The Influence of Secondment on Labour Productivity in Germany

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II

Preface and Acknowledgements

This thesis is submitted to TU Delft in partial fulfilment of the requirements for the degree of Master of Science in Management of Technology. The motivation to write about this topic mainly originates from the political discourse in Germany and from work experience in the German industry – I was curious whether secondment was conducive to the country's progress or not. During numerous meetings with Dr. Servaas Storm in November and December, we developed these raw ideas into a workable master thesis project.

I want to thank my family and, above all, my parents for longstanding support in my academic efforts. Many thanks also to my friends for well-needed distraction and to my flatmates for the continuous coffee supply and the nice chats on our balcony. Thanks to the team of "project room 4"– the multitude of discussions made this endeavour much more enjoyable and gave it less of a lone-fighter character. I also want to thank my graduation committee for all the feedback which has improved this thesis immensely. Special thanks go to Dr. Servaas Storm for the enjoyable and inspirational collaboration which made the last six month a very interesting but also pleasant and formative experience.

The most cursory reader may find the bare essentials of this thesis in the executive abstract. The hurried reader may also want to read the short summaries at the end of each chapter covering the main findings. To those who are patient, I recommend reading the thesis page by page.

IV

Executive Summary

Since the 1980s, many countries have deregulated their labour markets, whereas only a few have engaged in stricter regulation (OECD, 2004). The deregulations primarily liberalised temporary work arrangements and it was more directed at temporary workers for the lesser resistance they offered as opposed to the collective grievance offered by the permanent workforce. Following standard macro-theory, market regulation is a cost to firms, even if it may have benefits related to workers' motivation, effort and work intensity (Storm & Naastepad, 2012).

Secondment refers to engaging workers of a different (or outside) company to undertake tasks at the 'host' company instead of relying on standard forms of employment contracts that may be written between an employer and an employee – be it for temporary workload requirements or for strategical considerations. Secondment has risen in Germany in the last two decades and secondment remains a perennial issue across the political spectrum (Bundesagentur für Arbeit, 2018a). Wolfgang Streeck has once described the German economy as being characterized by beneficial constraints – a notion claiming that good economic performance is only possible on the foundation of a "well-integrated society" (Streeck, 1997, p. 199). In this context, this project investigates the following question:

What is the influence of secondment intensity on labour productivity growth in Germany?

Here, secondment intensity refers to the number of secondment workers relative to the total workforce. Descriptive analysis of secondment shows that secondment workers are overly exposed to business cycle swings. On average, secondment workers earn not even 60% of the median salary in Germany. Many new secondment workers were previously immediately unemployed and novices

The research question was investigated based on secondary data on four aggregation levels: Firstly, based on a time series for entire Germany (1991-2016); secondly, relying on a short panel consisting of nine main industry categories (2013-2015); thirdly, based on firm-level data provided by the German Federal employment agency which was aggregated according to 43 industries (2010-2015) and lastly, based on the firm-level data itself.

Coefficients for secondment intensity on national-level and firm-level are statistically highly significant and confirm the hypothesis that higher secondment intensities are associated with lower labour productivity growth. Regarding the magnitude of the coefficient, however, there are some discrepancies: A fixed-effects regression applied to firm-level data estimates the coefficient at roughly -1.1 whereas ordinary-least squares regression on national level arrives at roughly -2.0.

Relying on industry data consisting of nine industries, the results were not statistically different from zero. Based on firm-level data aggregated along 43 industry categories, statistically weak evidence of an even more negative association between rising secondment intensities and labour productivity was found (coefficient: -2.9; statistically significant only at the ten percent level based on ordinary-least-squares).

No lags are included between independent and dependent variable – therefore, the findings are subjected to the limitation that no causality can be inferred from the analysis. Nevertheless, the condition that there is correlation between the dependent and independent variable is met.

The definitions of productivity growth (based on value added per hour worked on national-level and turnover per person engaged on firm-level) indicate that the negative coefficient for secondment intensity indeed is negative. Falling hourly productivity was not compensated by higher growth of hours worked per person, as shown by negative coefficients based on both definitions. Even if secondment might increase participation rates of under-represented groups – an economy should strive for both higher participation rates and higher productivity.

The total number of secondment workers had a share of 2.3 percent in the total workforce in 2016 – how could a comparably small phenomenon have a significant influence on overall labour productivity growth? Higher secondment intensities might proxy a general shift away from high-trust and long-lasting labour relations – which were standard in Germany for many years and which are found to be conducive to labour productivity growth – and towards more changeable or even precarious labour relations.

Contents

List of Figures

XII

List of Tables

List of Abbreviations

CME	Coordinated Market Economies
FDZ	Research Data Centre
FE	Fixed-effects
FEA	Federal Employment Agency
GDP	Gross Domestic Product
H0	Null hypothesis
Ha	Alternative hypothesis
IAB	German Institute for Employment Research
ISIC rev 4	International Standard Industrial Classification of All Economic Activities, fourth revision
KldB	German occupational classification system
LME	Liberal Market Economies
NAIRU	Non-accelerating inflation rate of unemployment
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary-least-squares regression
POLS	Pooled ordinary-least-squares regression
RE	Random-effects
STAN	Structural Analysis Database

1. Introduction

Secondment, which refers to engaging workers of a different company to undertake tasks at the host company, has experienced a strong rise in Germany over roughly the last two decades (Bundesagentur für Arbeit, 2018a). The press takes different views on secondment, but, after all, it is subjected to controversial discussions, as illustrated by the following newspaper headlines:

"Is secondment really that bad?" (Zacharakis, 2016)

"The truth about Secondment" (FOCUS Online, 2011)

"Secondment law: Working on a trial for four years" (Dribbusch, 2017)

The quotes above are just some examples of more or less recent headlines from major German newspapers, all critically dealing with secondment. These articles are written from quite different standpoints: one describes the high numbers of secondment workers as clouding the view on Germany's (apart from that) impressive performance; others state that it enables the long-time unemployed to re-enter the labour market and again others find fault with the duality of social protection and employment conditions secondment creates as compared to regular employment.

The development of secondment over the past two decades is shown is the graph below:
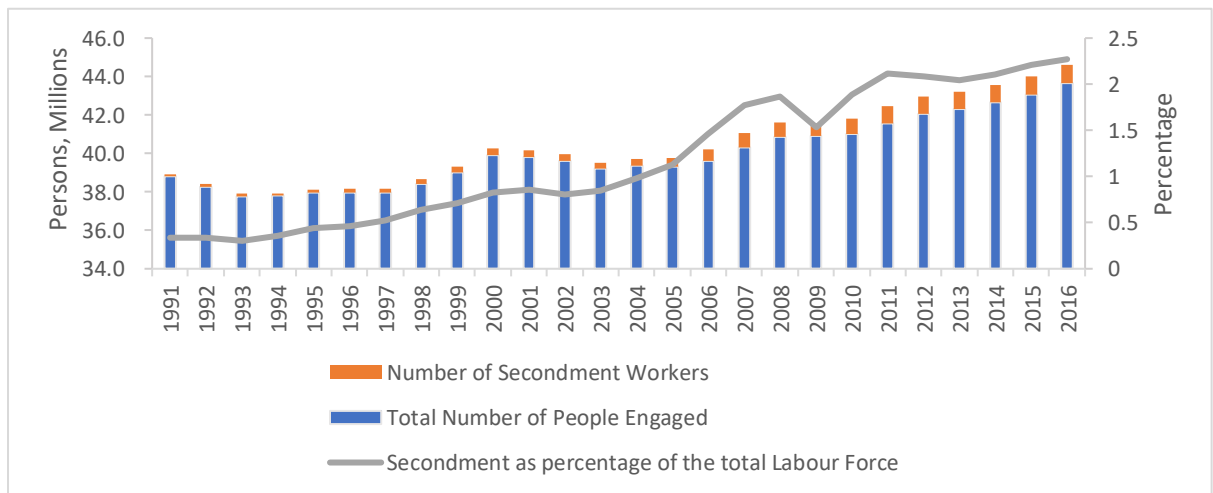
Figure 1: Number of secondment workers in Germany (Bundesagentur für Arbeit, 2015, 2017; OECD.stat, 2018)

The graph depicts a steady increase of secondment over the years, only dampened by the financial crisis. The public debate is centred around the social, if not humanitarian, aspects of secondment (Does it lead to sustainable employment? Should people who do the same job be allowed to work

for different conditions?), but this thesis will look at the microeconomic and macroeconomic implication of secondment.

1.1. Problem Definition

Since the 1980s, many countries have deregulated their labour markets, whereas only few have embraced stricter regulation (OECD, 2004). The deregulations primarily liberalised temporary work arrangements and it was more directed at flexible work arrangements for the lesser resistance offered by them as opposed to the impedance offered by the entire workforce. Following standard macro-theory, market regulation is a cost to firms, even if it may have benefits related to workers' motivation, effort and work intensity (Storm & Naastepad, 2012). Standard macro-economic theory assumes that labour market regulation increases workers' bargaining power, thereby increases wage growth and ultimately leads to inflation, which the central banks responds to by increasing the interest rate. Labour market deregulation is still being discussed as means to help the economy to its feet, and Emmanuel Macron has put the topic on top of his agenda just recently (BBC, 2017).

"Productivity is quite literally a matter of survival for businesses", and that is the case regardless of country, time or industry (Syverson, 2011, p. 327). Hence, what role does secondment play against the background of the for companies vitally important productivity? With respect to this trend towards liberalization of the labour market, the phenomenon and its effect on productivity should be well understood before endorsing it. Another facet to this question is that firms strive to compile their productive capacities in the most efficient way, and hence might need some guidance in whether to take full advantage of the liberalizations within the labour market. But on the other hand, it is also relevant to science and policy making as to assure an efficient institutional framework for firms to operate in.

Practical Relevance

Contract workers are employed by companies such as Brunel, but effectively, they work for clients and mostly on site. Ragnitz (2008) finds that a major reason for secondment is firm flexibility, more specifically circumventing security of tenure, as opposed to reducing costs. Therefore, exploring the effect of secondment on labour productivity and supervision will be a valuable information for firms to manage their human resources most efficiently. Hence, on one hand, firms own the problem of how to compose their labour force in the most efficient way. On the other hand, this issue is of national importance as the policy framework should benefit ideally both employees and firms in such a way that it leads to the most effective outcome.

2

So far, little research has been conducted on the influence of employment protection legislation (with secondment being a part of it) on (labour) productivity (Bassanini, Nunziata, & Venn, 2009). Hence, this research project will contribute towards a better understanding of secondment as a part of employment protection legislation. Labour productivity, as the most complete output measure, could be seen as some sort of proxy for the socio-economic implications of secondment. From a macro-economic perspective and within the realm of non-accelerating inflation rate of unemployment (NAIRU) economics, labour market deregulation is still the panacea to lower unemployment and boost the economy. Within the scope of that economic model, it is even more important to fully understand the effect of labour market deregulation on labour productivity. Kleinknecht has done research on flexibility in general and its influence on innovation and rigidities resulting from it, but to the best of my knowledge, the effects of secondment as an isolated phenomenon have not been investigated yet.

1.2. Theoretical Background

It is a robust finding that higher productivity producers are more prone to survival than their lower productivity rivals (Syverson, 2011). Also, large productivity differences across producers are observed, in other words, "some producers seem to have figured out their business (or at least are on their way), while others are woefully lacking" (p. 327). But apart from the general role of productivity, there is not much consensus on what affects (higher) productivity.

According to Bassanini et al. (2009), there is still a lot of uncertainty regarding the influence of employment protection legislation on technical efficiency. To date, most of the literature covers dismissal protection, but little attention is paid to temporary contracts or contract work. The literature looks at labour productivity and employment protection legislation mostly based on aggregate data and the debate, some of which is presented hereinafter, remains multilateral. DeFreitas and Marshall (1998) conclude from a sample of Latin American countries that strict employment protection legislation impact on labour productivity growth is negative. Nickell and Layard (1999), as well as Koeniger (2005), oppose that finding by reporting a slightly positive relation between the growth of total factor productivity (productivity growth which cannot be attributed to either labour or capital input), severity of employment protection legislation and RD intensity. Nickel and Layard reach that conclusion based on OECD data for several countries in the 1980s and 1990s and Koeniger bases his findings also on OECD data covering the period 1972-1998.

Autor, Kerr and Kugler (2007) use U.S. data to estimate that dismissal protections hamper the flow of employment and firm entry. Based on firm-level data, they find evidence of capital deepening and a decline in total factor productivity because of the introduction of dismissal protection. These findings are confirmed by Cingano et al. (2008), studying Italian companies after a reform (implemented in 1990) that raised dismissal costs in small firms with less than 15 employees. Micco and Pagés (2006) also report weak evidence of a relation between employment protection legislation and productivity. They apply a difference-in-difference estimator on cross-sectional industry level data which covers both OECD and non-OECD countries and arrive at a negative relation between dismissal costs and labour productivity, although this does not seem very robust as the findings are dependent on Nigeria's presence in the sample and without controlling for previous employment protection levels.

There seems to be some evidence that countries with higher levels of employment protection legislation are slower in reaching long-run productivity levels (Burgess, Knetter, & Michelacci, 2000). Caballero et al. (2010) analyse a sample of 60 countries and confirm this finding and add that this effect seems to be stronger in countries with strong rule of law. Using firm-level data from 46 developing countries, Pierre and Scarpetta (2006) report evidence that severe employment protection legislation effects most negatively innovative firms.

There is evidence pointing in the direction of a positive as well as a negative relation between labour market deregulation and productivity. Most importantly, the background against which the reforms are implemented seems to be relevant. In some examples, small firms are affected, in others, it is innovative firms, hence attention should be devoted to the institutional framework against which the increase in the number of secondment workers takes place.

1.3. Research Approach

This project shares the premise presented by Frey in his (1999) book on economics and human behaviour. Economics is seen as "part of those sciences which deal with actual problems of the society by providing insights, improving our understanding and suggesting solutions" (p. vii).

Following Frey's perception of economics, this project will start out by analysing the state of research regarding secondment or, in broader terms, flexible labour relations. Then, some attention is devoted to the social aspects of secondment. The institutional framework against which economic activities take place is described and put into perspective by comparing it to other systems. Here, the approach is broader than one might expect at first glance, but due to institutional complementarities, secondment is not a pure labour market phenomenon as it reaches further into

4

the social welfare system. The German economy's main characteristics will be outlined, but secondment will also be presented as a labour market phenomenon. In a second step, we will move on to Frey's "improving our understanding" (p.vii) by analysing the influence of secondment from a productivity-standpoint. Here, several aggregation levels will play a role, starting off with national data, then moving on to an industry-level panel and, finally, relying on firm level data by the Federal Employment Agency. Methodology-wise, this project relies on regression analysis to quantify the influence of secondment on labour productivity.

1.4. Research Objective

The regulatory framework for secondment workers has been reformed during the last two decades and secondment has seen a strong rise. In this line, it seems pressing for companies to know whether the intensified use of secondment influences labour productivity (negatively), and if so to what extent. Productivity as such is concerned with the relation between inputs and outputs and theoretically it would be possible to relate the influence of secondment to any form of productivity, be it energy productivity, capital productivity or material productivity. Productivity will refer to labour productivity as the latter is the most comprehensive output indicator (as it also includes capital productivity and total factor productivity) and secondment will be regarded as the independent variable.

Generally, it seems reasonable to relate the number of secondment workers to firm size as one wouldn't expect that absolute levels of secondment are meaningful in this context. Therefore, secondment intensity, which is defined as the number of contract workers relative to the total number of employees, will be used. It is desirable to look at labour productivity growth instead of productivity as this is how the concept is operationalized in the NAIRU economic model (Storm & Naastepad, 2012).

The above-mentioned phenomenon will be explored based on the following research objective:

The objective of this project is to deliver a validated model regarding the influence of secondment intensity on labour productivity by means of secondary data analysis and case studies. A validated model, in this context, refers to a model in which the influence of secondment on labour productivity is quantifiable.

1.5. Research Questions

The underlying research question of this thesis is:

What is the influence of secondment intensity on labour productivity growth?

The main research question will be answered based on the following questions. Question 1 deals with the theory behind the central concepts of the main research question, secondment and labour productivity. Furthermore, differences between the Anglo-Saxon and the Continental-European model are explored. The theoretical background has shown that the institutional framework, against which the phenomenon is observed, is of high importance. The German economy is found to be a prime example of "Coordinated Market Economies" in the literature on institutional frameworks (Hall & Soskice, 2001), and hence, it should be taken into account in achieving the research objective.

1) What research is available to explain the influence of secondment intensity on labour productivity growth?
   a. How does economic theory approach flexible labour relations in general and specifically secondment?
   b. How does economic theory approach labour productivity (growth)?
   c. How different are the Anglo-Saxon and the European-Continental model in approaching question 1a and 1b?

Various streams of economic literature differ among others in the "degree of detail" which they take as a basis for their (empirical) research. Studies on several aggregation levels can be found, for instance on country-, industry- or firm-level. Thus:

2) Does the influence of secondment intensity on labour productivity growth differ at various levels of aggregation?

Kleinknecht et al. (2014) finds that the influence of flexible labour relations on innovation depends on the type of innovation, distinguishing between routinized innovation models and "Silicon Valley-type garage businesses" (p.1216). In a similar manner, it could be the case that the influence of secondment on labour productivity is moderated by variables such as industry, type of innovation, company age, company culture, labour union affiliation et cetera. Flexible or rigid labour markets respectively are associated with different characteristics with respect to the management of a firm, with low labour protection showing higher levels of supervision (Storm & Naastepad, 2012). Reversing that logic, rising degrees of supervision might indicate difficulties concerning the incentive structure as well as distrust from management towards employees (Storm & Naastepad, 2009). The next question touches upon that:

3) Which other variables play a role in the relation between secondment intensity and labour productivity growth?

The following two questions relate to whether the influence of secondment on labour productivity manifests differently at particular levels of tenure and secondment intensity.

Relying on secondment workers as opposed to permanently employed people adds an additional intermediary in the form of a personnel service provider. From a legal perspective, the latter employs the worker who is then contracted by a different firm. But what if the contracted worker stays for longer periods of time at one company, say equally long as a permanent employee stays on average? Then the question arises, whether there is, technically, any difference between permanent and contracted workers at long periods of engagement. Hence, the relation between secondment and labour productivity presumably varies at different levels of tenure, which refers to the amount of time a worker stays at one company or self-employed, see Storm and Naastepad (2012). Paracelsus is famous for his quote that "All things are poison and nothing is without poison; only the dose makes a thing not a poison" and from that one is tempted to assume that the intensity of secondment wouldn't be without influence (1965, p. 510). These thoughts lead to question 4 and its sub questions:

4) How do the characteristics of secondment intensity manifest in the relation between secondment and labour productivity growth?
   a. Does average tenure of a contract worker relate to that of permanently employed workforce?
   b. Does the influence of secondment intensity on labour productivity growth vary at different levels of tenure?
   c. Does the influence of secondment intensity on labour productivity growth manifest differently at certain levels of secondment intensity?

1.5.1. Hypotheses

Based on the research questions, hypotheses and the corresponding null-hypotheses are developed. They are not created individually for certain parts of this thesis and hence might not necessarily fit all of it. In other words, some might be testable only on micro-data and not based on macro-data.

The first hypothesis relates to the main research question:

H1: Higher levels of secondment intensity are associated with lower levels of labour productivity growth.

H1.0: Higher levels of secondment intensity have no influence on labour productivity growth.

The second research question asks whether the influence of secondment intensity on labour productivity manifests differently when analysed at different aggregation.

H2.1 The influence of secondment intensity on labour productivity growth manifests differently when analysed at different levels of aggregation.

H2.1.0: Analysing the influence of secondment intensity on labour productivity growth on different levels of aggregation leads to no significant difference in the results.

The third group of research questions revolves around variables which explain some of the variance in the relation between secondment intensity and labour productivity growth. Accordingly:

H3.1: In the relation between secondment intensity and labour productivity growth, higher supervision intensities or thicker management layers explain some of the variation.

H3.1.0: In the relation between secondment intensity and labour productivity growth, higher supervision intensities or thicker management layers explain none of the variation.

The fourth group of questions revolves around the characteristics of secondment with respect to the main research question.

H4.1: The average secondment worker's tenure is shorter than compared to the overall workforce's average tenure.

H4.1.0: There is no significant difference between the average secondment worker's tenure as compared to the overall workforce's average tenure.

H4.2: Certain levels of secondment intensity have an influence on the relation between secondment and labour productivity growth. (For example, the relation could be inverse parabolic: Very low levels are not optimal, and so are very high levels, with an optimum in between.)

H4.2.0: Certain levels of secondment intensity play no role in the relation between labour productivity growth and secondment intensity.

2. Theoretical Chapter

This chapter analyses economic theories and research regarding labour productivity and labour market flexibility. Economists have sought deeper understanding by dismantling economic growth which has – among other things – lead to the famous concept of total factor productivity (TFP). This and other attempts to couch the economy in formulas with respect to (labour) productivity (growth) are presented in section 2.1. The next section proceeds with productivity theory tailored to the firm-level as. In section 2.3, quantitative and theoretical research regarding labour market regulation and its influence on labour productivity are analysed. The chapter closes with a section on supervision respectively thickness of management layers and short conclusion with implications for this study.

2.1. Growth Accounting, the Macro-Economic Paradigm and Labour Productivity

Macroeconomists have long striven to dismantle aggregate productivity growth – which is the origin of a large part of the inter-country per capita income differences – to improve the understanding of productivity disparities (Syverson, 2011). Solow has pioneered the splitting up of productivity into labour productivity, capital productivity and a residual. In the conceptualization of the wage-bargaining for central bank action and monetary policy purposes, labour productivity (growth) has a quite prominent position. The explanation of this topic and the dismantling of labour productivity are the purpose of the following two subsections.

2.1.1. Fundamentals of Labour Productivity: Total Factor Productivity

Output growth (for instance turnover or GDP at an aggregate level) can be disintegrated into the following residuals (Bassanini et al., 2009): changes in hours worked, which equals the total contribution employment and demographics, and the output per hour worked, which is nominated labour productivity. The latter can be further disintegrated into shifts in quality and composition of labour, capital accumulation and an "unexplained residual", which Solow arrived at by reconsidering the general production function:

$$X = f(L, K) \hspace{3cm} \text{Equation 1}$$

with X being the output, K being capital input and L labour input, and based on the assumption of constant returns to scale and dividing by L, Solow (1957) arrived at the following new production function ($\lambda = X/L$; $k = K/L$;):

$$\lambda = g(k); where\ g(k) = f(k, 1) \hspace{3cm} \text{Equation 2}$$

Thereby, he showed that output per unit of labour is dependent on capital per unit of labour, permitting us to focus on the relationship capital accumulation – output growth. Expressed in growth rates (^):

$$\hat{\lambda} = \hat{\lambda}_k + \hat{a} \hspace{3cm} \text{Equation 3}$$

with $\hat{\lambda}_k$ being changes in labour productivity growth due to changes in capital intensity and $\hat{a}$ being all changes which cannot be explained in input growth and hence must be attributed to changes in the production function. Solow called $\hat{a}$ the rate of change of total factor productivity (TFP), which is also known as multi-factor productivity.

