anglo-German Foundation for the Study of Industrial Society, London.

Thatcher, M. (2007), Reforming national regulatory institutions: The EU and cross-national variety in European network industries, Beyond Varieties of Capitalism: Conflict, Contradiction, and Complementarities in the European Economy, 147–172.

The Economist (2004), Germany on the mend, The Economist.

Thelen, K. (2009), Institutional Change in Advanced Political Economies, British Journal of Industrial Relations 47 (3), 471–498.

Thelen, K. (2004), How Institutions Evolve: The Political Economy of Skills in Germany, Britain, the United States, and Japan, Cambridge University Press.

Thelen, K. and M.R. Busemeyer (2011), Institutional Change in German Vocational Training: From Collectivism toward Segmentalism, in: Busemeyer, M. R. and C. Trampusch (eds.), The Political Economy of Collective Skill Formation, Oxford University Press, 68–100.

Unwin, L. and J. Wellington (1995), Reconstructing the Work-based Route: lessons from the Modern Apprenticeship, The Vocational Aspect of Education 47 (4), 337–352.

Van der Velden, R.K. and M.H. Wolbers (2003), The integration of young people into the labour market: the role of training systems and labour market regulation, Transitions from education to work in Europe. The integration of youth into EU labour markets, 186–211.

Wagner, J. (2008), German works councils and productivity: first evidence from a nonparametric test, Applied Economics Letters 15 (9), 727–730.

Weatherall, C.D. (2009), Do Subsidized Adult Apprenticeships Increase the Vocational Attendance Rate?, Applied Economics Quarterly (formerly: Konjunkturpolitik) 55 (1), 61–81.

Webb, S. and B. Webb (1897), Industrial Democracy, Theclassics.Us, Place of publication not identified.

Weiss, M. and M. Schmidt (2008), Labour Law and Industrial Relations in Germany, Kluwer Law International B.V.

Westergard-Nielsen, N. and A. Rasmussen (1997), Apprenticeship training in Denmark : the impacts of subsidies.

Winkelmann, R. (1996), Employment Prospects and Skill Acquisition of Apprenticeship-Trained Workers in Germany, Industrial and Labor Relations Review 49 (4), 658.

Wolter, S.C., S. Mühlemann and J. Schweri (2006), Why Some Firms Train Apprentices and Many Others Do Not, German Economic Review 7 (3), 249–264.

Wolter, S.C. and P. Ryan (2011), Apprenticeship, Handbook of the Economics of Education, Elsevier.

Wooldridge, J.M. (2014), Quasi-maximum likelihood estimation and testing for nonlinear models with endogenous explanatory variables, Journal of Econometrics 182 (1), 226–234.

Wooldridge, J.M. (2007), What's New in Econometrics? Lecture 6: Control functions and related methods, NBER Summer Institute.