Criticism of Total Factor Productivity

In his elaboration on TFP, Storm begins with defining the notion of "potential output x_p" in line with the notion of TFP growth (2017, p. 174). L_p is defined as the potential labour supply within the meaning of the maximum number of hours worked and the potential labour productivity λ_p is defined as the ratio of the potential output x_p divided by the potential labour supply L_p. Hence the following equation is obtained:

$$x_p = L_p * \lambda_p \hspace{3cm} \text{Equation 4}$$

Logarithmic transformation and differentiation yield the following equation:

$$\hat{x}_p = \hat{L}_p + \hat{\lambda}_p \hspace{3cm} \text{Equation 5}$$

The equation shows that potential output growth depends on the growth of the potential hours worked and the growth of hourly labour productivity growth. Storm assumes that the growth of potential labour supply is zero to focus on labour productivity growth per hour worked. He explains $\hat{\lambda}_p$ by means of the Cobb-Douglas production function presuming constant returns to scale:

$$x = aL^{\phi}K^{1-\phi} \hspace{3cm} \text{Equation 6}$$

with x denoting output and L denoting the number of hours worked (the actual number of hours worked and not the potential number). K denotes the value of the capital stock, a is a factor of scale and "the exponent ϕ is typically assumed to correspond to the observed labour share in income" (Storm, 2017, p. 174). Jones, as cited in Storm (2017), obtained the following equation by dividing by x^{ϕ} and solving for labour productivity:

$$\lambda = a^{\frac{1}{\phi}} k^{\frac{-(1-\phi)}{\phi}}$$

Equation 7

Here, λ denotes actual labour productivity and k is the capital productivity which is obtained by dividing x through K. By means of differentiation, the equation is expressed in growth rates:

$$\hat{\lambda} = \frac{1}{\phi}\hat{a} - \frac{1-\phi}{\phi}\hat{k}$$

Equation 8

$\hat{a}$ represents TFP growth. From this equation, it can be concluded that labour productivity growth depends on capital productivity growth and TFP growth. But the neoclassical growth model assumes that the capital-output ratio is constant[1], which leads to the following equation:

$$\hat{\lambda} = \frac{1}{\phi}\hat{a}$$

Equation 9

Substituting Equation 9 into Equation 5, one must conclude that "potential output growth depends on TFP growth, or $\hat{x} = (1/\phi)\hat{a}$ (while assuming $\hat{L}_p = 0$)" (Storm, 2017, p. 174). Differentiating Equation 7 after logarithmic transformation yields the same equation as Solow obtained in Equation 3, with the additional information on constant returns to scale:

$$\hat{x} = \hat{a} + \phi\hat{L} + (1-\phi)\hat{K}$$

Equation 10

Solving for $\hat{a}$, we obtain the following expression:

$$\hat{a} = \hat{x} - \phi\hat{L} - (1-\phi)\hat{K}$$

Equation 11

There are two ways in which TFP growth can be measured based on observable data. Rada and Taylor (2006) tried to directly measure TFP growth based on the assumptions that $\hat{\lambda} = \hat{x} - \hat{L}$ and $\hat{k} = \hat{x} - \hat{K}$. They arrive at the following equation:

$$\hat{a} = \phi\hat{\lambda} + (1-\phi)\hat{k}$$

Equation 12

This equation depicts $\hat{a}$ as a weighted average of labour productivity growth and capital productivity growth (Storm, 2017). Based on Kaldor's stylized fact which postulates that the capital-output ratio

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[1] The Solow model assumes a closed economy – there is no government sector and no international trade (Whelan, 2015). Hence, output stems from either consumption or investment, with savings equalling investment. Changes in capital stock have two causes, negative changes are due to depreciation, positive changes are due to savings. Savings are assumed to have a constant share in consumers income. Since investment equals savings, investment also has a constant share in output. Hence, the development of the capital stock depends on the ratio investment-depreciation. If the ratio capital-output equals saving-depreciation, then the capital stock will stay constant.

has no long-run trend, it can be concluded that $\hat{k} = 0$ (Kaldor, 1957). Hence, Equation 12 can be rewritten as $\hat{a} = \phi\hat{\lambda}$. This implies that "the causality [...] runs from labor productivity growth to TFP growth and not vice versa as in the long run, and it follows not just that $\hat{x}_p = \hat{\lambda}_p = (1/\phi)\hat{a} = \hat{\lambda}$ but also that TFP growth adds no additional analytical insight and can be dropped from the economist's growth-accounting tool kit without consequence" (Storm, 2017, p. 175). Servaas Storm also presents a second approach to this proof which is not presented here as the first one makes the point quite clearly.

2.1.2. NAIRU Economics and Labour Productivity

Flexible labour markets are most often a matter of concern in association with macro-economic thinking following the NAIRU-model. Central to this model is the idea of identifying a sustainable rate of capacity utilization, one at which inflation is reasonably low (OECD, 2000). Within this model, the idea of "sustainable resource utilization" (p. 1) has been operationalized, as the non-accelerating inflation rate of unemployment (NAIRU), the latter lending its name to the model. Following the logic, inflation would rise whenever actual unemployment falls below the NAIRU, the opposite would happen if it exceeded that rate.

The standard NAIRU model comprises a wage setting curve and a price setting curve (Storm & Naastepad, 2012). The former is inspired by the wage bargaining process over money wage growth $\hat{W}$, which is inferred to depend on the rate of actual unemployment u, the rate of labour productivity growth $\hat{\lambda}$ (exogenous), expected future inflation $\hat{p}_e$, and all kinds of institutional and regulatory arrangements regarding employment protection legislation z, also denoted as labour market rigidities (A. Kleinknecht et al., 2014).

$$\hat{W} = \alpha_0 - \alpha_1 u_a + \alpha_2 \hat{\lambda} + \alpha_3 z + \hat{p}_e \qquad \text{Equation 13}$$

From this equation follows that lower actual unemployment will strengthen the bargaining power of workers and wage claims will be higher. Furthermore, higher labour productivity growth will be incorporated in workers' wage claims, so that higher labour productivity growth gives more room for wage growth. The degree to which labour productivity growth is reflected in the wage bargaining process is expressed by means of the coefficient α_2 which adopts values between zero and one, with the value of one indicating that labour productivity is fully reflected. By definition, higher levels of z represent higher degrees of employment protection legislation, strengthening workers' bargaining position. Higher expected inflation will feed into higher wage claims to compensate for it.

The price setting curve, in consistency with the behaviour of firms based on oligopolistic competition, is thought of as reflecting real wage growth. Prices are assumed to result from a mark-up over labour unit costs. From a constant mark-up rate follows:

$$\widehat{W} - \hat{p} = \hat{\lambda} \qquad\qquad \text{Equation 14}$$

And:

$$\hat{w} = \widehat{W} - \hat{p} = \hat{\lambda} \qquad\qquad \text{Equation 15}$$

Real wage growth is represented by $\hat{w}$ and has to equal labour productivity growth to not be inflationary. Constant profit mark-ups also imply that inflationary pressures from increasing or excessive profit mark-ups are ruled out by assumption. If real inflation equals expected inflation, we arrive at the following equation for the natural rate of unemployment, denoted by u_n, which functions as a benchmark for central bank action:

$$u_n = \frac{\alpha_0 - (1 - \alpha_2)\hat{\lambda} + \alpha_3 z}{\alpha_1} \qquad\qquad \text{Equation 16}$$

This equation shows how the natural rate of unemployment is determined by labour productivity growth $\hat{\lambda}$ and employment regulation legislation z (Storm & Naastepad, 2012). Higher z and lower $\hat{\lambda}$ hence require higher unemployment as a "disciplining device" (p. 6) to temper wage growth claims.

The natural rate of unemployment (or: structural unemployment) affects real people, and hence it is of great interest to policy makers to keep it as low as possible. In achieving that, the control variables labour productivity and employment protection legislation could be proceeded with. But augmenting labour productivity growth through some sort of technology policy has proven difficult, so that "structural reforms" have become the standard remedy (A. Kleinknecht et al., 2014).

The standard remedy had been supported by evidence showing that the USA, as compared to Europe, experienced higher GDP growth during the period 1990-2007. By now, it has been found that higher growth in the US has been fuelled by massive debt growth and asset bubbles, so that the long-run growth rates of countries with rigid or flexible labour markets do not differ too much. Flexible labour, in this case, I define as employers' freedom from constraints in human resource management such as dismissal protection.

Referring to the research objective (section 1.4), the last paragraphs make the point that labour productivity, as opposed to other forms of productivity, is of central importance regarding the current macro-economic policy paradigm. If deregulation of the labour market had a negative

influence on labour productivity, then the aspired reduction of the natural rate of unemployment would manifest in one of the three following ways: it would not occur at all, it would occur in weakened form, or the decrease in labour productivity would overcompensate the effect of labour market deregulation and raise the natural rate of unemployment.

2.2. Productivity at the firm-level

Theoretically, productivity is a rather candid concept, but when it is researched at the firm-level, some more questions arise.

2.2.1. Measurement

Syverson (2011) elaborates on two groups of problems regarding measurement of firm-level productivity. Given that a firm produces more than one output, Syverson asks whether several outputs should be condensed into just one output. If the answer is positive, one still must agree upon a method to do so. Also, he addresses that output quantities are often not available, so that revenues, inflated to a common base year, serve as a proxy. This, however, is problematic when different qualities of products are not mirrored in prices due to superior market power of some companies. If that is the case, then revenue gives more insight into the market characteristics than the productivity of a firm.

The second group of problems centres around measurement of inputs (Syverson, 2011). Labour can be operationalized as "number of employees, employee hours or some quality adjusted measures" (p.331), for example wage bills. Capital inputs can be conceived based on the company's capital stock's book value, as Syverson explains, but again, that poses several questions. Firstly, there is uncertainty of how good capital stock represents capital services. If the book value is taken as the capital stock, then based on which interest rate should it be deflated? The capital stock could also be approximated based on observed investments and perpetual inventory method, but, again, how to depreciate? Furthermore, one must decide on how to handle intermediate inputs. Productivity could be determined either based on gross output including all intermediary inputs. On the other hand, intermediate inputs could be simply subtracted from output to isolate a value-added production function from gross productivity. And on top of all these considerations, any unmeasured input variations will be reflected in the productivity measure. To fulfil the requirement of robustness, several operationalizations could be used to determine whether the results depend upon these.

2.2.2. Which Factors Impact Productivity?

This section discusses adjustment levers which can be used to influence productivity at the firm level. It outlines, partly based on Syverson's (2011) structure, the influence of managerial talent, higher quality inputs (labour and capital), information technology and RD, tacit knowledge, product innovation, firm structure and other control variables. Control variables are not of the researcher's primary interest, still they are included as they are expected to affect the dependent variable (Boslaugh, 2008). Accordingly, this section also treats control variables that have been used in other quantitative research projects related to labour productivity.

Managerial Talent

Long ago, Walker wrote in his (1887) paper on the source of business profits, that the "excess of produce" (p. 275) comes from achieving an objective by the most the efficient way, from saving waste, from meeting market demands to the point, and from adequate timing and payment of sales. Walker attributes differences in profits to administrative and managerial personnel's ability to meet business needs. According to Syverson (2011), it is only recently that the availability of micro-data has allowed for more empirically driven research regarding management practices, for the abstract nature of managerial inputs not alleviating its analysis. A rather recent study on the influence of management practices on productivity is based on a survey among 700 plant managers with regard to workaday management practices rather than strategic-managerial decisions in medium-sized firms in the US, UK, France and Germany (Bloom & Van Reenen, 2008). Questions covered the areas operations, monitoring, incentives and goals and were based on open questions, with an inter-interviewer correlation of 0.73. The researchers' perception of best practice matched dominant management consulting recommendations, raising the question whether the answers were corresponding to actual management behaviour or just "buzz words", but still, their definition of best practice is statistically significantly correlated with total factor productivity. The following two factors explain most of the country-level differences in management scores: Stronger competition (1) is positively correlated with best-practice management methods. Family-ownership in the second generation, with the oldest son of the firm's founder being his successor (2), is associated with lower best-management practice scores. Interestingly, family-ownership in isolation scores well on managerial best-practice. An even more recent study by same authors mostly backs these results (Nicholas Bloom & Van Reenen, 2010).

Business cycles and technological development

De Nederlandsche Bank (DNB) published an article, headlining that making employment relations more flexible goes along with a decreasing share of employment income (DNB Public, 2018b), based on an analysis of eight Dutch industries for the period 1996-2015. Weakened wage bargaining positions of flexible workers are named as a possible explanation of the finding. In their regression model, DNB controlled for business activity, technological progress and import intensity (DNB Public, 2018a). Business activity was captured as the difference between the growth rate of gross value added and the trend growth rate of gross value added, expressed as percentage by dividing by the growth rate of gross value added's trend. Technological progress was expressed as relative cost of investment in terms of private consumption's deflator. Globalisation was depicted as imported goods and services as a percentage of total intermediate inputs. Vergeer and Kleinknecht (2017) include GDP growth as the Kaldoor-Verdoorn theory postulates a positive influence of GDP growth on labour productivity growth. Also, a one-year lag of GDP growth is included.

Inter- and intra-group specific productivity effects

With respect to intra-country productivity effects, the possibility of granger causality has to be taken into account to avoid wrongly ascribing productivity gains to one of the independent variables (Jansen, 2004). The author makes the point that countries which currently experience productivity growth might be more prone to future productivity growth due to persistency of the latter. In this line, Vergeer and Kleinknecht, in their 2017 study on the relationship between wage growth and productivity growth based on a panel of 19 OECD countries covering the period 1960-2004, captured those effects by introducing one, two, three, and four till nine lags of labour productivity to account for what they have named "state dependency" (Vergeer & Kleinknecht, 2017, p. 11). In addition, they created dummies for countries and years to correct for unrecognized country- and time-dependent effects. Inter-country differences in labour productivity were conceived by means of a lagged variable for the difference between the level of labour productivity of any given country and the highest labour productivity in the sample – rooted in the premise that a greater deviation from the best practice country leaves more room for "imitation and catching up" (p.11).

Control Variables derived from the production function

Following the production function as presented in subsection 2.1.1, productivity depends on the inputs of capital and labour. Capital should be included in the regression model so as not to wrongly ascribe productivity increases solely to labour which, in reality, are based on higher capital inputs. Weisskopf, in his (1987) study on the effect of unemployment on labour productivity in the biggest

seven OECD countries (plus Sweden), frames this point more sharply, stating that in regressions with labour productivity in terms of real output per hour as the dependent variable, "one must control for the effects of fluctuations in the rate of utilization of productive capacity on the proportion of labour hours worked that are effectively utilized in production" (p. 138). The rationale behind that argument is the "quasi-fixed character" (p. 138) of a compelling part of the labour force, as labour hours, in response to business cycles, do not fluctuate as much as output does for that workers are often kept during supposedly temporary downswings. Another study shows a slightly different take on this phenomenon by including a variable for labour productivity's sensitivity to swings in capital utilisation in response to business activity (Vergeer & Kleinknecht, 2017). Given a rise in business activity, they suspect intensified use of hoarded labour to coincide with growing salaries, so that the increase in labour productivity might be wrongly attributed to wage growth. Therefore, several lagged capital/output ratios were included.

workIn their (1998) paper on labour productivity growth rates in Latin American and Asian countries, DeFreitas and Marshall factor in capital as capital intensity, which refers to the capital stock relative to the number of workers. Due to data unavailability, they fall back on an equipment share in GDP per worker as a proxy. They also state that capital intensity accounts for shifts from low-productivity to higher or high-productivity activities.

Human Resources

Beyond physical resources, differences in human resources might explain some of the productivity differences (DeFreitas & Marshall, 1998). Not only might a higher educated or more skilled workforce increase the capacity to develop ideas and products, it might also augment the capability to incorporate and realize foreign ideas, technologies, trends and similar. Moreover, a higher educated and better skilled workforce increases the return on capital and hence promotes investment in capital. DeFreitas and Marshall rely on a variable with a ten-year lag on changes in secondary education enrolment as a proxy for education and skill. Investigating the effects of unemployment on labour productivity in the biggest seven OECD countries plus Sweden, Weisskopf (1987) finds a strongly positive effect of unemployment on labour productivity only in the US, a less pronounced effect in the other countries, and a negative effect in Sweden and Germany. He concludes that the "strength of unemployment effects on productivity growth will vary negatively with the degree to which a country's socioeconomic environment is characterized by cooperative capital-labour relations and worker security" (p.127). DeFreitas and Marshall, therefore, also include unemployment as a control variable with some adjustments as they do not study OECD countries.

2.3. Flexibility versus Rigidity

In his influential contribution to the book "Contemporary Capitalism: The Embeddedness of Institutions", Streeck argues that social constraints may be economically beneficial (Streeck, 1997). More specifically, he suggests that "[…] socially institutionalized constraints on the rational voluntarism of interest-maximizing behaviour may be economically beneficial […]" (p. 197). This is to counter mainstream economic thinking, where market interventions are only deemed legitimate if they are directed at ensuring the continued viability of what Streeck calls "rational voluntarism" (p. 197). But the notion of "beneficial constraints" is also differentiated from more mainstream-conform versions of market intervention: Government intervention in the form of industry policies or subsidies may be expedient; nevertheless, industry polices most often only serve existing preference of rational and market-oriented actors. Streeck retorts that industry policy remain within the voluntary and that constraining actors' preferences may be more conducive to economic performance. Also, the notion stands apart from the paradigm that societies have the right to intervene in markets to adjust outcomes. Efficiency, to a high degree, stems from the enforcement of social constraints rather than that an efficient economy exists outside of society, where the society may or may not wish to intervene. Importantly, beneficial constraints refer to more than necessary and legitimate measures to prevent and adjust for market failures which rational market participants also do not desire, but which they are unable to foreclose. Social constrains increase performance not only by catering to the preference of actors but also by altering actors' preferences.

The bottom line of this approach is that good economic performance is impossible without appropriate embeddedness in a "well-integrated society" (Streeck, 1997, p. 199). The other way around, a society's existence is limited to the extent "that it is capable of imposing normative constraints, or social obligations, on the pursuit of individual interest" (p. 199). This, however, is not to say that all social constrains are beneficial to the economy in any case, but it is to say that some are beneficial.

Voluntary agreements cannot compensate for social constraints, as short-term economic pressures might lead employers to (temporarily) refrain from arrangements that are beneficial in the long-run. Even temporary defections away from agreements and towards the market minimum can have long-lasting and severe implications. Informal promises regarding wages and security of employment may lose confidence if they have been circumvented once. To use the words of Streeck: "A single instance of defection may thus annihilate all of an employer's previous investment in the "X-efficiency" […] derived from high wages, secure employment and worker participation" (p. 201). On the contrary, firms that cannot refrain from paying high wages or participation are likely to

benefit more constantly and to a greater extent from such measures. These firms simply cannot succumb the enticement of temporary deviations which are detrimental for the long-run.

Moreover, Streeck associates social constraints with positive effects on trust (Streeck, 1997). Mutually dependent parties can, given the presence of social constraints, rely on certain behaviour independent of outer circumstances. Likewise, investment behaviour not bound to norms and rationality seems to be advantageous in economic terms and may outdo those who are too concerned with profits, as markets often seem to reward features of a product or service which are not obvious to economic and rational reasoning.

If social constraints and market rationality are two extremes of a sphere, where should secondment be placed? On one side, it surely questions the – previously without any alternative – commitment to regular employment. Especially pertaining to employer-employee relations, the use of secondment workers might stir up mistrust among employees, as regular employment is no longer the only option to compose a labour force and employees might fear to be replaced with secondment workers. In this regard, it makes firms less constraint in their actions. On the other side, it depends on the conditions which apply to employment in secondment agencies. At their employing secondment agency, secondment workers are regular employees with all remedies and rights resulting from that.

Streeck argues from a rather theoretical perspective. In contrast, the next subsection presents some of the empirical studies on labour market flexibility.

2.3.1. Quantitative Research on Labour Market Flexibility and Labour Productivity

From 1980 onwards, various countries have passed laws with the intent to reform their labour markets towards more deregulated ones (Bassanini et al., 2009). Comparatively few have engaged in reforms actually increasing worker protection, and if so, then starting from relatively weak regulations. From an OECD Report follows that most countries focused on temporary contracts and flexible work arrangements in general as opposed to regular contracts as the deregulation of temporary work mostly encounters less resistance (OECD, 2004). The following paragraphs deal with empirical findings on flexible labour relations and labour productivity, mostly based on OECD data.

Bassanini et al (2009) research the effect of dismissal protection on productivity in OECD countries based on a panel covering the years 1982 till 2003. They state that labour productivity growth was responsible for at least 50% of GDP per capita growth within the majority of OECD countries, with many OECD countries even exceeding 50%. Most OECD countries are characterized by an ageing

population, making further productivity growth together with higher participation rates of under-represented groups in the labour market essential for maintaining or even rising living standards. Consequently, productivity growth is of great importance to policy making. However, little does research know with respect to the effect of employment protection legislation (which covers secondment) on (labour) productivity. In case of strict protection against dismissal but more liberal regulation regarding temporary work (and presumably also secondment), temporary work and secondment can be used by firms to bypass dismissal protection. Bassanini et al. claim that "[c]ountries can therefore 'choose' different combinations of the two types of regulation and achieve similar degrees of 'aggregate flexibility' […] "(p. 387). Regarding these sectional employment regulation legislation reforms, Bassanini et al. conclude that they do not seem to be the best way of augmenting labour productivity. No evidence of a significant impact of temporary contracts on productivity is found. Dismissal protection legislation which actually is enforced has a negative impact on productivity growth.

Kleinknecht et al. (2014) studied the influence of flexible labour on innovation. Using data from Statistics Netherlands averaged over the period 1998-2008 in 26 manufacturing and commercial service sectors, they find that temporary contracts are primary used with the intention to scrimp wage costs, while secondment workers come into play when there is a true need for flexibility. Controlling for type of innovation, the study reaches the conclusion that for industries with routinized innovation models, a high share of temporary workers negatively impacts R&D activities. Flexible labour relations seem to fit "Silicon Valley-type garage businesses" (p. 1216), whereas flexible labour relations appear to be harmful in industries characterized by routinized innovation

The influence of labour productivity growth on wage growth has been described frequently (Storm & Naastepad, 2012), and Vergeer & Kleinknecht (2017) point out that there is a causality in either direction, since a one-percentage point reduction is associated with a long run 0.31-0.35 % reduction of labour productivity growth. This finding is based on a panel of 19 OECD countries covering the years 1960-2004 and stresses the importance of wage growth as an incentive for firms to engage in labour-saving and hence productivity enhancing activities.

Regarding the determination of labour productivity, it is important to determine how to account for secondment workers. Technically, secondment workers are on the payroll of another company, the intermediary, so that they could be considered a cost. But then, by definition, secondment would increase labour productivity, as the number of employees does not change, whilst the output augments. Hence it seems appropriate to sum secondment workers and employees when determining labour productivity. As mentioned earlier, Kleinknecht (2014) finds that the use of

secondment reflects a true need for flexibility. This indicates that secondment workers could be used to absorb peaks and lows in workload (possibly instead of labour hoarding) and should hence be taken into account when computing the labour productivity ratio.

Analysing unemployment rates in OECD countries from the 1960s to the 1990s, Vergeer and Kleinknecht (2010) conclude that rather rigid European labour markets experience higher real-wage increases as compared to the more flexible Anglo-Saxon type labour markets. The higher labour productivity growth in Europe may originate in stronger capital-labour substitution. Also, vintage-effects, which describe the phenomenon that "old" capital needs to be replaced timelier as profitability decreases faster due to rising labour costs. Slow wage increases can hence lead to ageing capital stocks. The last subsection turns towards intra-firm labour relations and present literature on the thickness of management layers and productivity.

2.3.2. Employees, Management and Labour Productivity

During the last three or four decades, many organizations realized that labour productivity growth depends heavily on the management-worker relationship (Verburg, Ortt, & Dicke, 2005). The efficiency wage model entails that higher wages increase the employee's dismissal cost, leading to a more prominent threat of dismissal which serves as a substitute for supervision. However, the efficiency-wage theory treats workers motivation as exogenous and is assumed to only depend on the real wage rate. Supervision intensity is defined as the "percentage of the non-agricultural labour force working in administrative and managerial occupations" (Storm & Naastepad, 2012, p. 93). It indicates the degree to which the management trusts employees – higher supervision intensities are associated with less trust (Gordon, 1994, 1996; Buchele and Christiansen, 1999; as cited in Verburg et al., 2005). Storm and Naastepad (2012) report that more deregulated labour markets show higher degrees of supervision and monitoring by management with the heaviest supervision existing in the US and other Anglo-Saxon economies, being four times larger than the smallest burden (Scandinavian countries). Based on data on 19 OECD countries, Storm and Naastepad find that high-trust management-worker relations lead to higher labour productivity growth (in Verburg et al., 2005).

These findings also seem to hold within one country, as investigated by Kleinknecht et al. (2016). In a study on the link between the share of flexible workers and the share of managers among the firm's employees in the Netherlands, they find that sectors probably characterized by lower rates of job turnover, such as healthcare, education, public services and public administration, show less management bureaucracies than private business firms. The finding is attributed to higher levels of trust and loyalty as well as typically pronounced percentages of trade union membership. But higher

supervision intensities seem to have other negative consequences, too: According to the study by Kleinknecht et al. (2014), the percentage increase of management relative to the total number of employees is associated with a lower probability that money will be devoted to R&D.

2.4. Summary

This chapter aimed at answering the first two parts of the first research question ("What research is available to explain the influence of secondment on labour productivity growth?"). The question has been answered by dividing it into two parts: The first treats standard literature on growth accounting and labour productivity; the second part of the first research question treats how economic theory approaches flexible labour relations.

Standard economic theory suggests using of total factor productivity as a dependent variable. More recent studies, however, show that total factor productivity is associated with conceptual and empirical problems. Therefore, labour productivity (growth) is preferred over total factor productivity as the dependent variable. Labour productivity growth is crucial for countries with an ageing population to maintain or even rise living standards – labour productivity growth induced roughly 50% of GDP growth in OECD countries (Bassanini et al., 2009). Factors that influence productivity were gathered also with respect to subsequent regression models. Managerial talent, economic activity in general and capital (intensity) should be included.

Theoretical and empirical research was evaluated in view of labour market flexibility and labour productivity. Streeck (1997) proposes that good economic performance is dependent on an appropriate embeddedness in a "well-integrated society" (p.199). Other research based on OECD data finds that flexible labour relations fit silicon-valley type business that focus on radical innovation. A comparison of rather flexible labour markets in Anglo-Saxon countries to rather rigid ones in European countries concludes that labour productivity growth is higher in rigid labour markets. Higher shares of flexible workers as well as higher job turnover are associated with higher supervision intensities, which in turn indicate a less trustful worker-management relation. In contrast, high-trust worker-management relations are associated with higher labour productivity growth and less money devoted to R&D activities.

3. Model Germany

In the article entitled "Complementarity and Labour Market Institutions", Daan van der Linde argues that reforms have to be considered in their entireness, as a "seemingly narrow reform on the labour market may have far-reaching implications throughout other spheres of the economy at different points in time" (Unger, 2015, pp. 327–328). The Varieties of Capitalism approach frames the idea of institutional complementarities similarly, since "the presence (or efficiency) of one increases the returns from (or efficiency of) the other" (Hall & Soskice, 2001, p. 17). To set the scene against which the rise in secondment has taken place, this chapter outlines the institutional framework of Germany, its core characteristics and the state of economic affairs. The German Model, or "Modell Deutschland", a term coined by Markovits (Unger, 2015, p. 185), is found to be a distinct peculiarity within the varieties of capitalism. This chapter is intended to guide the interpretation of the empirical test in the later part of this thesis.

Van der Linde defines the aggregate effect of labour market reforms as the sum of direct effects plus the "interaction between the new and existing institutions" (pp. 330-331). The example of the Dutch mortgage market provides a first impression of complementarity. Mortgages as high as the home value do not require down payments in the Netherlands, but they require a permanent employment contract. Deregulating the labour market might lead to a rise of flexible work arrangements of all kinds, for example fixed-term contracts, freelancing or secondment. This labour market reform might reach beyond the labour market and effect the housing market through the mortgage-channel. Increasing the share of flexible work arrangements in the total of all work arrangements could decrease the number of people who classify for a mortgage without down payment and thereby influence the housing market. Hence, ""[f]ixing" the labour market today may require "fixing" the housing market tomorrow" (p. 331).

Secondment is, in general terms, a labour market phenomenon. Still, the example in the previous paragraph shows that complementarities within an institutional context can surface through rather unexpected channels. Consequently, this chapter aims at outlining the interplay between secondment as a labour market phenomenon and some adjacent areas. The chapter starts out by using the "Varieties of Capitalism" approach to describe the inter-company relations in Germany and the institutional interaction. The conventionalized dichotomy of "Coordinated Market Economies" and "Liberal Market Economies" as delineated by Hall and Soskice cover the peculiarities of Germany pertaining to finance, education, transfer of knowledge, internal structure and production (2001). Subsequently, more attention is devoted to the internal structure of firms pertaining to promotion and management based on Lazonick's theory of the innovative firm (2007). The social security system of a country gives a lot of insights on how the society pictures the social

coexistence. It has a lot of interfaces with the labour market; for example, as the social security system determines to a certain extend whether families can rely on publicly provided child care facilities so that both parents can be in employment.

Much of the literature on Germany approaches Germany in a very conventionalized way and a significant share of the still influential literature does not cover the later developments and reforms. To account for that, one section deals with rather recent changes to the German Model which might have led to deviations from the conventionalized model. The chapter closes with a short overview of recent economic developments and the current economic situation of Germany.

3.1. Varieties of Capitalism and Innovative Firms

Over time, different approaches of how to address the coordination problem regarding employees have emerged. Central to this problem is to ensure proper training and skills of employees, but also to align their actions with the goals of the firm, to foster cooperation. More specifically, problems around adverse selection, moral hazard and problems around sharing or withholding of information and efforts arise (Hall & Soskice, 2001)

Two different systems of firm-interaction are distinguished (p.109): the "Liberal Market Economies" (LMEs) and the "Coordinated Market Economies" (CMEs), with industrial relations, vocational training and education, corporate governance, interfirm relations and relationships with employees characterizing the institutional framework. LMEs and CMEs differ in how they coordinate economic actors, with Anglo-Saxon countries typically belonging to LMEs, while the Nordic and central-European (Germany amongst others) countries can be attributed to the group of CMEs. Certainly, the overall picture is not as black and white as presented in this dichotomy, but since Germany is the prime example of one, of the two, it seems helpful to rely on this theory in sketching the German economy.

3.1.1. Coordinated Market Economies: The Example of Germany

Using the example of Germany, Hall and Soskice (2001) delineate coordinated market economies. Germany shows many of the standard features – notwithstanding, each country has its idiosyncrasies.

Finance

With respect to the financial system, Hall and Soskice stress the availability of "patient capital" (2001, p. 22). On the one hand, it is crucial for investments that return profits only in the long-run and on the other hand, it is important for maintaining their labour force in times of demand shortfalls. Here, the availability of secondment workers increases firms' flexibility in responding to demand fluctuations. If the availability of finance is not dependent on balance sheet information, then other, more inside-information must play a role. In such networks, a good reputation is crucial to maintain one's position within that network (Vitols, 1997). Actors will refrain from providing false information for the sake of their reputation. In Germany, that information is accessible to investors (1) through close ties between companies, suppliers and clients; (2) from cross-shareholding and (3) through membership in industry associations (Hall & Soskice, 2001). Also, firms fund investments by means of retained profits, so that they are not as dependent on external finance as firms in LMEs. The threat of hostile takeovers, however, can put the focus a lot more on financial performance as to make a stand against others claiming that they could generate more profit out of the company. Therefore, "corporate strategies found in many CMEs also depend on tax provisions, securities regulations, and networks of cross-shareholding" (p.23) to deter hostile takeovers.

Internal Structure

This type of "network monitoring" is reflected in the internal structure of firms in CMEs (Hall & Soskice, 2001, p. 24). Managers and top-executives differ from their colleagues in LMEs in that their power is restricted and decisions have to be approved by advisory boards (with representatives of: employees, major shareholders, other established managers, major suppliers and customers) and hence encourage consent decision making as well as the sharing of information (Hall & Soskice, 2001). This internal structure also manifests in management incentives and management compensation. Reputations remains central as the firm structure rewards the reaching of consensus. A manager's ability to facilitate the reaching of consensus in turn determines that manager's success. Stock options on the other hand play a smaller role and hence do not tie managers' actions down to focussing purely on profitability.

Production

Generally, the workforce tends to be highly skilled and it is given a lot more autonomy than in LMEs to encourage the sharing of information needed for continuous incremental improvements (Sorge & Warner, 1986). This strategy, however, comes at the risk of refusal of active cooperation

by employees. Employees who share their knowledge for the purpose of innovation might fear exploitation or becoming redundant due to improved processes. Also, headhunting of skilled employees by other companies is a threat pertaining to employees with high degrees of autonomy. Consequently, companies in CMEs need appropriate institutions to solve the problems of headhunting and knowledge sharing. In the German economy, this problem is approached by means of "industry-level bargains between trade unions and employer associations" (Hall & Soskice, 2001, p. 24), from which most often follows a "leading settlement" (p.24). Usually, this agreement is reached in engineering due to the power unions possess in this area – here, unions can assure workers of having achieved a reasonable agreement. It is across-the-board employers' associations membership, rather than unions density, which makes these agreements binding. These agreements make it difficult to headhunt labour as employees would find approximately the same conditions in any other company. Secondment workers do not belong to the employees of a company and are hence not covered by the "leading settlement" (p. 24). To a certain extent, firms can circumvent these settlements by using secondment workers instead of employing more employees. Still, this practice is limited by the enforcement of conformity pertaining to secondment workers who work for longer than nine months in a firm (Bundesagentur für Arbeit, 2018a). This means that secondment workers must be subjected to the same working conditions as regular employees after nine months of activity at any given firm.

On firm-level, workers unions are complemented by work councils consisting of elected employee representatives possessing reasonable power over dismissals and working conditions. These protect employees against both random dismissals and changes in working conditions and incentivise investment in "company-specific skills and extra effort" (p.25). Thelen finds, as cited in Hall and Soskice (2001), that employers' associations act as intermediators and ensure that those involved work to rule.

Education and Training

Firm-specific and industry-specific skills are different from general skills as they are less valuable in general settings, with industry-specific skills being only of use within a single industry (Hall & Soskice, 2001). The comparative form of industry-specific skills are firm-specific skills, which are only meaningful to one specific firm. CMEs generally employ labour with pronounced industry- or firm-specific skills and hence depend a lot on education and training systems to educate their workforce. Culpepper, in the same book, stresses the importance of coordination: workers need assurance that the apprenticeship or training they follow indeed leads to profitable employment, whilst employers need to be assured that investment in training will provide workers with relevant skills and that upskilled employees will not be headhunted right away. In Germany, industry-wide

employer associations as well as and trade unions safeguard the quality of the training system, which is partially publicly funded. Major firms are firmly encouraged to employ apprentices and industry-wide skill categories are agreed on, so that freeloading is limited. Industry-wide standards also ensure demand for the qualifications apprentices obtain during their training, thereby increasing apprentices' market value if their employment is not continued after completion of the apprenticeship. The broad coverage of employer-associations renders them appropriate to assure the quality and adequacy of the system.

Transfer of Knowledge

Firm-specific and industry-specific knowledge demands for long-term labour relations, but those, in turn, limit technology and knowledge transfer through labour movement between companies (Hall & Soskice, 2001). This is achieved by "inter-company relations of the sort that facilitate the diffusion of technology across the economy" (p. 26). In Germany, there is a legal framework allowing for more cooperation between firms, and within sub-industries "there are even tacit sanctions against too intense competition" (Soskice, 1997, p. 90). Furthermore, business associations collaborate with public officials and facilitate technology diffusion by supporting firm competencies with public subsidies (Hall & Soskice, 2001). Business associations have private information about the sector at command and make use of it to design suitable subsidy programs. Also, firms often jointly finance research, frequently involving quasi-public research institutes. Standards developed by industry associations form a shared knowledge-base and hence allow for cooperation among employees from different firms. To the extent that secondment workers deal with relevant and state-of-the-art knowledge, there are various possibilities of how secondment influences knowledge transfer. On one hand, given that secondment workers rotate through different companies, they could increase knowledge transfer by absorbing best practices and findings at each of the companies. Nevertheless, this requires secondment workers to be deployed on state-of-the-art projects. If they are only deployed on routine and low-creativity tasks, it is questionable whether they would be exposed to anything valuable enough to share.

All in all, it should be evident how all these components form the German institutional framework. A large share of successful German firms engages in superior quality products and rely on high-skilled workers with industry or even firm-specific skills. Long-term contracts and long tenures give workers the necessary boundary conditions to be able to specialise as opposed to improve their general employability. Industry-based wage bargaining reduces competition on wages and decreases the risk of poaching for firms that invest in training. Industry-wide standards regarding training are monitored by industry associations and hence assures apprentices that they indeed acquire profitable education which is demanded by the industry. Inter-firm collaboration enables

technology transfer, further facilitated by shared standards and knowledge stemming from high-quality education. Patient capital is willing to finance long-term projects and relies not only on public balance sheet information but on also insider information obtained through networks, most prominently through ties between companies, suppliers and clients, cross-shareholding, and industry associations. Management power is restricted, and decisions need approval from advisory boards. The workforce is given a lot more autonomy than in LMEs and together with long-lasting labour relations and the consensus-based management style, employees can afford to actively cooperate.

3.1.2. Coordinated Market Economies versus Liberal Market Economies

Firms being located in countries that belong to the group of LMEs mostly coordinate themselves by means of hierarchy and market relationships, which "are characterized by the arm's-length exchange of goods or services in the context of competition and formal contracting" (Hall & Soskice, 2001, p. 8). Supply and demand are determined by price signals created by markets which are based on the marginalism in neoclassical economics.

On the other hand, in CMEs, firms align their activities and compose their core capabilities relying on non-market relationships rather than market relationships (Hall & Soskice, 2001). These forms of coordination are based more on relational and partial contracts and networks are overseen by means of private information from networks. In-house competencies are rather built on collaborative relationships. The equilibrium outcome on which firms base their activities is reached through strategic interaction between actors and does not depend that much on demand and supply, as in the liberal market economies. This is not to argue that firms in LMEs do not enter at all in to relationships beyond pure market forces and it is not to say either that markets and hierarchies are not important in CMEs. But firms in CMEs make use of a wider range of organisational and institutional support for their activities. Coordination is achieved through strategic interaction and the institutions and organisations which contribute to reducing uncertainty regarding other actors' behaviour provide the foundation for "credible commitments to each other" (p.10). Elinor Ostrom proposes that these institutions provide capacities for exchange of information, monitoring of behaviour and sanctioning of defection from cooperation (Ostrom, 1990). Among these are most often business or employer associations, trade unions, networks of cross-shareholding as well as legal or regulatory systems. This is exemplified in the topic of operating collaborative vocational training schemes, as delineated in Culpepper and Finegold (1999) (as cited in Hall & Soskice, 2001). Whether firms are eager to take part in those schemes is dependent on their confidence that employees will learn valuable skills which will lead to sustained competitive advantage and which will lead to lucrative employment.

In CMEs, the presence of specific skills depicts "core characteristic of firms' product market strategies", so that firms engage in professional formation based on vocational training in a way that meets their needs (Unger, 2015, p. 110). The wish for investment in firm-specific knowledge generates demand for job security on both sides, as employers need securities for their investment into human resources and employees need job security to be able to accumulate firm-specific knowledge as opposed to knowledge improving their general employability. Hall and Soskice (2001) conclude that corporate strategies differ along the dichotomy LME and CME by referring to a study of Knetter (1989), who found that firms in CMEs respond differently to the appreciation of exchange rates than firms in LMEs. Firms in CMEs maintain their prices to not lose market share and accept lower profits. LME countries, by contrast, pass price increases on in full to not loose on profitability. Hall and Soskice argue that LME firms must maintain their profitability due to the structure of their financing, whilst the loss in market share can be compensated for quickly as it is easier to dismiss employees. CME firms on the other hand would rather maintain market share as they cannot adapt their workforce that quickly, whilst they have access to finance independent of their financial situation. Returning to the big picture, Hall and Soskice (2001) stress that actors in CMEs are more inclined "to invest in *specific* and *co-specific assets* (i.e. assets that cannot readily be turned to another purpose and assets whose returns depend heavily on the active cooperation of others)" (p.17). Actors in LMEs, however, should look for investment into assets which have value beyond that primary purpose, or, in other words, which can be used valuably in other contexts, too.

This and the previous subsection have demonstrated how firms, the state and workers interact in coordinated market economies. The next section complements with an intra-firm analysis of "Varieties of Capitalism".

3.1.3. Varieties of Innovative Firms

The "Varieties of Capitalism" approach is mainly concerned with the coaction of countries and firms – the state engages as an investor in resource allocation (research, education, infrastructure) and big powerful businesses engage in innovation by shaping market forces and apportioning workers to new and promising projects. According to Lazonick, "the defining characteristic of capitalism is the innovative enterprise: the interaction of individuals […] in highly coordinated business organizations that can transform technologies and access markets to generate higher quality, lower cost products that underpin economic growth" (2007, p. 22). Without innovative enterprises, state investment would be pointless and hence, the analysis of the innovative enterprise is fundamental to the analysis of the "Varieties of Capitalism", as Lazonick argues.

Lazonick (2007) analyses different peculiarities of innovative firms in capitalist economies and characterizes the German economy in the period after World War II. He finds high levels of hierarchical integration and pronounced functional segmentation in German firms. Hierarchical integration implies that top managerial and executive staff most often have scientific or engineering backgrounds and have earned their positions by means of in-house careers. Strategies are implemented through managerial boards consisting of internal executives after approval by supervisory boards. During the 1950s, the system of codetermination has been implemented, which contains employee representation on supervisory boards. It also gives employees the right to form work councils and thereby participate in management throughout different levels of the company. Companies with 2000 or more employees divide the seats on the supervisory board in equal shares between worker and shareholder representatives, which are chaired by a shareholder representative who in turn has the right of a tie-breaking vote. Work councils' participation in decision making regarding questions around labour allocation, work conditions, and remuneration gives employees a say in investment and financial strategies.

Both shop floor and managerial employees are mostly reasonably educated, with the apprentice system being the entry into corporations (Lazonick, 2007). The apprentice ship system is dual in nature as it provides candidates with both theoretical and practical education. Bigger corporations financially engage more than proportionally in this system and hence cross-finance training in smaller firms. Lazonick stresses regional accumulation of skilled workers as a major strength of the German system as it enabled "symbiotic production in enterprises of different sizes, so that the ability to produce high-quality goods resided in both large managerial corporations and the smaller Mittelstand sector […]" (p.46). Baden-Württemberg is an example of such a region, where Bosch, Mercedes and Porsche are located, together with medium-sized companies (Mittelstand) specialised in metal working as well as engineering and are adapted to the needs of the automotive industry.

The institutional framework in Germany promoted high skill levels in production workers (Lazonick, 2007). In many cases, making use of and improving these skills enabled also shop floor managers to climb the career ladder into managerial positions within their field of functional specialization, leading to strong "organizational integration" (p.47). This in turn promotes high-quality and high-costs products, so that Germany's technological leadership was found to be based on organizational integration. Most probably, low numbers of secondment workers as compared to the overall labour force would not interfere with the concept of organizational integration. Given the high number of in-house careers, secondment could provide firms with more flexibility for short-term projects or workload peaks. Also, where it is difficult to dismiss workers once they have passed their trial period, secondment could be used to extensively become acquainted with people before hiring them. At higher shares of secondment intensities, secondment might disturb

organizational integration as secondment workers cannot move up the ladder within their host organization. Most probably, inhouse careers would be limited to regular employments, thereby restricting the selection of future managers to a smaller pool of candidates.

However, functional specialization lead to functional segmentation, rendering German companies specialized in electronics and mechanics vulnerable to competition from their more "organizationally integrated[2]" rivals (p.47). The Japanese were able to gain on Germany in terms of quality and precision and were able to compete with German products during the 1990s. Therefore, the major technology companies experienced a crisis in the early 1990s, causing mass dismissals which shook the German economy additive to the integration of the low-productivity East-German companies. Attempts to incorporate Japanese methods into German enterprises were partly successful.

Making efforts to counter these threats, German enterprises had to regain control over their financials, which until now – and as a consequence of the industrialization – was with house banks ("Hausbanken") (Lazonick, 2007). Those banks took the role of venture capitalists, lending money to firms, "and then, if these firms were well-established, floated "bearer"[3] shares in the firms among wealthy bank customers to enable the firms to pay back the bank loans" (p.47). The customers on the other hand held "bearer" shares with the banks and transferred the votes attached to them to the banks. Thereby, banks funded and protected firms. German firms were able to grow with much lower debt to equity ratios as compared to Japanese firms.

Lazonick has shown that the interaction of individuals in German firms is marked by hierarchical integration of workers and shop floor managers, but also by functional segmentation, meaning that employees rely on career-long specialization. The next section treats different welfare state models as these are very informative regarding the social coexistence.

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[2] In Japanese firms, functional segmentation was less present (Lazonick, 2007). Moreover, German firms hierarchically integrated both Craft workers and specialist, whereas the Japanese relied on more interaction especially between operatives and specialists.

[3] Bearer shares refer to a "security not registered on the books of the issuing corporation and thus payable to possessor of the shares. Negotiable without endorsement and transferred by delivery, thus avoiding some of the control associated with ordinary shares. Dividends are payable upon presentation of dividend coupons, which are dated or numbered. Applies mainly to international equities" (Harvey, 2018)

3.2. Social Market Economy and Welfare State Models

Titmuss (1963) defines the welfare state as a safety net in the event of market failure and as an institutional system of social rights. Esping-Andersen divides welfare states into three clusters – liberal, conservative and social-democratic (1990). In the following paragraphs, these three clusters will be characterised to put the German approach into perspective.

The first cluster, the liberal welfare state, is dominated by means-tested assistance as well as moderate universal transfers and modest social-insurance plans. Typical examples of this cluster are the U.S., Canada, as well as Australia. Benefits from the welfare state are directed mostly towards low-income classes of the population. Policy making is led by "traditional, liberal work-ethic norms: it is one where the limits of welfare equal the marginal propensity to opt for welfare instead of work" (p.26). Consequently, entitlement to payments is subjected to strict scrutiny, often accompanied by stigmatisation, and payments are mostly modest. Market mechanisms are reinforced either passively by assuring only a minimum level or actively by subsidizing private welfare arrangements. This manifestation of the welfare state reduces "de-commodification" [4] (p.26) and leads "to equality of poverty among state-welfare recipients" (p.27) and "market-differentiated welfare among the majorities" (p.27), but it also leads to a dualism between the two.

The second cluster comprises countries such as Austria, France, Germany, and Italy. "[T]he historical corporatist-statist legacy" was adapted to the needs of today's "post-industrial class structure" (Esping-Andersen, 1990, p. 27). The liberal notions of market efficiency and commodification were never the main concern of these corporatist welfare states and social rights as such were never seriously questioned. Differences in status were preserved and consequently, rights depended on status and class. This corporatist approach with its umbrella of welfare measures ousted the market from its position as a provider of welfare, so that private and occupational arrangements did not play a major role. These welfare states were mostly influence by the church and hence featured commitment to the traditional family, commonly excluding stay-at-home-wives and fostering maternity. The concept of subsidiarity[5] implies that the state would only intervene after exhaustion of the family's capacity to address its members' needs.

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[4] De-commodification denotes the situation when a service is tantamount to a right, so that a person can make a living without participating actively in the market by means of work (Esping-Andersen, 1990).

[5] Subsidiarity: It refers to the principal that an authority acts in a subsidiary way, only addressing issues which cannot be addressed at a more local level (Oxford Dictionaries, 2018).

The third cluster contains the "social-democratic" (p.27) regimes, which applied the concepts of universalism and de-commodification of social rights also to its new middle-classes (Esping-Andersen, 1990). These social-democrats countries strive for "equality of the highest standards, not an equality of minimal needs" (p.27) as it is the case in other countries and they would not tolerate the dualism between both state versus market and working-class versus middle-class. The welfare system benefits are improved to be in no way inferior to new middle-class standards and even workers are entitled to enjoy the "quality of rights" (p.27) that, in other clusters, are only available to the "better-off" (p.27). This system lead to high levels of de-commodification and manual workers are given the opportunity to experience rights which usually had been limited to civil servants and white-collar employees. All classes of the population are covered by the umbrella of a single insurance system, with benefits, however, being according to conventional earnings. Also, family policy is addressed differently as in the corporatist-subsidiarity cluster, as the burden of having a family is socialised right away and not just after exploiting the family's capacity to address its needs. The system strives for individual independence instead of dependence on the family and hence combines elements from both socialism and liberalism. The state directly caters for the care of children, the elderly and those in need of help and takes on a big social burden. Parents can choose to work because the state takes care of family needs.

To sum up, Germany belongs to the second cluster of welfare states – providing an umbrella of welfare measures that displaced the market from its position as the provider of welfare. Subsidiarity is a leading concept as the exhaustion of local capacities is a condition for the entitlement to public welfare measures. Much of the features of the German economy described so far concern a conventionalized Germany which has undergone significant reforms. The following section outlines some of these reforms.

3.3. Model Germany – Still Intact?

So far, the German Model, or "Modell Deutschland" has been described based on how it was seen in science before the implementation of the Agenda 2010 (early 2000s). Recently, various authors have addressed the topic whether this "traditional" German Model is still in place or whether the reforms have transformed away from its roots.

In the book "The German Model", Peter Hall admits that the German Model has undergone some changes, for example universal banking has decreased, trade union membership has declined as well as collective bargaining coverage and work councils have increased in importance (Unger, 2015). Also, the German economy has been liberalized in many aspects, but Hall believes the German political economy continues to be different from many others. In the same book, Wolfgang

Streeck comments on the notion of "beneficial constraints" which he had coined earlier – stating that this notion was appropriate before the liberalisation of the German labour market which took place due to globalisation, reunification and pressures emanating from employers.

Anke Hassel agrees that the German Model has experienced considerable changes over the last decade (Unger, 2015). Regarding the Agenda 2010 reforms and other liberal transformations, she concludes that a development towards a more liberal economy is undeniable, but the most "German" features have remained intact, combining "coordination in the core features of the manufacturing sector with new liberal elements" (p. 128). Formally, institutions are often still the same as in the post-war period, but they have been hollowed out and, in some cases, only a skeleton is left.

3.3.1. Recent Reforms: Agenda 2010 and Harz Reforms

In "The German Model" edited by Brigitte Unger (2015), Anke Hassel provides an elaborate summary of the recent reforms which have been implemented in the German economy, and doing so, she follows the "Varieties of Capitalism" approach which has also been used to structure this chapter. She presents her analysis along the following domains: Collective bargaining institutions, labour market and social policy, training and corporate governance.

Collective bargaining institutions

In the early 2000s, threatening to intervene legally if collective bargaining was not becoming more flexible prompted collective bargaining institutions to move into the direction of plant-level bargaining rather than industry-wide bargaining (Unger, 2015). Thereby, legal intervention was avoided and still, bargaining was broken down to plant-level bargaining. As collective bargaining became more flexible, membership loss in employers' confederations which started in the 1990s ground to a halt. Industry membership decreased on both sides and union density – reported by Visser – came down from 24.6 to 18.6 percent between 2000 and 2010 (Unger, 2015). Overall, this lead to a significantly higher level of flexibility at the firm level and to decrepit unions and employer associations.

Labour market and social policy

Labour market and social policies were the most addressed areas of the Agenda 2010 reforms. The Harz reforms transformed the Federal Employment Agency and had a strong influence on basic social security, unemployment benefits and provision of the long-term unemployed. Before the reforms, the focus for the unemployed was to retain their skills. Re-education was less of a concern.

34

The reforms changed the priorities towards re-education and re-employing people quickly, but also lower-qualified jobs would no longer be disregarded (Hassel & Schiller, 2010). The Harz IV reforms strongly reduced the length of unemployment benefit payments (from 32 months down to 12 month) to put emphasis on finding new employment timely (Odendahl, 2017). After 12 months, the unemployed would only receive social assistance as opposed to the unlimited fall-back unemployment assistance of 50% of the previous net income that was in place earlier. From then on, the entitlement to payments was strongly means-tested. In addition, the mini-job system was extended so that low-paid part-time workers could top up their earnings with social security benefits to meet the minimum subsistence level. Consequently, the number of working poor and the number of people in insecure jobs in Germany increased. Germany's big low-wage sector, however, precedes these reforms (it is one of the European countries with the highest proportion of low-paid jobs).

Training and Education

Thelen and Busemeyer argue that Germany's training and education system is experiencing some significant but non-obvious change (2008). Still, a large share of the German youth chooses for vocational training as opposed to academic education and the fundamental features of the traditional collectivist system are still intact, but it is changing towards a more segmentalist system. Firms' participation in vocational training is decreasing since the 1990s and more flexibility is allowed on firm-level which in turn decreases comparability between firms. This is where the segmentalism surfaces: firm-level interests are given priority over collective interest. Training intensity decreased much more in small firms than in medium and big firms, with many small firms not offering training at all. Consequently, the excess demand for training positions led to a "patchwork system of training, education and labour market measures that is supposed to ease the transition between school and vocational training for those who are initially unsuccessful in finding and apprenticeship place" (p.12). Also, a part of this excess demand was absorbed by universities as proofed by an increasing number of first-year students.

Corporate Governance

The at the time very tight system of cross-shareholding is on the decline due to successful attempts to liberalise Germany's capital market as well as the corporate sector (Unger, 2015). According to Hassel and Williamson, Germany's capital market was rendered more transparent and a supervisory agency for stock trading was enacted at federal level (Unger, 2015). The capital gains tax was reformed which permitted companies "more easily to shed stakes in other firms" (p.117). Also, international accounting standards were implemented instead of the German standards and the

system of interlocking directorates was facilitated as a new tax code (adopted in 2002) promoted not to hold more than five supervisory board seats. Corporate finance has remained true to the system of CMEs and is still a lot less stock based than in LMEs.

In essence, the labour market was liberalized with the recent reforms. Union power was weakened by making bargaining more flexible and allowing for plant-level agreements. Training can also be adapted to firm needs. The Federal Employment Agency has shifted its focus on quick re-employment (if necessary, after re-education) instead of the maintaining of skills. Shorter and lower unemployment benefit payments put emphasis on this shift. Moreover, precarious employment is subsidized as low-income earners can now top up their earnings with Federal Employment Agency money.

After approaching Germany in a conventionalized way and after outlining reforms, the last section sketches current state of the German labour market and social security system.

3.3.2. Labour Market and Social Security System

The "social market economy" features an "strongly organized civil society, regulated corporate governance and labour markets as well as an extensive welfare state" (Unger, 2015, p. 108). The German welfare state can look back on a long tradition and dates to imperial times under Otto von Bismarck. Historically, it was based on "social insurance and earnings-related benefits, as the organizing principles of social protection for workers, social assistance for the non-working poor, and the concept of subsidiarity with regard to social services" (p. 187). The social market economy is deeply entrenched in Germany, as it is also explicitly mentioned in the constitution (Deutscher Bundestag, 2014): The Federal Republic of Germany is a democratic and social federal state (Article 20, §1). The constitutional order in the *Länder* must conform to the principles of a republican, democratic and social state governed by the rule of law, within the meaning of the Basic Law. (Article 28, § 1).

Still, only few social rights are directly rooted in the Basic Law (Bundeszentrale für politische Bildung, 2013). Maternity protection, for example is explicitly mentioned in Article 6 paragraph 4, as it guarantees mothers protection and support. Many more social rights can be derived from the Basic Law, such as the prohibition of discrimination, which follows from the Article 1 paragraph 1 ("Human dignity shall be inviolable.")

This subsection will provide an overview of the most important features of the German social security system – it does strive for completeness – and revolves around the topics unemployment, employment, minimum salary, insurance, inclusion, pensions and income support

(Bundesministerium für Arbeit und Soziales, 2017). As we will see in chapter 3.4.1, roughly two thirds of all newly employed secondment workers have been unemployed immediately before signing the contract with the secondment agency. A more elaborate characterization of the German social security system is deemed necessary to understand the transition from unemployment into a secondment contract (which happens frequently).

Unemployment Benefits and Social security benefits

Entitlement to unemployment benefits is based on 360 days of continuous employment subjected to social insurance contributions (Bundesministerium für Arbeit und Soziales, 2017). The durations of the entitlement depend on the length of previous employment and range between six months (after 12 months of employment) and 12 months (after 24 months of employment). For people aged 50 or older, age is considered and further increases the duration of entitlement (up to 24 months after 48 months of employment and older than 58 years). After unemployment benefits have been exhausted, the so-called unemployment benefits II are available as a fall-back option.

Unemployment benefits II is the broadest of all measures: All people eligible for benefits should be able to live a life that corresponds to mans' dignity, as specified in the code of social law (SGB, 2003, para. 1). In the event of inadequate income and wealth, the social security benefits cover the subsistence minimum to ensure subsistence at a socially acceptable level, corresponding with the person's individual situation (Bundesministerium für Arbeit und Soziales, 2017). It is a subordinate measure and comes into play after all other measures are exhausted, such as income and wealth of the eligible person and of those obliged to support the person.

People who do not manage to return to employment, despite extensive efforts, are entitled to unemployment benefits II (means-tested), which can also complement salaries to meet the subsistence minimum. Basic security benefits follow the guideline of "promoting and demanding" (p. 50). Support is organized on household basis, striving to promote self-reliance and to restore the household's capacity to cover its living expenses. From an institutional perspective, basic security benefits provide all the support for job search from one source, be it advice, training, placing and integration measures, accompanied by an individual contact person. A rehabilitation agreement is set up to specify binding activities for the job seeker under consideration of his or her specific needs and social situation. These rehabilitation services are rendered by Jobcenters in combination with the local municipality. Special attention is payed to people under the age of 25 to facilitate their entry into the job market. In their work, Jobcenters follow the principle that any job is reasonable, with exceptions based on physical and mental capabilities. Refusing a to take up reasonable work will lead to reductions and ultimately in cancellation of unemployment benefits II.

It is oriented towards the subsistence minimum and covers basic needs including housing and heating plus individual specific needs, if applicable. The standard payments amount to 409 Euro per month for adult singles and 386 Euro for adult couples (Bundesministerium für Arbeit und Soziales, 2017, p. 53). Statuary health insurance and nursing care insurance are also borne by the Federal Employment Agency.

Accommodation, Children, upbringing and caring

Since rents have increased considerably and do exceed some citizens' financial means, the government provides accommodation allowance to ensure suitable and appropriate housing (Bundesministerium für Arbeit und Soziales, 2017). It can take shape either in the form of rent subsidy or in the form of a state subsidy for home owners and the amount depends on the number of persons of the household, household income and local rent index. Persons whose accommodation is catered for by the state are not eligible for accommodation allowance.

Raising of children is supported in two ways: Families receive payments of 192 till 223 Euro per child for children below 25, depending on the number of children to ensure the subsistence minimum and tax privileges to support families in general (Bundesministerium für Arbeit und Soziales, 2017). The federal parental benefit compensates for income losses during the first month after a child has been borne. The payments amount to 65-100% of the previous salary, but they don't fall behind 300 Euro and don't exceed 1800 Euro. Both partners can make use of two till 12 months, allowing for a total of 14 month per couple if both stay at home for two months. Parental leave allows parents to reduce their working time for a given period and guarantees to return to contract conditions once the parental leave comes to an end.

Similarly, domestic caring of relatives in need is encouraged by means of the nursing leave act and the family nursing leave act (Bundesministerium für Arbeit und Soziales, 2017). In the case of unexpected occurrence of a caring situation, employees are entitled to stay away from work for up to 10 working days to arrange adequate caring for relatives whilst the employee must continue payments during that time insofar as such an obligation results from agreements or legal obligations (independent of company size). In the opposite case, 90% of the lost net salary are compensated. Besides, employees wishing to take care of close relatives in need of care are entitled to six months leave (part-time arrangements are possible, too) for caring purposes in companies with more than 15 employees. The family nursing leave act allows for caring for close relatives up to 24 months. Here, the premise is that average weekly work hours do not fall short of 15 and it is limited to companies with more than 25 employees. During the last stage in the life of close relatives,

employees have the right to stay away from work partly or full-time for up to three months to accompany relatives in hospice stays or similar.

Employment promotion

This category aims at increasing the employability of the unemployed and at leveraging the balance in the job market (Bundesministerium für Arbeit und Soziales, 2017). The Federal Employment Agency engages in activities related to advice in the matter of:

- career choice and planning both for students and employees
- advising companies how to best fill their vacancies
- placing of apprenticeships and jobs

There is a special mediation budget which is used to address barriers to progress in a flexible, purposeful and demand-based way and provides the opportunity to support people with individual measures (Bundesministerium für Arbeit und Soziales, 2017). In the case of barriers to employment such as lack of education or training, the Federal Employment Agency runs programs to provide people with entry-level vocational qualifications to meet the requirements for further training or education. Also, costs for further-training can be covered if training is necessary to take up work or as a measure to prevent unemployment. Special programs exist for people with a migrant background as well as for disabled people. These measures mostly address the employed, whereas other measures promote entrepreneurship. A special programme, for example, supports the launching of a new company and aims at assuring the subsistence both socially and economically during the most often stormy times immediately after starting a business. For six months, payments exceed the unemployment benefits by 300 Euro and for subsequent nine months, founders are entitled to payments as high as 300 Euro.

Business cycles

If firms find themselves forced to reduce the working hours due to inevitable events and if they declare short time work, then the affected workers will receive short time work payments (60-67 % of the reduction in net salary, max. 12 months) from the Federal Employment Agency (Bundesministerium für Arbeit und Soziales, 2017). The main motivation behind this measure is to ensure continued employment and prevent layoffs of the affected firm's employees in the case of temporary non-productive time. Inevitable is defined as not mainly customary in the industry, not mainly operational or seasonal, not coverable by payed leave and not manageable by making use of customary fluctuations in working hours.

Labour law

German labour law differentiates between individual and collective laws. Individual labour laws centre around the single employment relation resulting from the contractual employee-employer relation (Bundesministerium für Arbeit und Soziales, 2017). Fundamental rights apply to any employment contract, such as federal vocational measures, sickness pay and regulations regarding part-time work and fixed-term employment. The latter grants any employee the right to reduce his or her working hours under specific conditions and guarantees equal employment conditions as compared to full-time workers.

Dismissal protection, which is more present in the literature on labour economics, is also regulated within the individual labour laws (Bundesministerium für Arbeit und Soziales, 2017). Employers as well as employees must observe the termination notice period of at least four weeks to the fifteenth or the end of the month. The period of notice increases by one month in each case after more than five, eight, twelve and fifteen years of tenure and climaxes in a period of notice of seven months after 20 years tenure (p. 58). From a social and from a legal perspective, dismissal is justified for reasons in the person's behaviour, for reasons lying in that person or for operational reasons.

Collective labour laws centre around collective agreements and the industrial constitution law (Bundesministerium für Arbeit und Soziales, 2017). The former is based on free collective bargaining and many of the German employment relations strongly depend on them. The specific functions of collective bargaining have already been outlined in sections 3.1 and 3.2 and won't be addressed again. In the industrial constitution law, the intra-company relations between employee and employer are specified, based on the principle that employer and workers council collaborate trustingly with the represented labour union. Employees of companies with more than five adult employees are entitled to set up a workers' council.

Codetermination

Codetermination in Germany is founded on the principle that democratic principles should extend to all spheres of life (Bundesministerium für Arbeit und Soziales, 2017). All companies outside of the mining and steel industry which employ more than 2000 employees (including daughter companies) are covered by the 1976 act on codetermination. It specifies that the supervisory committee is composed in equal shares of employee and shareholder representatives. Shareholders still predominate in many cases as the chair of the committee usually is a shareholder representative who has two votes in case of standoff. The election of the employee representatives depends on the total number of employees (either primary election or by delegates). Shareholder representatives

are elected in line with the type of company. The chair is elected based on supermajority by the members of the committee. The supervisory committee's importance stems from the fact that it appoints the chief officers of the company.

In companies limited by shares with 501 to 2000 employees, the supervisory committee consists of only one third employee representatives (Bundesministerium für Arbeit und Soziales, 2017). No specific rules apply to limited corporations and limited partnerships founded before 10th of August 1994 and to those which are not family-owned companies, meaning that their supervisory board always consists of at least one third employee representatives even if the total number employees does not exceed 500. Still, with only one third of the seats, employees' influence is limited, but it grants access to valuable and top-of-mind information.

Codetermination in the steel and mining industry not only the longest tradition, it is also the most far-reaching. Companies limited by shares with more than 1000 employees come under this law. Not only does the supervisory committee consist of equal shares of employee and shareholder representatives, it also contains a "neutral" member. The advisory committee appoints the chief officers. Employee representatives vote the labour director to ensure a faithful relationship.

Minimum wage

The minimum wage of 8,84 Euro per hour applies to all employees of legal age or with a completed job qualification (Bundesministerium für Arbeit und Soziales, 2017). Still, some industries were excepted from the minimum wage up until 31st of December 2017. Also, the long-term unemployed can take up employment for less during the first six month of employment to facilitate their entry into the job market. Interns are also covered by the minimum wage if the duration of the internships exceeds three months and if it does not constitute an obligatory part of their education.

Pensions

Employees with salaries above 450 Euro per months are compulsorily insured which results in payments of 15% (employer) and 18,7% (employee) of the salary (Bundesministerium für Arbeit und Soziales, 2017, p. 149). This entitles assured persons to the whole service spectrum such as standard retirement, rehabilitation, retirement due to reduced earning capacity and so forth. Only some groups of the self-employed are covered by compulsory pensions schemes, mainly self-employed teachers, training staff, caregivers and midwives, who, in turn, are given the right to opt out of this scheme after 18 years of occupation. Entrepreneurs can apply for an exemption of compulsory pension insurance for up to three years. Standard retirement age is 67 years (p.156), but people who have been insured for longer than 45 years are given the right to retire with 65

(deduction-free). However, working until the standard retirement age is not the only way to go, as it is possible to retire early after 35 years of insurance payments and with a pension payment deduction of 0,3% for each month of early retirement (p.157). The government also promotes private and corporate pension plans to address the ageing population by means of tax-deductions.

3.3.3. How does it relate to secondment?

Overall, several features of the German social security system are relevant regarding secondment: It is evident that German employees are entitled to all kinds of leaves from work; be it the parental leave act, which allows young parents to stay away from work for a total of 14 months for both parents or the nursing leave act which entitles employees to stay away from work to care for close relatives. Also, the labour law stipulates the right to reduce the weekly working hours to some sort of part time arrangements. Even if some of these rights only apply to employees of bigger firms which are expected to be less severely affected ty these measures (smaller companies are relatively more affected if one employee is unavailable for some reason), still do they demand a lot of flexibility from employees. Here, secondment could come in handy for firms to cope with shocks to labour availability. On the other hand, and pertaining to the unemployed, any job is considered reasonable. The length of unemployment benefit payments are not too generous as compared to an average application processes which may easily include several interview rounds. This might influence recruitment practices of secondment agencies, which rely disproportionately heavily on the unemployed, as we will see in chapter 4.

It could well be that secondment gives companies more moving space to cope with fluctuations in the labour force which result from social security law and thereby alter labour productivity growth. On the other hand, secondment opens for firms the opportunity to circumvent some of the defining features of the social security system such as dismissal legislation. Moreover, there now is an alternative to standard employment. The subsequent section shifts from the regulatory and institutional perspective to an historic one – it treats recent economic developments and Germany's crisis recovery.

3.4. Germany's Economy

This section is divided into three parts: First off, Germany's recent economic history is summarized. Only shortly after the financial crisis, The Economist published an article headlining "Powerhouse Deutschland" (O'Sullivan, 2010). Apparently, Germany has recovered quicker than other countries, and therefore, attention is also paid to Germany's crisis recovery.

3.4.1. Recent Economic History

In the book "The German Model", edited by Brigitte Unger (2015), Wolfgang Streeck describes the German economy as one which has always produced highly competitive goods both in terms of quality and price. Due to superior engineering and product design combined with customization and craftmanship, German corporations showed flat hierarchies and strong collaboration between design and execution, which facilitated the evolution to a "pattern of diversified quality production without much difficulty" (Unger, 2015, p. 81) in the course of the 1980s. The demand for those products showed low sensitivity for prices, so that the D-Mark revaluation after 1969 actually benefited the German trade surplus. As opposed to the Anglo-American countries, Germany shifted only slowly towards a service-led economy due to its manufacturing competitiveness. This lead to much slower deindustrialization. Service sector activities were rather integrated into manufacturing than that they led to growth of the financial sector. Streeck further states that Germany's competitive manufacturing sector led to a "stable pattern of labour inclusion, with strong trade unions, co-determination on the shop floor and in the enterprise, low wage dispersion both within and between firms, considerable "rigidities" in the labour market, and a surplus of high skills giving factories extensive internal flexibility and innovative capacity" (p. 82). He summarizes the German system as one which was characterized by "beneficial constraints" (p. 82) which fostered the development and invention of superior products together with marketing and production practices and in turn supporting high wages and good working conditions.

Reunification, globalization and the end of communism lead to pressure asking for a more liberalized labour market, for which Germany was susceptible precisely because of its high degree of industrialization (Unger, 2015). After the reunification, the German economy was characterized by stagnation, with five million people unemployed (Storm & Naastepad, 2015). The threat of production offshoring appeared to be smaller than expected, but still big enough to convince unions to go without real wage increase, accepting a two-tier wage system and weaker employment protection legislation, which was brought forward by decreasing union power, unemployment and low inflation in the mid-1990s. The European Monetary Union then imposed one interest rate on the whole union. Differences in in inflation rates across different countries lead to diverging real interest rates, with the German real interest rate being too high due to low inflation, which in turn lead to a worse economic situation. In contrast, high domestic inflation in southern-European countries gave rise to economic growth in those countries.

Against this background, Germany adopted the "Agenda 2010 reforms (Odendahl, 2017), which primarily tackled welfare state spending. Some economists claim that Germany's strong crisis recovery can be attributed to these labour market reforms, others claim that Germany increased

cost-competitiveness at the expense of its neighbours – subsection 3.4.1 revolves around these questions.

3.4.1. Crisis Recovery

In the wake of the 2008 financial crisis, Germany's export dependent economy was hit hard as its GDP decreased by 6.6 percent accumulatively in 5 subsequent quarters (Storm & Naastepad, 2015). Germany managed to recover its GDP by the first quarter of 2011, (taking the first quarter of 2008 as a base). France was not hit as hard as Germany, but it took longer to recover its GDP, and Italy and Spain were doing even worse. Before the crisis, the German unemployment rate roughly equalled the European average of 7.5%. Since then, Germany was performing formidably as compared to the European average. By 2013, German unemployment declined to 5.4%, whilst the European average increased to 12.1%. In the top 100 most complex products, Germany has a share of 18%, much more than its neighbours France (3.6%), Italy (3.1%) and Spain (0.9%) (Felipe & Kumar, 2011). Storm and Naastepad (2015) conclude that German exports are to a big part determined by world income and that relative unit labour costs are extraneous. From that follows that wage suppression is not the root of fabulous exports, as it was overcompensated by wage restraint elsewhere. Germany's non-traded[6] sector has experienced a strong increase in productivity, which was to some extend caused by a strong increase in part-time work. Hence, the root of strong export performance lies in building up technological capabilities that led to high productivity growth and non-price competitiveness. Decomposing Germany's exports into structural[7] and competitiveness[8] effect, it becomes evident that Germany has lost on the competitiveness effect, as its actual export market share growth fell behind the structural effect. After all, German companies did not get carried away by short-termism and instead focussed on building non-price competitiveness. And all this took place within the framework of beneficial constraints as described by Wolfgang Streeck (see chapter 3.3.1).

The claim that Germany's competitiveness and crisis recovery stems from technologically competitive products implies that the strong recovery must be attributed to its core-industries rather than the more deregulated branches (Storm & Naastepad, 2015). Also, the German welfare state contributed significantly to recovery as well as two stimulus programs (the biggest in Europe) of

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[6] non-tradable sector: locally rendered services (e.g. health, education, retail, construction).

[7] Structure effect: Changes of a country's exports due to changes in its markets, given a constant market share in those markets (Storm & Naastepad, 2015).

[8] Competitiveness effect: residual term after exports have been decomposed accounting for the structure effect. By definition, it captures price as well as non-price factors (regulatory and institutional framework, RD) (Storm & Naastepad, 2015).

Keynesian nature and two bailout programs, restoring confidence in the economy. The so-called "Umweltprämie" ("environment bonus"), which was in common parlance better known as "Abwrackprämie" ("scrappage bonus") supported car buyers with 2500 Euro for their old cars and helped to maintain employment in export-oriented industries. Firms were further supported in spanning demand shortfalls by the institutional framework "Kurzarbeit", which allows firms to reduce the working hours of their employees, whilst the government bears a part of the costs[9]. Hereby, layoffs were avoided. The program's maximum duration was extended, which, as of 2009, amounted to 24 months. This extended period lasted till 2012, so that labour market adjustments were realized most dominantly through concessions in hours worked per employee as opposed to layoffs. In case of dismissals, it was mostly people with temporary contracts who were affected. This enabled firms to maintain their workforce of well-trained employees and to rebuild capacity quickly in the wake of the crisis. Thereby, the German economy was able to use the momentum which resulted from the Asian recovery, partly driven through China's enormous Keynesian investment programme. In addition to that, luxury consumption fuelled by rising inequalities in emerging economies also supported German recovery. Also, public short-time provisions helped to keep demand up in times of decreasing exports.

3.5. Summary

The literature study on several forms of institutional contexts, innovative firms and welfare states has shown that different countries rely on ways that are idiosyncratic for the coordinating economic actors and their decisions. Regarding the first research question ("What research is available to explain the influence of secondment on labour productivity growth?") and more specifically with respect to the different approaches of CMEs and LMEs towards labour productivity growth and labour market flexibility, the literature often describes the (conventionalised) German economy as an exemplar for applied non-flexible forms of coordination. In CMEs, patient capital enables firms to pursuing projects which are only profitable in the long run. It also allows companies to react differently to demand shortfalls: firms would rather maintain the market share, accept lower prices and maintain the labour force.

Long periods of notice and dismissal protection enable both companies and employees to focus on firm-specific skills. Employees are less concerned with their general employability and firms can afford to invest in training as the institutional context allows them to retain workers. Collective

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[9] Secondment workers are also covered by the short-time work scheme. See chapter 4 for more details.

bargaining makes headhunting less interesting as it equalizes working conditions across firms. Knowledge sharing takes the form of inter-firm collaboration rather than worker mobility.

Lazonick's (2007) analysis of the innovative enterprises in Germany points out to the presence of highly educated workforce both at shop floor and management levels – the apprentice system is the symbolic entrance ticket to corporations. Regional accumulation of skilled labour leads to symbiotic activities of medium-sized companies as well as big corporations, such as in Baden-Württemberg, where Porsche, Bosch, Mercedes and many mid-sized automotive companies are located. The German institutional framework promotes high skill in production workers through adequate training. The opportunities of upward mobility for the shop floor workers add to the need for such an institutional framework. The importance of career-long functional specialization in Germany firms has led to functional segmentation which made them vulnerable to competition from more organizationally integrated Japanese firms.

Germany's welfare state comprises an umbrella of welfare measures which ousted the market from its position as a major welfare provider, yet, the liberal notions of market efficiency and commodification were never seriously questioned (Esping-Andersen, 1990, p. 27). It commits to the traditional family – excluding stay-at-home wives and fostering maternity. But most importantly, it relies on the concept of subsidiarity which encompasses that the state only addresses issues which cannot be solved at a more local level.

Germany's todays welfare state comprises a plurality of measures. It exceeds the classical welfare state domains upbringing and re-employing and presents many opportunities for employees to address family matters: For example, in case of serious illness, workers are entitled to reduce the weekly working hours and the Federal Employment Agency takes care of some of the cost.

This chapter has shown that the German institution framework is designed for continuity and stability rather than flexibility pertaining to labour relations. After studying both the institutional and economical context of Germany, the next chapter will analyse secondment as a labour market phenomenon within the German economy.

4. Secondment

Secondment is approached in a descriptive way in this chapter. It provides an overview of regulations, developments and some descriptive statistics on secondment in Germany. It aims at providing a better understanding of secondment as a labour market phenomenon. General developments in secondment are described and compared to other European countries. Secondment workers are described along the following topics and partly also compared to the overall workforce: fluctuations in the total number of people employed; salaries; recruiting; existing work contracts and terminated contracts as well as the domains they work in. The chapter concludes with a short summary thereof.

4.1. Regulations

Since 1972, secondment is depicted by law in Germany. Table 1 summarises the most important regulatory changes with regard to secondment (Bundesagentur für Arbeit, 2018a).

Table 1.

Chronology of legislation regarding Secondment in Germany (Bundesagentur für Arbeit, 2018a).

Date	Regulatory change
1985	• Prolongation of the maximum secondment duration from 3 to 6 months
1994	• Maximum secondment duration increases to 9 months • Repeal of the synchronisation ban for from the Federal Employment Agency (FEA) assigned and difficult to place unemployed people
1997	• Increase of the maximum secondment duration to 12 months • Permission to synchronise the first use with the employment contract for fist-time secondment • Permission to unique time limitation without objective reason and repeated time limitations of contracts with the same secondment employee
2002	• Increase of the maximum duration to 24 months, enforced conformity after 12 months.
2003	• Discontinuation of synchronisation- and rehiring ban and the maximum duration of secondment • Enforced conformity principle in absence of divergent collective agreements
2009	• "Law on securing employment and stability" enables short-time work for secondment workers (till 31st December 2011)
30th April 2011	• Introduction of the "revolving door clause"[10] • Introduction of a lower wage limit

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[10] Prohibits to dismiss employees and rehiring them as secondment workers with worse contractual conditions within 6 months.

1st December 2011	• Implementation of the EU-secondment regulation (creation of the application area of the secondment jurisdiction, among others)
2012	• Introduction of a lower wage limit till 31st October 2013, as of 1st April 2014: Second act regarding the lower wage limit (till 31st December 2016)
1st April 2017	• After 9 Month, secondment employees must receive the same pay as permanent staff • Maximum duration of secondment: 18 months

Note. Sourced and modified Bundesagentur für Arbeit (2018a). Dates: 1st of January, if not specified otherwise.

The most important regulatory changes surely concern the maximum secondment duration and conformity of employment conditions, which are have a significant influence on the price-competitiveness of secondment.

4.2. Development of Secondment

The development of secondment is shaped both by regulatory changes as well as high business activity (Bundesagentur für Arbeit, 2018a). The great financial crisis of 2008/2009 caused a sharp decline of secondment, despite short-time work was reformed to also cover secondment agencies. Pronounced increases in Secondment are observed after pathbreaking regulatory changes. In especial, deregulation as of 1st January 2002 lead to a subsequent rise in secondment. Also, the Harz-reforms resulted in further growth of the branch.
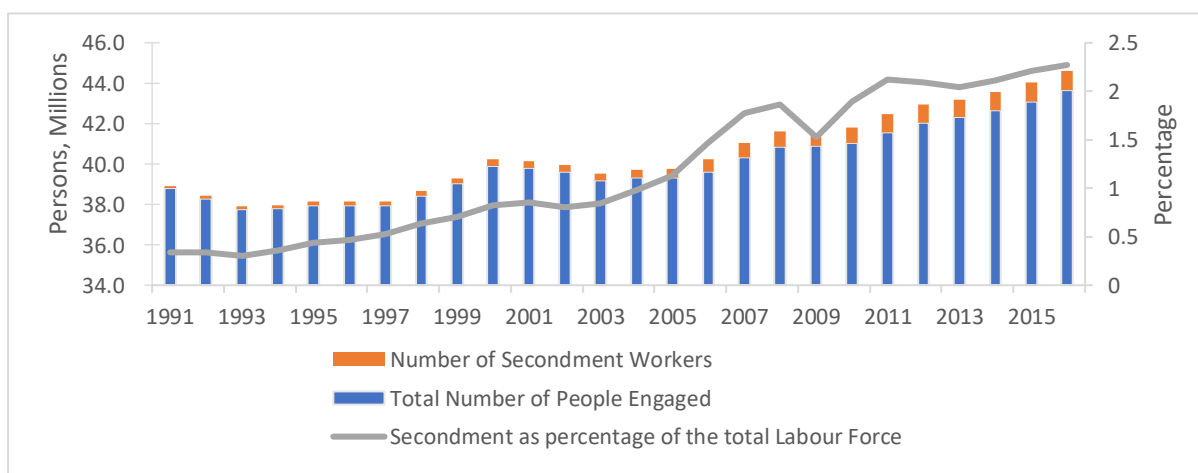
Figure 2: Number of Secondment employees from 1973-2017, own calculations based on FEA data (Bundesagentur für Arbeit, 2015, 2017; OECD.stat, 2018)[11].

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[11] The data was pooled from these three sources. As of January 2013, the statistical registration method of secondment workers changed, which might explain some of the increase afterwards, as the coverage most probably increased (Bundesagentur für Arbeit, 2018a).

The following figure compares secondment intensities for several European countries (Figure 3). The countries have been selected such that they represent the variety of secondment intensities in Europe. The Figure shows that different levels of secondment intensity persist within countries. For the European Union as a whole, a slight upward trend can be observed.
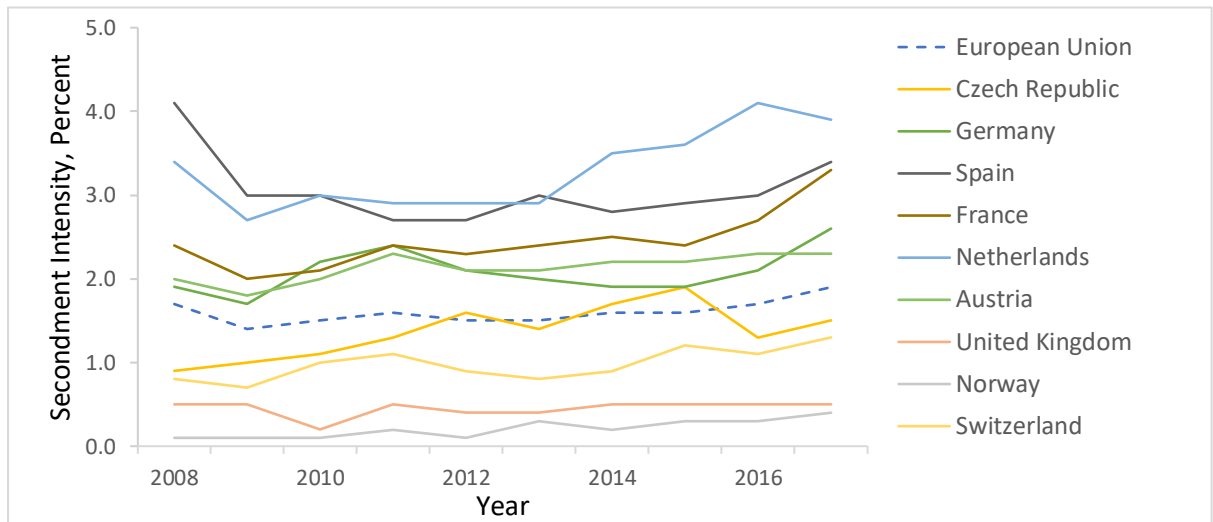
Figure 3. Development of secondment intensities compared across Europe. Author's calculation based on Eurostat data (Eurostat, 2018).

Figure 4 shows that secondment workers, in many years, account for a much more than proportional share of fluctuations in employment. Compared to the overall number of employees in Germany, secondment has a rather smaller share with roughly 3%. Still, growth and declines of secondment have a significant impact on the development of total employment. In 2006, for example, the share of secondment in total increase in employment exceeded 50%. When the crisis stroke in Germany in 2009, secondment workers had to bear the cost, as overall employment declined slower than secondment employment.
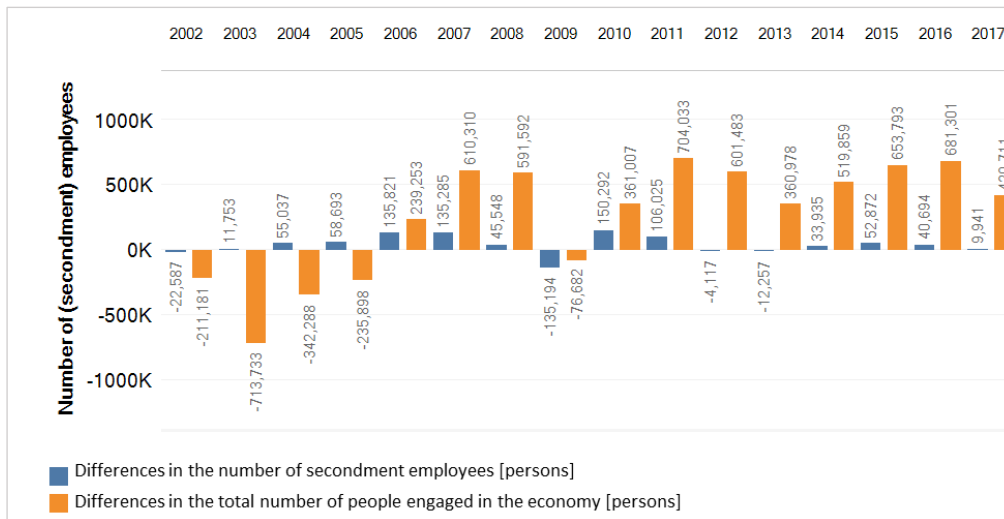
Figure 4: Fluctuations of employment compared. Own calculation using data by the FEA(Bundesagentur für Arbeit, 2018b).

4.3. Employment in Secondment

In the first half of 2017, roughly 719.000 people were employed by a secondment agency, which is a 6% increase as compared to the year before (Bundesagentur für Arbeit, 2018a). Secondment features workers from many education levels and previous employment histories, but it largely represents an employment prospect for the unemployed, for those facing unemployment, young professionals and job-returnees. Roughly two thirds of the employment contracts with secondment agencies were concluded with persons who were previously unemployed or who have never had an employment contract before. Almost three quarters of those were unemployed for up to one year and one quarter either never had an employment relationship before or were unemployed for longer than one year. One third of the newly employed in the secondment sector were consecutively employed, in other words, previous employment bordered employment by a secondment agency.
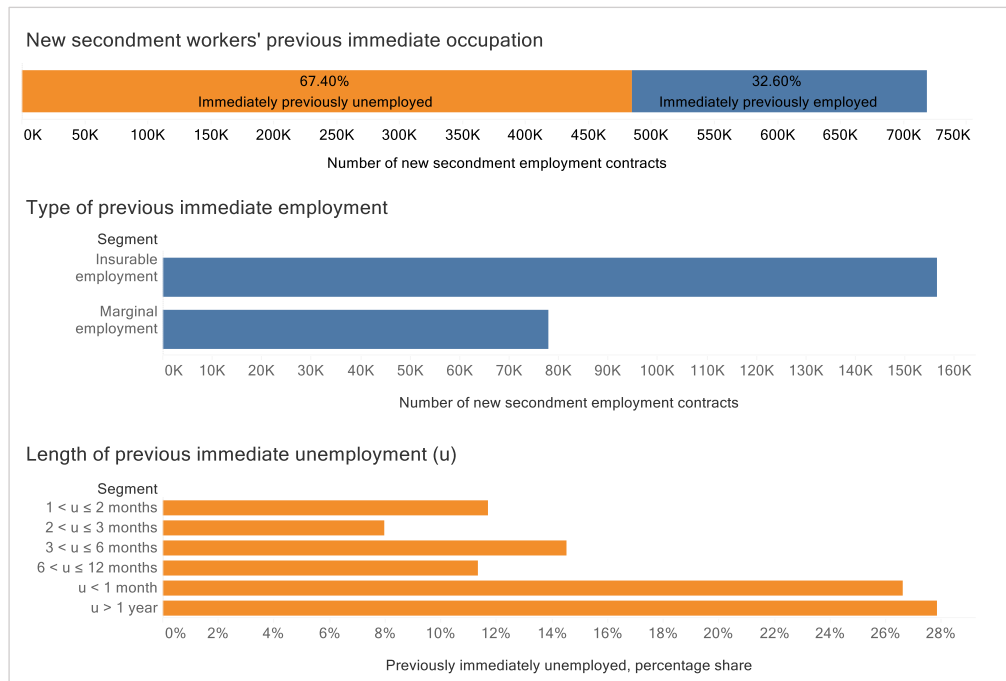
Figure 5: Previous occupations of secondment employees compared. Own calculation based on FEA data (Bundesagentur für Arbeit, 2018b).

Also, the number of terminated employment relations with secondment agencies reflects the dynamics within that branch. 719.000 new employment contracts face 661.000 terminated employment contracts in the secondment branch. The durations of secondment employment contracts which were terminated in the first half of 2015 are striking, roughly 24 percent of the contracts have existed for more than one year, whilst almost 28 (!) percent have existed for less than one month, as shown in Figure 6 based on data from the federal employment agency (Bundesagentur für Arbeit, 2018b) .
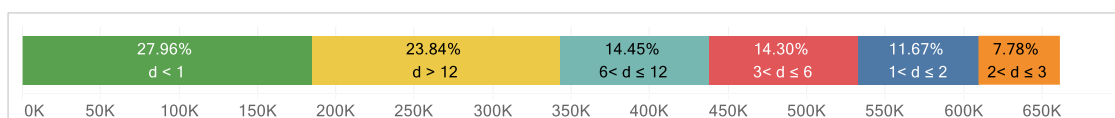
Figure 6: Number of terminated secondment employment contracts in the first half of 2015, duration (d) in months. Own calculation based on FEA data (Bundesagentur für Arbeit, 2018b).

The duration of existing employment relations between secondment workers and secondment agencies at certain key dates also represents the dynamics in that sector. Figure 7 shows the duration of existing secondment employment contracts at certain key dates (either 31st of December or 30th of June) (Bundesagentur für Arbeit, 2018b). By the end of June 2017, the total number of secondment employees equalled 1,13 Million. About 47% of those have existed for more than one year, employment contract durations of more than three and up to twelve months almost make up another third. The last 22 percent are covered by employment relations of up to 3 months.
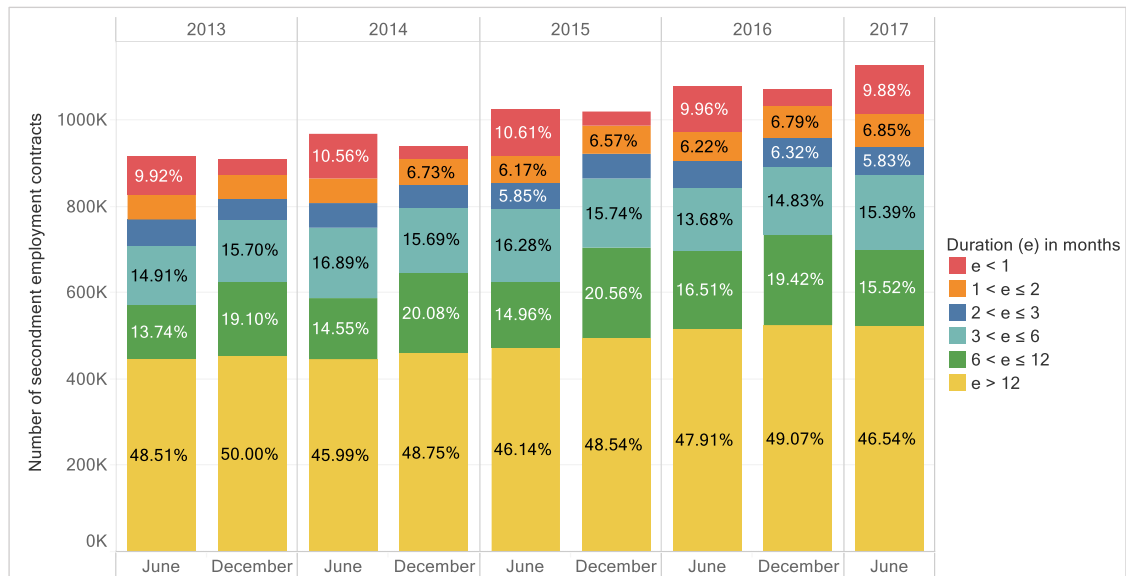
Figure 7: Duration of employment contracts between employees and secondment agencies which were in force on the reference date. Author's calculations based on FEA data (Bundesagentur für Arbeit, 2018b).

Over the course of time, a seasonal pattern becomes visible: Employment relations of up to one month are higher on the reference date in summer, and so are those of six till 12 months at the reference date in December, due to stronger business activity during the summer months.

Also, the wages earned by secondment workers differ from the median salaries in overall employment, see Figure 8. Segmenting by expertise, it becomes evident that secondment workers earn less than employees in regular employment relations. Secondment workers in assistant positions earn a median salary of 1543 Euro monthly which amounts to 72% of their regular employed colleagues. The higher the expertise, the smaller the pay-gap becomes, as experts receive roughly 86% of median salaries as compared to regular employment.
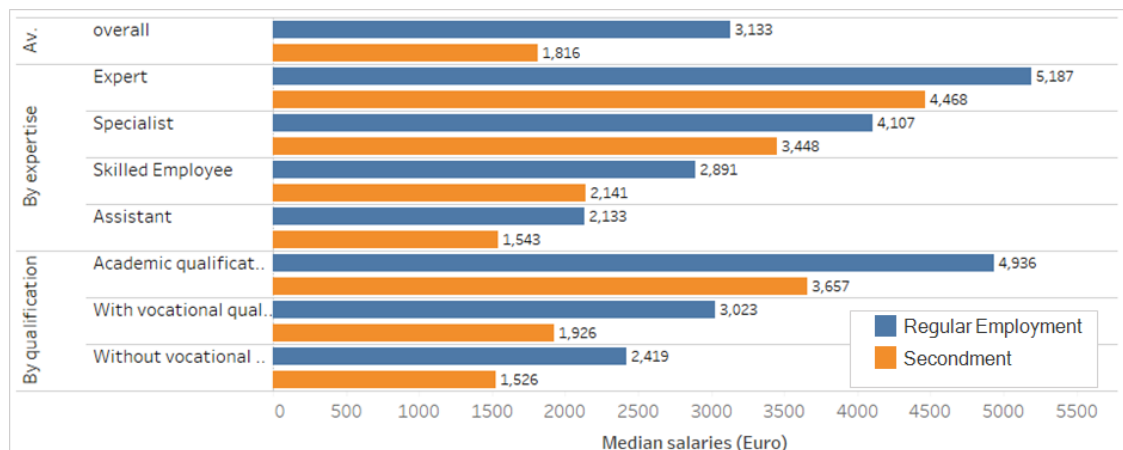
Figure 8: Salaries: Secondment and overall employment compared. Own calculation based on FEA data (Bundesagentur für Arbeit, 2018b).

Segmentation by qualification tells a similar story. The higher the educational level is, the closer the median salaries in secondment resemble those in regular employment. Apparently, academic qualification is not tantamount to expert expertise in terms of the pay-gap as secondment employees with academic education earn roughly 25% less than their regularly employed counterparts. Secondment employees without qualification and those with vocational qualification earn over a third less as compared to regular employment. Secondment employees of all expertise and qualification earn much less money than their regularly employed colleagues, but, alarmingly, the biggest gaps are observed at the lowest salaries in absolute terms, making it difficult to live off these salaries, let alone supporting a family. The median salaries in the secondment sector overall are more than 40% lower as compared to general employment. This is due to the distribution of secondment workers which is strongly skewed towards low-end activities, both in terms of qualification and expertise.

In subsection 3.3.2 it is mentioned that the Federal Employment Agency no longer focusses on jobs that match the experience and qualification of the unemployed – any job is sufficient. Figure 5 has shown that many people that enter secondment agencies were previously unemployed. Together with Figure 8, one can follow that the strategy of the Federal Employment Agency to quickly re-employ might drive people into accepting worse salaries at secondment agencies as the shorter duration of unemployment benefits might also restrict room for manoeuvre.

Secondment is centred around four main domains (Figure 9): business and business-related activities, production, person-related services and other business-related services (Bundesagentur für Arbeit, 2018b). IT and natural sciences only play a minor role.
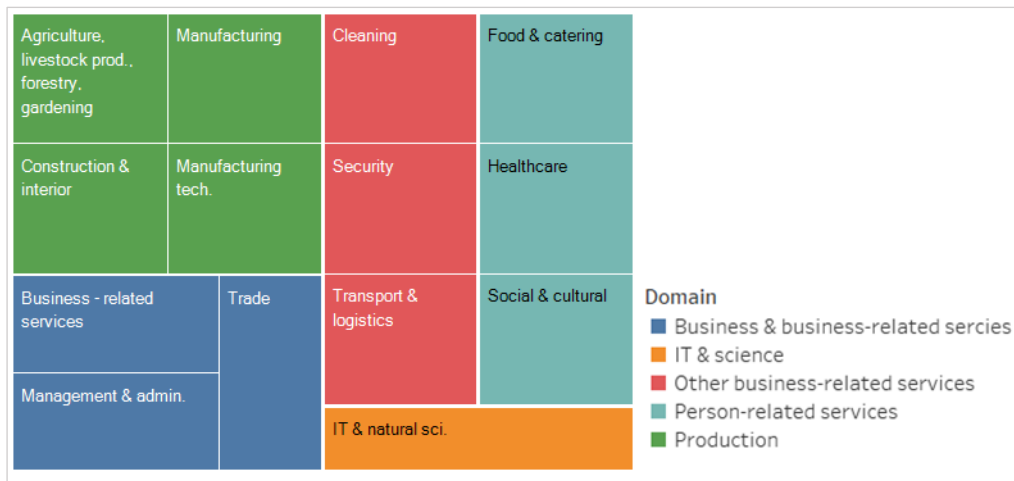
Figure 9: Division of secondment employees by domains. Author's calculation based on FEA data (Bundesagentur für Arbeit, 2018b).

Comparing the distribution of secondment and overall employment over the main domains show that secondment workers are not distributed proportionally (Figure 10). Considering the overall employment situation, only roughly 35% of all employees work in production-related fields. Of all secondment employees, however, almost 50% work in production-related jobs. A relation of almost factor three is observed in other business-related services which plays a lot smaller role within the secondment sector.
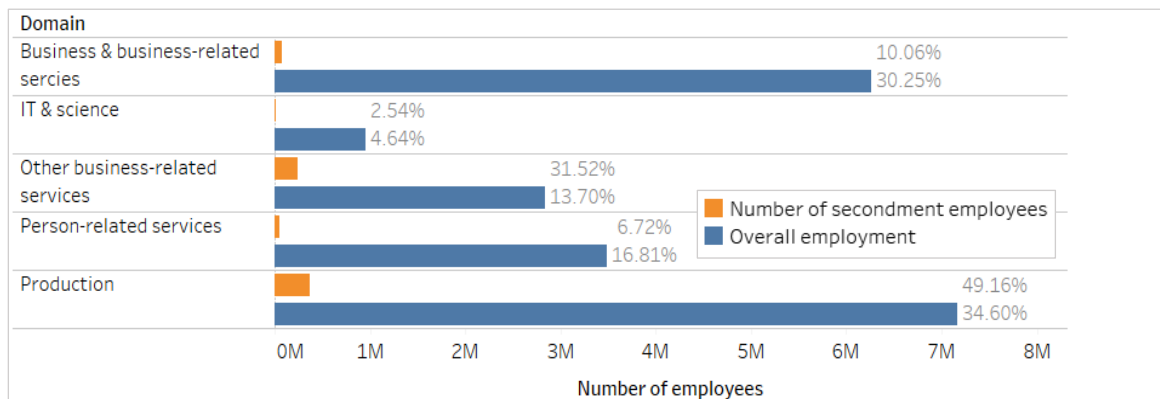
Figure 10: Domains of secondment workers compared to overall employment. Calculated based on FEA data (Bundesagentur für Arbeit, 2018b).

4.4. Secondment and Codetermination

From a technical point of view, secondment workers remain employed at their "home" organisation, whilst they work at their host organisation. Wassermann and Rudolph point out that, under certain conditions, secondment workers can participate in the workers' council elections (2007). From a legal perspective, however, in assessing the number of seats assigned to worker representatives, the

54

number of secondment workers is not taken into consideration as they are not employees of that specific firm. In the years 2002 to 2006, the number of organisations in which secondment workers participated in workers' council elections has risen from 23 % to roughly 31%, indicating efforts in integrating secondment workers. This confronts workers' councils with the problem of less resources as compared to the number of employees they practically represent (for example the number of people with payed leave for workers 'council activities). From employees' perspective, this is critical as their representation in and influence on the organisation diminishes.

Organisations in turn can make use of that situation to weaken codetermination. Given the situation that an organisation's number of employees is close to, but smaller than a certain threshold of the codetermination legislation, managers might opt for secondment workers instead of regular employees to keep the assessment basis for codetermination (number of employees) under that threshold. Deploying secondment workers still enables the firm to increase the number of people working for it without augmenting the number of employees on its payroll. The study by Wassermann and Rudolph (2007) indicates that almost 30% of the employers agreed to voluntarily consider the number of secondment workers eligible to vote for determining the number of seats for the worker representatives. In fact, they also report cases in which the number of seats assigned to worker representatives declined due to intensified use of secondment as a measure to optimize the number of employees relative to a certain threshold. On average, worker representatives lack roughly 10% of the seats they could have had if secondment workers were considered.

4.4.1. Secondment and worker unions

Earlier in this chapter, labour unions have been described as a core feature of the classical German Model. Mulitze (2006) quotes an comment of an IG-Metall secretary on secondment, which expresses their view boldly (as cited in Wassermann & Rudolph, 2007, p. 15): "For a long time, we have championed the view that secondment should be forbidden, and that is why we have not devoted attention to this domain".

4.5. Summary

Secondment itself was rather insignificant in Germany up until a series of deregulations pertaining to the maximum secondment duration which is the maximum time a company can engage a worker from a secondment agency. The most prominent regulatory change happened in 2002, when the maximum duration was doubled to 24 months. In the same year, enforced conformity after one year was introduced which requires secondment employees to work for the same conditions as regular

employees of the company. But not all regulatory changes fall under deregulation: In the wake of the crisis in 2009, a bill enabling short-time work for secondment workers was passed and in 2011, dismissing employees and re-hiring them as secondment workers was prohibited.

Nowadays, the total number of secondment workers does not exceed a couple percent of the total workforce (2.3 percent in 2016), but still, changes in the number of secondment workers account for a significant share of the fluctuations in the total workforce – in other words, secondment workers more prominently absorb fluctuations in employment than regular employees do. In 2009, for example, the decrease in the number of secondment employees exceeded the net change in overall employment, as calculated based on data by the FEA (Bundesagentur für Arbeit, 2018a). This branch is generally very dynamic which is evident from the numbers on terminated contracts. Approximately 28 percent of all terminated contracts have lasted for less than a month. Between June 2013 and June 2017, the number of secondment employment contracts existing longer than a year is mostly just below 50 percent. The remainder is composed of contracts existing for less than a year.

Moreover, roughly two thirds of all freshly contracted secondment workers are recruited from within the unemployed whilst roughly 30 percent of the previously unemployed secondment workers have been unemployed for more than a year, showing that secondment especially constitutes an opportunity for the unemployed to re-enter the labour market. Segmenting secondment workers by domain, it becomes evident that the largest single group is production, followed by business related services (trade, management), other business related services (such as cleaning, security, transport and logistics), person related services such as food and catering, healthcare, social and cultural domains.

Salary-wise, secondment workers are worse off than regular employees and that independently of the education level – the median salary in secondment amounts to approximately 1800 Euros as compared to 3150 euros in the overall labour force, as calculated based on FEA data (Bundesagentur für Arbeit, 2018b). Still, with increasing education levels, the pay gap between secondment workers and regular employees dwindles. Here, the highest salaries in the secondment sector are received by experts (classification according to expertise) rather than by workers with academic qualification.

Pertaining to codetermination, secondment provides companies with a possibility to artificially lower their total number of employees, which is the reference value for different levels of codetermination. There are several thresholds, for example 500 employees and 2000 employees, which could trigger a company's management to rather opt for secondment workers instead of regular employees to not overstep the threshold.

5. Methods

This chapter provides an overview on the regression methods which will be used for data analysis in the following chapters. Two different streams of methods are used: methods for time series and for panel data analysis. A time series is defined as a group of observations x_t which are each observed at a specific time t (Brockwell & Davis, 2002). A panel refers to several groups of observations x_{it} which are each observed at a specific time t for several in of time series on several individuals i (countries, firms, et cetera.); put differently, a panel consists of several time series on different individuals (Brockwell & Davis, 2002). With respect to time series analysis, ordinary least squares linear regression was used. As this is a basic method, this chapter focusses on panel data econometrics.

5.1. Panel Data Econometrics

In the recent years, panel data research has become more popular in social science research as it allows for the analysis of individual-level change (Andreß, Golsch, & Schmidt, 2013). Cross-sectional data suffices for the analyses of levels and trends but estimates of stability and change are only possible based on panel data. Panel data also has more to offer as to take measures regarding omitted variable bias – it is possible to control for at least some of the unobserved heterogeneity.

Econometric models for panel data analysis differ in how they approach unobserved heterogeneity. If there is neither unit-specific nor temporal effects, then the panel could be treated as a single big cross section – the data could be pooled and analysed by means of an ordinary least squares regression model (Yaffee, 2003). This model has constant coefficients, referring to both slopes and intercepts. A model with no significant temporal effects but with significant differences between the cross-sectional units is called fixed-effects model. In this case, the model has constant slopes, but the intercepts are specific to the cross-sectional unit and may or may not change over time. The random-effects model approaches the unobserved heterogeneity by adding a random constant term to the regression equation and by assuming "that the intercept is a random outcome variable" (p. 7). The random outcome variable, in turn, consists of a mean value and a random error term which is cross-section specific.

The remainder of this section deals with the intuition behind the models which were introduced in the previous paragraph and concludes with technical aspects of and the formulas behind the methods in Stata.

5.1.1.The Fixed-Effects Model

The fixed-effects estimator is suitable for the analysis of variables which vary over time (Torres-Reyna, 2007). It investigates the effect of an independent variable on a dependent variable within a specific unit (firm, individual person, country, et cetera) with unique characteristics that potentially impact the independent variable. Opting for fixed-effects, one assumes that peculiarities of the individual might affect or even bias the independent or dependent variable and that there is a need to account for that – in other words, one assumes that the individual's error term is correlated with the independent variable. The fixed-effects estimator removes all time-invariant characteristics so that the pure effect of the independent variable on the dependent variable becomes observable.

Another assumption behind the fixed-effects model is that these time-invariant characteristics are idiosyncratic to the individual and that they are not correlated with the characteristics of other individuals (Torres-Reyna, 2007). The characteristics of the individual are embraced in the constant and the error term. If this assumption is violated, that is to say that the error terms are correlated, then inferences produced by the fixed-effects model might be incorrect as that relationship needs to be included in the model.

In conclusion, the fixed-effects model estimates cannot contain a omitted variable bias due to time-constant characteristics (Torres-Reyna, 2007). A drawback of this method is that the fixed-effects estimator cannot be used to research time-constant causes of changes in the dependent variable. Therefore, the fixed-effects model aims at investigating causes of changes within a unit, which cannot originate in time-constant factors. As mentioned earlier, correlation between the time-invariant characteristics causes problems in the fixed-effects estimates and need to be included in the model. In some cases, this can be accomplished with the random-effects model, which will be discussed in the following part (main motivation for the Hausman test).

5.2. The Random-Effects Model

The random-effects model assumes that the variance across units is random and not correlated with the independent or dependent variables (Torres-Reyna, 2007). If there is a theoretical rationale that the differences across units haven an effect on the dependent variable, then the random-effects model should be preferred. A main advantage of this model is that it allows for the inclusion of time-invariant variables. Random-effects models assume the unit's error term is not correlated with the independent variables so that variables which are constant over time can also serve as independent variables. Contrary to fixed-effects, one must specify these individual characteristics

that possibly influence the independent variables. This may not always be possible and hence lead to omitted variable bias.

5.3. Panel Data Models in Stata

The Stata command "xtreg" allows the fitting of regression models to panel data (StataCorp LLC, 2017). In the options, one can specify whether to fit a random-effects model (option "re"), a fixed-effects model which uses the within estimator (option "fe") and the option "re" fits a generalized least squares random-effects model.

The general models applied by xtreg have the following form:

$$y_{it} = a + x_{it}\beta + v_i + \epsilon_{it}$$ Equation 17

for $i = 1, \ldots, n$ and for each $i, t = 1, \ldots, T$, where T_i are the periods that are actually observed. In this equation, the main interest lies in the estimates of β and less attention is paid to the error term $v_i + \epsilon_{it}$. v_i is defined as the "unit-specific error term" (p.423) which is constant for any unit in the data set. ϵ_{it} is the ""usual" error term with the usual properties" (p.423) which refers to a mean of 0, no correlation with itself, v and x, as well as homoskedasticity.

Given the truth of Equation 17, it must also be true that

$$\bar{y}_i = \alpha + \bar{x}_i\beta + v_i + \bar{\epsilon}_i$$ Equation 18

with $\bar{y}_i = \sum_t y_{it} / T_i$; $\bar{x}_i = \sum_t x_{it} / T_i$; and $\bar{\epsilon}_i = \sum_t \epsilon_{it} / T_i$. Furthermore, if Equation 18 is subtracted from Equation 17, it must be true that

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\beta + (\epsilon_{it} - \bar{\epsilon}_i)$$ Equation 19

Based on the former three equations, β can be estimated (StataCorp LLC, 2017). The Stata command "xtreg" with the option "fe" runs the fixed-effects estimator, which is also known as the within estimator and uses OLS to estimate Equation 19. The between estimator is run by using the same command with the option "be" and performs the estimation by using OLS on Equation 18. The option "re" provides the random-effects estimator, which amounts to "[…] a (matrix) weighted average of the estimates produced by the between and within estimators" (p.423). Random effects correspond to the estimation of the following equation:

$$(y_{it} - \theta\bar{y}_i) = (1 - \theta)\alpha + (x_{it} - \theta\bar{x}_i)\beta + \{(1 - \theta)v_i + (\epsilon_{it} - \bar{\epsilon}_i)\}$$ Equation 20

In this equation, θ is a function of the variances σ_v^2 and σ_ϵ^2. $\sigma_v^2 = 0$ would mean that v_i is always 0 and that θ is also equal to 0. Then, Equation 17 can be estimated by means of OLS. If σ_ϵ^2 equals 0, then θ is also equal to zero and the fixed-effects or within estimator transports all the information, which would be tantamount to a regression with an R^2 of 1.

The fixed-effects estimates based on Equation 19 are conditional to the assumption that the v_i have no distribution and can be treated as "fixed and estimable" (StataCorp LLC, 2017, p. 423). This has quite some implications for the use of the fixed-effects estimator, but other than that, there is much in support of this estimator. Regarding the between estimator, the conditions on the sample which are imposed by the fixed-effects estimator are not assumed, but it requires the assumption that v_i and $\bar{x}_i$ are uncorrelated, according to the assumptions of the OLS estimator. If the latter two where correlated, the estimator could not discriminate between how much of the change in $\bar{y}_i$, due to an increase in $\bar{x}_i$, needs to be attributed to β or to the correlation which is not known. Also, the random-effects estimator requires this assumption of no correlation. It produces more efficient results as compared to the between estimator even if the small-sample properties are unknown. It is more efficient since the between estimator leaves the over-time information in the panel out of consideration whereas the random-effects estimator both makes use of between and within information of the panel.

5.3.1. Variance estimators

A main assumption of traditional statistical inference is that the data are independent (Angrist & Pischke, 2008). An important form of dependence occurs in group-structured data, which is called the "clustering problem" (p. 221). Serial correlation, in contrast, refers to correlation over time. Often, these problems are approached with the in most statistical programmes readily implemented option "robust", which performs the "robust or sandwich estimator of variance" (StataCorp LLC, 2017, p. 20). Thereby, some robustness to misspecification is achieved, but only if the observations are independent. Angrist and Pischke (2008), though, explain that if robust standard errors are used with homoscedastic residuals, the robust estimator may be a lot more biased than the conventional standard error. Consequently, robust standard errors can be even more misleading than classical standard error if heteroskedasticity is only modest. Robust standard errors are subjected to a much higher sampling variability as compared to classical OLS standard errors. Prudence is necessary in case of small samples due to additional bias that can arise. As a rule of thumb, they recommend special caution in cases where the robust standard errors fall short of the classical standard errors.

Most panel estimation commands in Stata allow for specification of how to approach the estimation of the variance-covariance matrix (VCE) that corresponds to the parameter estimates (StataCorp

LLC, 2017). Standard errors reported in the regression table correspond to the diagonal elements of the VCE (root of the variances). The option "vce(robust)" performs the "robust or sandwich estimator of variance" (p.20).

The option "vce(cluster *clustvar*)" relaxes the assumption regarding independence of the observations by specifying that the standard errors allow for intragroup correlation (StataCorp LLC, 2017, p. 21). In other words, the independence assumption is relaxed within groups (clusters), but they remain independent across groups. "clustvar" specifies the cluster variable, for example "industry" as a comprehensive group for firms. It only affects the standard errors, not the estimated coefficients.

5.4. Summary

Panel data models differ in how they approach unobserved heterogeneity. Given the presence of temporal and / or unit-specific effects, then the panel cannot be regarded as one big cross-section (Torres-Reyna, 2007). If this is the case, ordinary-least-squares regression is not appropriate. The fixed-effects model, instead, lends itself in situations with significant differences between the cross-sectional units. The model has constant slopes, but different intercepts per unit. As the fixed-effects model removes time-invariant characteristics, it cannot contain omitted variable bias due to these constant characteristics. The random-effects model assumes that the variance across units is random and not correlated with the independent or dependent variables. If there is a reason to assume that the differences across units influence the dependent variable, then this model is preferred. It also allows for the inclusion of constant terms, but the individual characteristics must be specified because they are not removed which might lead to omitted variable bias. Robust standard are commonly used to achieve some robustness to misspecification, but Angrist and Pischke (2008) stress that robust standard errors are a lot more biased if used with modest heteroskedasticity.

6. Data

In this chapter, data for the subsequent regression analysis are described. The chapter revolves around two different data sources, which were the starting point for the creation of four data sets. Firstly, the Structural Analysis Database (STAN) by the OECD is used for the compilation of a national-level data set and an industry-level data set with a coarser segmentation. These two data sets represent entire Germany. Here, the focus lies on how different classification systems were aligned to subsequently merge the data. Moreover, on firm-level, a data set by the Institute for Employment Research" (IAB) which belongs to the German Federal Employment Agency was used. It is based on social data which is subjected to the data protection clause of the social security statue book. The chapter concludes with a summary of data availability. It involves restriction pertaining to publication of results and usage of the data which slows down the process considerably.

6.1. Structural Analysis Database

STAN is the acronym for "Structural Analysis Database" – a database that allows for the analysis of industry as well as national level performance at a considerable level of detail (OECD, STAN Database, 2005). It provides information on output, input, international trade and investment and hence facilitates the analysis of productivity, competitiveness and structural developments on a yearly basis. Most of the financial variables are available in current prices, volumes and deflators. It relies mainly on OECD member countries' national accounts and combines them with data from industry surveys and censuses, but it also relies on estimations and thus does not necessarily represent member countries' data submissions. Industries are segmented based on ISIC rev. 4 to enable international comparisons (OECD, n.d.). STAN is updated continuously, meaning that new data are published as soon as it is available. The data are available online and can be downloaded for offline use in several formats (OECD.stat, 2018). Due to the continuous updates, the downloaded data represents a "snapshot" of the database on that specific date. The data are available for the period 1991-2016 for Germany.

6.1.1. Complements to STAN: Statistics by the Federal Employment Agency and Destatis

The STAN Database, in the first place, provides industry-level data on production, output, people employed, etc, but for this research, it must be complemented with data on secondment and supervision, among others.

Data on secondment

The German Federal Employment Agency regularly publishes various data sets on German employment. Data on secondment workers as well as secondment agencies is collected for two reference dates per year (30th of June and 31st of December each year) and made available online (Statistik der Bundesagentur für Arbeit, 2018). The data were accessed on the FEA's web page for the period 12/2011-06/2017 (Statistik der Bundesagentur für Arbeit, 2012, 2014a, 2014b, 2015a, 2015b, 2016b, 2017a, 2017b, 2017c, 2018). In Contrast to the STAN data set, this series relies on classification by occupation instead of classification by industry, based on "Klassifikation der Berufe 2010" (KldB 2010). This occupational classification system is applied to the secondment data as of the third quarter of 2011 (Statistik der Bundesagentur für Arbeit, 2012). Unfortunately, the new occupational classification system KldB 2010 is not compatible with the old one (KldB 1988), limiting the workable data to the period December 2012 till June 2017[12]. The Federal Employment Agency also publishes the total number of secondment workers on a yearly basis (Bundesagentur für Arbeit, 2012). From 2011 onwards, the statistics are based on reports submitted by employers with the entitlement to send their employees to different companies (Statistik der Bundesagentur für Arbeit, 2012). All applicants who comply to the requirements are legally entitled to receive a secondment permission. If a company is in possession of such a permission, it is obliged to report statistics regarding seconded employees. All firms which engage in secondment are captured and not only those which can be described as secondment agencies[13].

In compiling the panel, the occupational classifications are summed up along their one-digit classification. Arithmetic averages of the values for each year are computed for two reasons: Firstly, to match the STAN data, which has only one data point per year, variable and category; and secondly, to smoothen seasonal swings in the data (which are quite pronounced, see Figure 2)[14].

In conclusion, data on secondment categorized by occupation is available for the period 2012-2016.

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[12] Segmentation by type of industry would be unrewarding as most of the secondment workers are employed by secondment agencies so that, segmenting by industry, most of them would be captured by the secondment industry, making it impossible to account for them as a part of their "host" industries (where secondment workers contribute to the output).

[13] These statistics are preferred over the general employment statistics as these capture secondment employees by economical assignment of their employer (secondment agency) so that it is not possible to discriminate between permanent personnel and secondment workers in any given company.

[14] Unfortunately, this leads to dropping both the 2011 observation since the observation for June 2011 is missing, and the 2017 observation since the observation for December 2017 is missing.

The Federal Employment Agency publishes occupational data with respect to the German workforce for two reference dates per year, namely 30th of June and 31st of December (Statistik der Bundesagentur für Arbeit, 2017d). To compile the time series on supervision, the data has been downloaded for each of the reference dates for the period of December 2012 till June 2017 (Statistik der Bundesagentur für Arbeit, 2014c, 2014d, 2015c, 2015d, 2016a, 2016a, 2017d, 2017e, 2017f, 2017g). Unfortunately, there is no older data available due to a change in occupational classification system, as described in the previous paragraph. The data are presented based on a four-digit occupational classification code, where a nine as the last digit indicates supervising or managing functions. This procedure comes at a cost some imprecision as the category 7110 ("business executives and board members") is not specified per industry category or attributed to a certain industry. Intuitively, this error is not of great concern given the small number of board members as compared to the overall employment and, on the reference date of 30th of June 2016, this category accounts for only 0,01% of total employment (own calculation).

In compiling the panel, the occupational classifications are summed up along their one-digit classification to align the data with the main industry categories (see section 6.1.1). Arithmetic averages of the values for each year are computed as to match the STAN data, which has only one data point per year, variable and category[15]. In conclusion, data on Supervision is available for the period of 2013 – 2016.

6.1.1. Matching the STAN Data with Federal Employment Agency Data

Due to a mismatch of segmentation systems, both the STAN database and the statistics by the Federal Employment Agency had to be brought down to a common denominator. ISIC rev. 4 relies on a system of lettered main categories (A till U) and two-, three- and four-digit sub-categories, of which the two-digit categories are considered in the STAN database (United Nations, 2018). Data by the German Federal Employment Agency, however, relies on nine broader main categories which are also segmented into three layers of subcategories (Statistische Ämter des Bundes und der Länder, 2011). The data on secondment by the Federal Employment Agency is much more aggregated as it relies on merely 16-19 categories, depending on the year. Those categories in turn are taken from the second level of segmentation in KldB 2010, rendering the main categories of

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[15] Unfortunately, this leads to dropping the 2012 observation since the observation for June 2012 is missing, and the 2017 observation, since the observation for December 2017 is missing (December 2017 is not of great concern for it is not covered in the STAN data set, as we will see in section 6.1.1).

KldB 2010 suitable to be used as main industry categories in this data set. The table below provides an overview of those categories:

Table 2.

Industry classification description.

Category	Description
Category 1	Agriculture, forestry, livestock, gardening
Category 2	Raw materials, production, manufacturing
Category 3	Construction, architecture, mapping, facility engineering
Category 4	Natural sciences, geography, IT
Category 5	Transport, logistics, protection, security
Category 6	Commercial services, trade in goods, sales, hotel business and tourism
Category 7	Company organisation, accounting, law and administration
Category 8	Health, social affairs, education, upbringing
Category 9	Linguistic, human and social sciences, economic sciences,

Note. (Statistische Ämter des Bundes und der Länder, 2011)

Subsequently, one of the nine main industry categories were assigned to the 99 first-order subcategories of the STAN database, relying on the definitions and explanatory notes of KldB 2010 and ISIC rev.4 (United Nations, 2018). Unfortunately, some of the 99 categories in the STAN database are pooled, for example subcategories number 31 (Furniture) and 32 (Other Manufacturing) are accounted for as one category and hence cannot be assigned to different main industry categories. Also, KldB 2010 and ISIC rev.4 rely on a different logic regarding some categories: ISIC rev.4 category number 45 (Wholesale and retail trade and repair of motor vehicles and motorcycles) consolidates sales and repair of vehicles and motorcycles, while KldB 2010 separates maintenance and sales (the percentage error still needs to be estimated). In addition to that, ISIC rev.4 relies on some catchall categories such as number 71 (Architectural and engineering activities; technical testing and analysis), number 72 (Scientific research and development) and number 96 (Other personal service activities) which, for example, captures services such as funeral, dry cleaning, hair dressing and wellness services. Table 3 shows the magnitude of these categories based on gross output in absolute terms and as a share of the total:

Table 3.

Gross output of STAN Categories D71, D72 and D96, and total (in Million Euros) and as a percentage of total.

Category	Absolute values			Percentage of Total		
	1991	2004	2015	1991	2004	2015
D71	2731595	4040111	5497831	1.07%	0.99%	1.24%
D72	29256	39969	67958	0.40%	0.52%	0.58%
D96	10933	21037	31925	1.18%	1.13%	0.92%
∑ D71, D72, D96	32162	45827	50387	2.65%	2.64%	2.73%

Note. Own calculation based on STAN data *(OECD.stat, 2018)*

Due to the relatively small share which these three categories have in the total, it is refrained from taking more complex measures to further itemize these categories by means of market share data ore similar. Instead, their subcategories were allocated to the main industry categories to then evenly distribute the magnitude over those. Numbers 71 and 72 span three respectively four categories and were allocated in equal shares to each of those, meaning that the nominal value of number 71 was divided by three and one third was attributed to each of the main industry categories. Number 96 can be attributed – based on its subcategories – to the main industry groups five and eight, but its catchall subcategory ("not elsewhere classified") had been left out.

Assigning the ISIC categories in the STAN database to the above-mentioned main industry categories was advantageous over ascribing the Federal Employment Agency database to some main categories formed out of the STAN database due to the following reasons: Firstly, the STAN database is segmented more accurately. Secondly, the STAN database allows for modification and adjustment of the level of detail regarding the classifications during the preparation for download as contrasted with the Federal Employment Agency data. Also, the classification here is tailored to the data, meaning that only significant subgroups are listed (in terms of size). Opposed to that, the STAN database follows its classification system quite stolidly.

Appendix A contains an exemplary table of how the categories from the STAN database were assigned to one more of the nine main industry categories[16]. It is imported to note that the STAN database works with different levels of aggregation: Some subcategories are pooled (for example D05T09: Mining and quarrying [B]) and it is tempting to assume that the more aggregate group of subcategories is created out of its components. That, however, is often not the case. The previous example contains subcategories five till nine and all variables as well as all years are covered.

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[16] The entire table is available upon request.

Though, the subcategories on their own are unbalanced as they have some omissions and cover only the years 2008-2015 and merely half of the variables, as the subcategories are derived from the more aggregate category. In this case, the subcategories rely on estimates based on Detailed Structural Business Statistics (DSB) or data from industry censuses (OECD.stat, 2018). That poses considerable constraints on the process described above to match these different data sets. Especially exasperating is that during the process of disaggregating broader groups of categories, more detailed variables such as hours worked are no longer included, limiting the denominator of possible productivity measures to "number of persons engaged". That being said, it has been attempted to compose the main industry categories by adding subcategories form the STAN database with the highest levels of aggregation.

In classical productivity theory, capital has a high importance, for instance see Solow (1957) or Syverson (2011). Unfortunately, the omissions in the more disaggregate levels of classification in the STAN database also effect capital. Therefore, the missing values are estimated based on capital to labour ratios in more aggregate classification levels. Here, the closest superordinate aggregation level is used. Due to other omissions, the capital labour ratio is limited to "Number of persons engaged – total employment" as opposed to hours worked or similar. Referring to the example in the previous paragraph, "D05T09: Mining and quarrying [B]" represented the closest superordinate aggregation level, meaning that its capital to labour ratios on a yearly basis have been used to estimate the capital labour ratios of its components "D05T06: Mining and quarrying of energy producing materials", "D07T08: Mining and quarrying except energy producing materials" and "D09: Mining support service activities". Due to similar best practices and technologies within industries, it is assumed that subcategories would rely on similar capital to labour rations. Table 4 gives an overview of the STAN industry subgroups for which capital values had to be estimated.

Table 4.

Share of STAN industry groups D74 and D75 in the total and their respective main industry category, based on gross output.

Category (STAN/ main industry category)	Gross output [M Euros], year		
	2008	2011	2015
Total	4811296	5111952	5497831
Category 2	1487714	1545905	1621326
Category 8	379519	427260	495005
D74	15098	16551	22583
D74, percentage of Total	0.31%	0.32%	0.41%
D74, percentage of Cat. 2	1.01%	1.07%	1.39%
D75	2913	3289	4597
D75, percentage of Total	0.06%	0.06%	0.08%
D75, percentage of Cat. 8	0.77%	0.77%	0.93%

Note. *Own calculation based on STAN data* (OECD.stat, 2018)

The share of the STAN industry subcategory in the total as well as in their respective main industry category has been calculated based on gross output for the years 2008, 2011 and 2015. It becomes evident that the categories with estimated capital values have a negligible small share in the total. Also, in their respective main industry category, they don't exceed 1.4%, so that this estimation process is not expected to negatively affect the results.

A similar issue arises with respect to gross output and value added expressed in Volumes (2010 Euros), which is not available at more disaggregate levels of industry classification. In the STAN database, inflation adjustment is industry-specific and the underlying inflation rates vary significantly. The general procedure is very comparable to the one of capital. Deflators were calculated from nominal and inflation-adjusted values of the closest subordinate category and then applied to the category at hand. This only concerns the STAN categories D74 and D75, so that the same comparativeness applies as presented in Table 4.

6.2. IAB Establishment Panel

The German Institute for employment research IAB („Institut für Arbeitsmarkt- und Berufsforschung"), which belongs to the Federal Employment Agency disposes of a database for its own research and for non-commercial research studies (IAB, 2018). For research purposes, the Research Data Centre (FDZ) of the German Federal Employment Agency provides access to firm-

level data with respect to social security and employment. The IAB Establishment Panel was used for this project[17] and the description reads as follows (FDZ, 2018):

> "The IAB Establishment Panel is an annual representative survey on various topics such as the determinants of labour demand. It has been conducted by the IAB since 1993 in West Germany and since 1996 in East Germany, too. The IAB Establishment Panel is the central basis for the analysis of labour demand in Germany."

Subsections 6.2.1 to 6.2.4 treat general characteristics of the data set, particularities regarding application and access as well as the preparation of the data set for analysis. Especially data access and publication of results are idiosyncratic and impose considerable restrictions on the pace of progress. Subsections 6.2.5 and 6.2.6 present technical aspects of the data preparation process and inflation adjustment. The last subsection presents how the data has been aggregated to create an industry-level data set based on firm-level data.

6.2.1. Survey Description

The IAB Establishment Panel covers firms of all sectors and sizes in Germany (Ellguth, Kohaut, & Möller, 2014). The survey started with roughly 4300 interviews in 1993 and since 2001; about 15500 firms are surveyed yearly. It is designed for both longitudinal and cross-sectional analysis. Establishments which took part in the survey in the previous year are contacted again – the interviewer's first task is to assure that the same unit still exists. In case of a different address and a significantly different number of employees, the interviewer follows a special procedure to determine the cause of these differences. If the procedure fails to dispel doubts, the firm is still surveyed but only included into the cross-sectional dimension.

The Establishment File of the Federal Employment Agency covers all establishments and agencies with a minimum of one employee subjected to social security and serves as a sampling frame for this data product (Ellguth et al., 2014). One-person establishments and those with only marginal forms of employment are not covered. The sampling method is "optimum stratification, whereby the probability of selection increases with the size of the establishment." (p. 30). As to account for panel mortality and changes in the economy, new firms are added to the panel every year.

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[17] The data application was filed for the Linked Personnel Panel (LPP), which is a linked-employer-employee data set. The IAB Establishment Panel is provided with that data set and contains firm performance indicators. After all, longitudinal data was preferred over the cross-sectional character of the LPP data set (only two waves) and hence, the analysis was based on the IAB Establishment Panel.

The panel is based on a questionnaire which, for the major part, is composed of annually asked questions regarding the workforce in terms of structure, education, recruitment, temporary and flexible forms of employment et cetera (Ellguth et al., 2014). Part of the topics are complemented with biennial questionnaires mostly about further training and innovation. Furthermore, every wave contains a focal topic of current political interest.

For the most part the IAB Establishment Panel is funded by the German Federal Employment Agency – ultimately, much of the data set is funded by the contributors to the German social security system (Ellguth et al., 2014). The Federal States also contribute financially to realize state-specific questionnaires to supplement the main part which grants them access to the entire data set.

6.2.2. Application Procedure

Requesting the data took a considerable amount of time and turned out to be successful. The data application process revolves around an application form, which is structured as follows: project description (both technical and in layman terms), reasoning for why and how the project is related to the German social security system or to scientific labour market research, reasoning for why the project is for public interest, a project end date, and reasoning why the information in this data set is required for the project. For the first time, I contacted the FDZ in early February 2018 and the agreement was signed in early April.

The submission of a first draft of the application lead to a fruitful discussion on several technical aspects of this project which were very helpful also for the progress of the thesis itself. Firstly, an FDZ employee raised the question how to distinguish between secondment and regular employees within any individual company. This lead to the idea of accounting for secondment workers in terms of secondment intensities. Secondly, the FDZ employee was concerned that secondment workers are not covered by surveys in their host organisation (the information in the data set is partly based on surveys), but the organisation they are employed at. That concern was addressed by considering secondment workers as "input" (via secondment intensity). Thirdly, in the first draft of the application, the end date of the project was specified as 1st of September 2018 (in accordance with the nominal duration of this master's degree). However, the employee was afraid that the project length might not be sufficing to deal with the complexity of the data. For more leeway, the end date was postponed to 1st of November 2018.

Also, it was discussed whether to include sensitive information on industry affiliation. "Sensitive" refers to that the inclusion of the variable in the data set must be justified separately. Due to the increased risk of identifying companies in the data set based on more precise industry affiliation,

the data are slightly more aggregated and no longer representative if that information is included. Hence, it has been desisted from including sensitive information on industry affiliation.

6.2.3. Data Access and Publication of Results

The data protection clause of the social security statue book also requires data protection measures beyond the initial screening of the project proposal (Hochfellner et al., n.d.). Due to the confidentiality of the data, the access is triple-layered: The FDZ provides test data, which have the same format as the original data and which can be used to prepare routines for on-site use as well as remote execution. The FDZ provides test data for every data set and Stata do-files to facilitate the simulating of the on-site work environment on a private computer. Likewise, the FDZ limits the preparation of the data (creating panels, merging aggregate data, creating variables) and the analysis of the data to Stata do-files (user-written routines) as these must follow a certain structure: Different stages of the analysis process must be specified in single do-files, for example, one do-file for the panel creation, a second for data preparation, a third for descriptive statistics, and so forth. These are required to be executed from a master do-file, so that the whole routine can be executed by running only the master do-file. This structure is the same for both on-site use and remote execution.

Once certain routines are created, they can be uploaded to the platform "JoSua" in either "internal use mode" or "Publication / Presentation Mode" (FDZ, 2017, p. X). "JoSua" then runs the scripts on the original data. The "Internal Use Mode" is meant for data preparation, the analysis of preliminary results and routine-testing. The output is automatically censored and can neither be downloaded nor used for publications and presentations. The "Publication / Presentation Mode", on the contrary, runs the routines in the same way only that it prompts manual review of the results which creates downloadable files for publications and presentations (the review takes five business days).

Remote Data Access is subjected to severe restrictions: The limit of jobs per user is one job a day, meaning that one set of routines can be uploaded and executed on any given day. Unfortunately, the daily job limit is not sensitive to errors, implying that a failed job still exhausts the daily job limit. A review procedure blocks the remote data access interface: Only after a job in presentation / publication mode exits the procedure, the interface is available again for the remote execution of macros.

On-site, one can work with the original data and run statistical tests at will, only limited minor restrictions regarding Stata commands (FDZ, 2017). The data can be accessed at several sites in Germany, England and the USA whilst the number of work places is limited and must be reserved

upfront[18]. After an on-site stay, routines can be uploaded in "Presentation / Publication Mode" which both creates downloadable results and routines, so that the do-files can be further edited off-site. All inquiries in "Presentation / Publication Mode", however, are censored manually which causes a delay of roughly five work days between inquiry and delivery of the results. The criteria for data review are applied with varying strictness – one and the same macro did pass the review the first time it was submitted but not the second time, making this procedure somewhat unreliable and time consuming.

On top of that, several restrictions apply to the code and the presentation of the results (FDZ, 2017). The code must be written in such a way that it is transparent to people familiar with the software (newly generated variables must be accompanied by a description, et cetera). Much attention is payed to documenting the number of observations a value is based on. More specifically, any results based on less than 20 observations will be deleted during the data privacy review and other values will be rounded to prevent reverse calculation. This also applies to ratios and the corresponding subgroups and to aggregates. Regarding publication, the rule of 20 observations implies that one cannot create scatter plots, since results for publication must never be informative about single observations (also applying to thin ends of histograms, residual plots, et cetera).

6.2.4. Data Access in Practice

Both remote execution and the possibility to work on the data on-site were used extensively. Much of the data work has been done during two onsite stays in Nürnberg and Mannheim. It is recommended to work on do-files in advance to make the most out of the on-site stay. The rules demand that these do-files are submitted at least three business days up front. After an on-site stay of three days, the do-files must be uploaded in presentation / publication mode to firstly obtain downloadable and presentable results, but also to further edit the do-files. According to the manuals, this may take up to five business days, but in practice, it even exceeded five business days. Bear in mind that it is not possible to remotely analyse data if one job is pending. In conclusion, the on-site data use in Nürnberg including preparation and follow-up took a total of 11 business days.

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[18] When I first contacted the nearest site in Cologne in early April, it was already booked up till mid-September.

6.2.5. Data Preparation

The IAB Establishment Panel is available for the years 1993-2016. Pertaining to secondment, however, the panel lacks data between 1998 and 2002. The analysis focusses on the other part, covering the years 2002 – 2016. The initial state of the data set comprises roughly 380.000 observations. Albeit, having chosen labour productivity growth as the dependent variable reduces the useful number of observations to a fraction of the initial number. Only those firms which provide information on either hours worked or the number of people engaged can be used to investigate the research objective. The data set also contains information on the profit situation in the previous year, but, unfortunately, only in the form of a categorical variable ranging from "1. very good" till "5. defective", so that it cannot be used in the productivity measure.

Information on the number of employees, freelancers, secondment workers, and interns is provided in the data set. Labour productivity could be defined based on the total number of employees, but if that was the case, the use of secondment workers in addition to the firm's employees would by definition increase labour productivity growth. Output would rise, but the nominal number of employees would remain constant (if secondment workers do not replace standard employment). In a different scenario, secondment workers could be used to replace standard employment. Still labour productivity rises, as output remains the same, but the number of employees decreases. Therefore, regarding the productivity measure, all people engaged in a company are considered (including employees, freelancers, interns and secondment workers). This, however, requires information on each of these categories.

These thoughts require the data to be meaningful on four concepts (numbers of: employees, interns, secondment workers, freelancers). The variables indicating the numbers are accompanied by categorical variables indicating whether the companies make use of a specific group, as indicated by the extract of a questionnaire in Figure 11:

30. In addition to the total number of employees reported in question 26, did you <u>also</u> employ staff from the following employment groups on 30 June 2016?

If so, **how many approximately?**

Total

a) Freelancers under contract for services	Yes .... □ ⇒ namely .... _____ No .... □
b) Temporary agency workers	Yes .... □ ⇒ namely .... _____ No .... □
c) "One-Euro-job" holders (work opportunities with additional expenses compensation)	Yes .... □ ⇒ namely .... _____ No .... □

Figure 11. Survey Question regarding secondment, freelancers and One-Euro-Employment (Institut für Arbeitsmarkt- und Berufsforschung (IAB) der Bundesagentur für Arbeit, 2016).

The data set is structured as follows: Most continuous variables, for example regarding the number of freelancers, are preceded by a binary variable indicating the existence of the concept (typically coded "Yes" respectively "No", sometimes "-9 n.s." for no-response).

Critical are those observations where the respondent positively indicates the presence of one group, but which are followed by a non-response regarding the number thereof. How could one make inferences about labour productivity if the number of one of the groups is not disclosed? Therefore, observations indicating answers other than "Yes" or "No" in the first part of the question were not considered for analysis. A binary variable indicating "Yes" regarding the engagement of for example freelancers followed by a missing value or non-response in the continuous variable consequently also leads to the deletion of that observation, as the number of people engaged cannot be conceived correctly.

Some other changes were necessary: A binary variable indicating "No" regarding the engagement of a certain group is followed by a missing in the continuous variable. As this would also stop the observation from being used (Stata returns a missing value if one of the values in the calculation is missing), it seems reasonable to recode these as "zero" in accordance with the binary variable. Figure 11 also gives indication on the general nature of the data set: Much of the information is collected for the reference 30th of June and, consequently, might not be reflect the business practice as averaged over the entire year.

The denominator in labour productivity growth has been delineated in the previous paragraph, leaving only the numerator unspecified. The panel provides information on business volume and the profit situation in the previous financial year. Profit however, is provided as a factor variable, ranging between "very good" and "defective". Hence, business volume is limited to business

volume in the nominator. There is some uncertainty as to which year the information on business volume belongs to. The question from the 2016 questionnaire is framed as follows (see Figure 12):

8. What was your business volume in the business fiscal year (normally the year 2015)?

Statements should be given only for the business unit in question (not e.g. for larger units including different locations). If the value cannot be indicated exactly, an approximation will suffice.

Approximate amount: _____ €

Figure 12. IAB 2016 Questionnaire: question on business volume. (Institut für Arbeitsmarkt- und Berufsforschung (IAB) der Bundesagentur für Arbeit, 2016)

There is no information on the fiscal year as such. It is assumed that information on business volumes generally belong to the previous fiscal year (the question belongs to the 2016 questionnaire whilst the question specifies that it normally relates to the year 2015) and corresponding changes were made.

As mentioned in section 2.1 and 2.2, capital is an important component of the production function. Unfortunately, the IAB establishment panel provides no information on capital stock. According to Mueller, it is common practice to use total investments as a proxy for capital stock (2008). Still, this is tied to the assumption that investment expenditures mirror depreciation. This approach is based on proportionality of investment and capital stock and therefore does not allow for the addition of net investments to replacement investments, as Mueller explains. He proposes a method for capital stock estimation which produces higher values for the capital proxy, but he concedes that his estimates could also be upward-biased. Hence, in this project, capital stock is proxied by total investments as the benefits of capital stock estimation are not totally clear and as the procedure itself is rather complex.

6.2.6. Inflation Adjustment

All monetary values in the data set are presented as nominal values so that inflation adjustment is necessary. For this purpose, GDP deflators[19] have been used (The World Bank Group, 2018), as recommended by Felipe and Kumar (2011).

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[19] As compared to consumer price indices (CPI), GDP deflators do not contain foreign goods and no imports (EconPot, 2006). CPIs include imports bought by consumers. For this project, the key difference is that GDP deflators cover all goods and services and CPIs only those bought by consumers. Therefore, GDP deflators seem appropriate. Test with CPIs have lead to similar results.

6.2.7. Aggregation on Industry Level

The firm-level data of the IAB contains variables indicating industry affiliation according to the German industry classification system (Fischer, Janik, Müller, & Schmucker, 2009). This opens the way for a more detailed panel on industry level as compared to the one based on OECD data, as described in section 6.1. The industry classification system is updated regularly – the IAB establishment panel contains three versions thereof. Unfortunately, these are not compatible with each other and each version of the classification system has only been applied as long as a newer version was not yet released. This means that the data can only be aggregated along one of these versions, which limits them maximum length of this industry panel to roughly six years. The data has been aggregated using Stata's "collapse" command ("collapse (sum) *variable1* (sum) *variable2*, by (industry classification year)"). This command aggregates the data along the values of the industry classification variable on a yearly basis.

6.3. Summary of Data Availability

In the previous sections, the composition of the data sets was described. Four data sets were obtained: One on national level, two on industry level and one on firm level. Figure 13 provides an overview on the data sets.
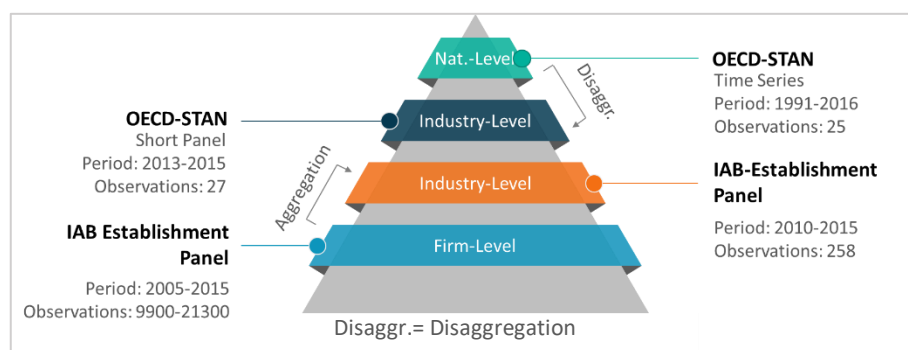
Figure 13. Summary of the data sets. The number of observations increases from top to bottom of the pyramid.

The data set on national level is based on OECD data, as well as the subsequent data set on industry level. The difference between the two data sets on industry level is that the upper one in the pyramid stems from the OED STAN data set, where much of the industry data are estimated taking national data as a starting point. The second industry panel, on the contrary, was created by aggregating firm-level data from the IAB Establishment Panel – the starting point is firm-level data. Also, this data set relies on a much more detailed industry classification system (43 categories versus nine). Another mayor difference is that the data sets based on STAN data reflect the entire economy –

these are no samples (partly estimates, though). The firm-level data sets, however, rely on optimum stratified sampling.

Access to the IAB Establishment Panel is strongly restricted: The original data can only be used on-site or via remote execution of Stata do-files. The publication of results is subjected to censoring which may take up to five working days and which poses restrictions on the statistical methods and the presentation of results. The data were accessed during two on-site stays in Mannheim and Nürnberg.

7. Results

This chapter presents the regression results on four different aggregation levels: Firstly, a time series for entire Germany covering the years 1991-2016 is analysed. Subsequently, a short panel on industry-level is investigated which segments Germany into nine industries and covers the years 2013-2015. Thirdly, an industry data set aggregated from firm-level data covering the years 2010-2015 is analysed. Lastly, a large micro-data panel gives insight into firm-level practises. Hence, with every section of this chapter, the number of observations increases.

7.1. National-Level: STAN Database

This time series covers Germany for the period 1991-2016. Secondment is investigated with respect to its influence on labour productivity growth. This section starts out with descriptive statistics, then the regression results are presented. After testing for robustness, the section closes with short concluding remarks.

The following variables were included in the analysis:

Table 5.

National-level variable description.

Variable	Unit	Remarks
Productivity	[%]	Growth rate of (value added per hour worked)
Capital	[%]	Growth rate of (capital stock per hour worked)
Economy	[%]	Percentage difference between the growth of value added and the trend growth of value added
Secondment	[%]	Number of secondment workers relative to all people engaged
Regulation	[-]	Dummy for regulatory change, coded 1 as of 2002

7.1.1. Descriptive Statistics

Figure 14 shows line plots of labour productivity defined as both Euros per hour worked (abbreviated as "productivity") and the growth rate thereof (abbreviated as "productivity gr"):
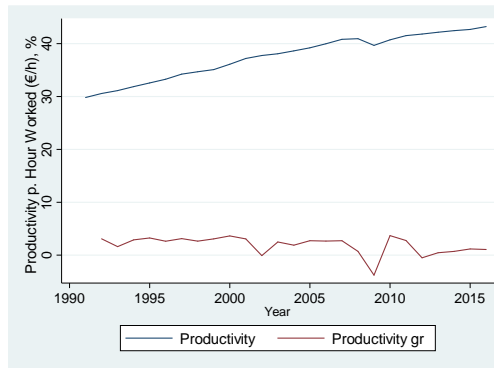
Figure 14. National level: Line plots of labour productivity and labour productivity growth over time.

The figure shows that labour productivity per hour worked has a strong upward trend and therefore does not meet the stationarity[20] assumption which is a requirement for many types of modelling (Stata, 2013). Expressed in growth rates, the upward-sloping trend is no longer present in neither of the four variables and also the problem of non-stationarity seems to be solved. Additionally, the Dickey-Fuller test for unit root was computed for labour productivity growth (Table 6).

Table 6.

National level: Dickey-Fuller test for unit-root.

Variable		Number of Obs.	Test Statistic	1% critical value	5% critical value	10% critical value	p-value for Z(t)
Productivity gr	Z(t)	24	-4.182	-3.75	-3	-2.63	0.0007

In this test, the null hypothesis states that the variable contains a unit root, whilst the alternative hypothesis states that the variable is founded on a stationary process. The test is highly significant so that the null hypothesis can be rejected. Similar as to the visual analysis, it can be concluded that the process behind the definition of labour productivity is stationary. Next to stationarity, normal distribution is assumed in many statistical tests and is assessed visually by means of histograms (Figure 15).

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[20] Stationarity implies that „all marginal and joint distributions of the process are invariant to time" (Pickup, 2015, p. 7).
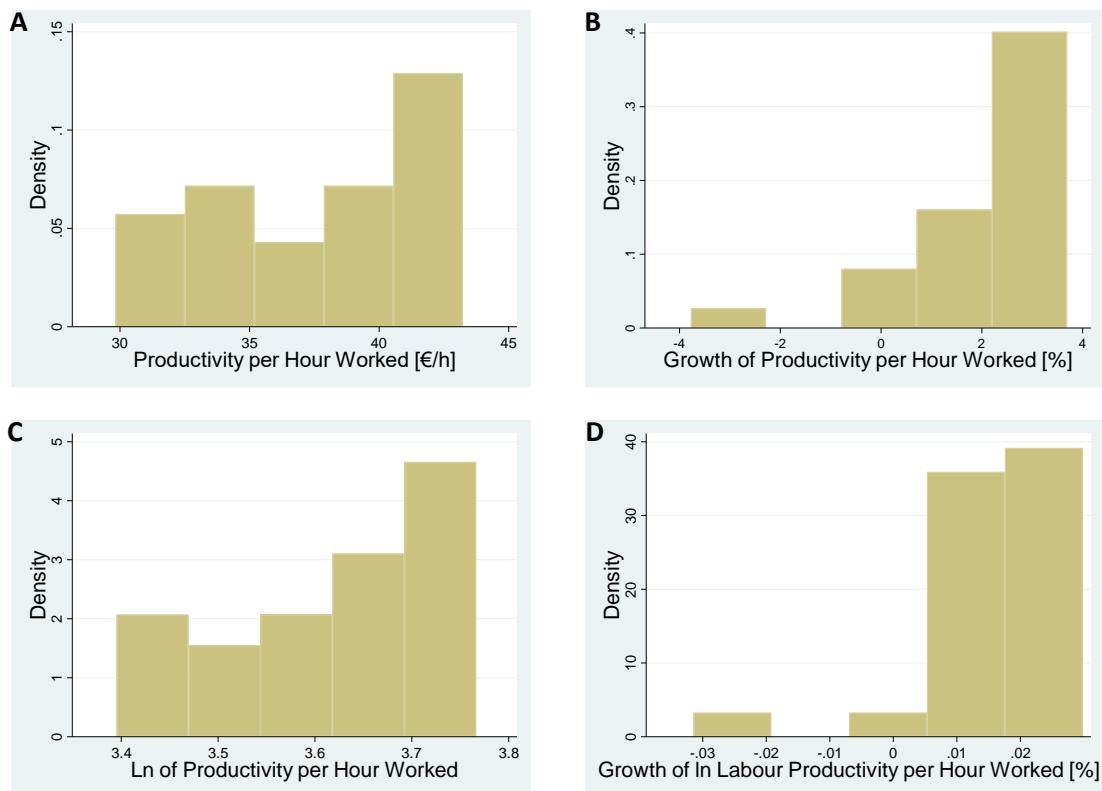
Figure 15. National level: Histograms of productivity per hour worked (A), growth of productivity per hour worked (B), natural logarithm (ln) of productivity per hour worked (C) and the growth[21] of the natural logarithm of productivity per hour worked (D).

Both productivity (histogram A) and the growth of productivity (histogram B) are far from normal distribution, but neither logarithmic transformation nor the expression of the logarithmic transformation in growth rates improved the distribution significantly. Therefore, the analysis will be based on the growth of productivity (unfortunately violating the normality assumption).

Ignoring the presence of serial correlation causes inefficient estimates of the coefficients and biased standard errors (Baltagi, 2005). Therefore, autocorrelation is assessed visually (in addition to regression postestimation tests) – Figure 16 and Figure 17 contain both autocorrelation plots and partial autocorrelation plots of labour productivity growth.

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[21] Approximated as the first difference of the natural logarithm.

80

Figure 16. National level: Autocorrelations of labour productivity growth.
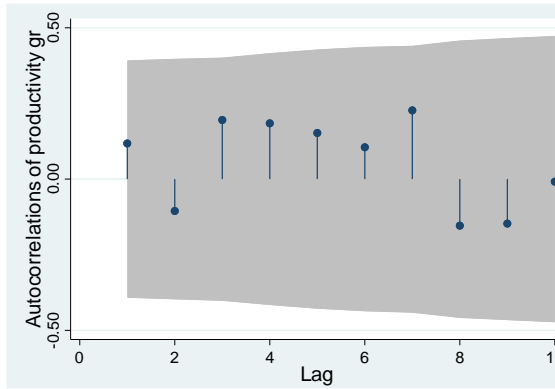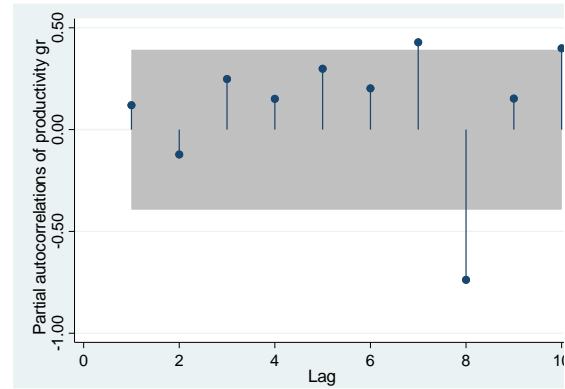
Figure 17. National level: Partial auto-correlations of labour productivity growth.

Regarding the autocorrelations, all lags are insignificant and hence do not indicate an autoregressive (AR) process. Also, the partial autocorrelations do not show any of the patterns described by Enders (2010, p. 63) with respect to moving average processes or the combination of both. Only the clear significance of the eighth la is somewhat suspicious as, to the best of my knowledge, there is no theoretical argument supporting the significance of the eighth lag.

Table 7 shows the correlation matrix for all variables which will be included in the regression analysis. Surprisingly, capital growth (which is defined as the growth of net capital stock per hour worked) and productivity are negatively correlated, which contradicts standard economic theory[22] (see Equation 3).

Table 7.

National level: Correlations of dependent and independent variables.

	Productivity gr	Capital	Secondment	Economy	Regulation
Productivity gr	1.0000				
Capital gr	-0.0861	1.0000			
Secondment	-0.4111	-0.7780	1.0000		
Economy	0.2029	0.1309	-0.0843	1.0000	
Regulation	-0.4950	-0.6462	0.8072	-0.1506	1.0000

The independent variable, secondment, is negatively correlated with labour productivity growth. Moreover, the scatter plot of labour productivity growth over secondment shows a negative trend –

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[22] Many studies estimate capital-labour substitution elasticities for the Netherlands roughly 0.3 (Naastepad & Kleinknecht, 2004). This estimate is not expected to be totally off as compared to the German economy, and hence, a positive correlation between capital and labour productivity growth was expected. If labour is substituted for capital, then the output is achieved with less working hours, so that labour productivity rises.

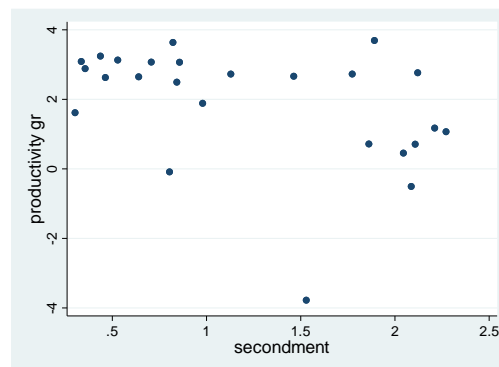higher levels of secondment seem to be associated with lower labour productivity growth (see Figure 18).

Figure 18. National level: Scatter plot of labour productivity growth over secondment intensity.

Table 8 contains summary statistics for all variables present in the regression analysis. The growth of labour productivity fluctuates between roughly -3.8 and 3.7 percent which seems plausible for an economy as a whole. The control variable for economic activity ("Economy") shows a very high standard deviation – it is approximately nine times higher than the average of that variable.

Table 8.

Time Series: Summary statistics.

Variable	Number of Observations	Mean	Standard Deviation	Min	Max
Productivity gr	25	1.9091	1.6703	-3.7759	3.6930
Capital gr	25	1.3804	1.6523	-1.0587	5.2839
Secondment	26	1.1884	0.7071	0.3023	2.2712
Economy	25	15.7545	137.4084	-438.8696	325.6408
Regulation	26	0.5769	0.5036	0	1

Still, this is plausible as it captures the deviation between the growth rate of value added and the trend growth rate of value added as a percentage. If, for example, value added grows twice as fast as the trends, then the variable takes a value of 100. The data also spans the financial crisis of 2007/2008, which lead to strong dip in economic activity in Germany with strong recovery. In the next section, the regression results based on the data presented in this section will be presented.

7.1.2. Regression Results

Table 9 contains regression results on national level based on the time series covering the years 1991-2016. The analysis was realized in the following manner: Capital intensity growth

82

(operationalized as the growth of net capital stock per hour worked[23], abbreviated as "Capital"), the control for economic activity ("Economy") and secondment intensity[24] ("Secondment") were added one after the other and regressed on labour productivity growth. Subsequently, the procedure was repeated including the dummy variable for regulatory change (increasing the maximum secondment duration from 12 to 24 months in 2002, "Regulation"). Unexpectedly, capital intensity growth has negative coefficients in all the regression, which, as mentioned earlier, contradicts standard macroeconomic theory[25]. It is highly significant when secondment intensity and the control for business cycles are both present in the regression. The models in columns three to six are all significant at the 0.1 percent level – the control for regulatory change ("Regulation") seems to have high explanatory power. Secondment intensity has a negative coefficient in all regressions but, without the control for regulatory change, it is only significant in combination with capital intensity growth and the control for economic activity (at one percent). The inclusion of the control for regulatory change leads to very high significance of secondment. After all, these regressions show evidence of a negative relation between secondment intensity and labour productivity growth. Accounting for regulatory change has little influence on the magnitude of the coefficients of secondment intensity; still it improves the overall significance of the models and the R-squared considerably.

The Durbin-Watson test for autocorrelation did indicate autocorrelation in none of the regressions in Table 9. However, in columns five and six, the test was indifferent (see Table 25 in Appendix A for detailed results). In addition, Durbin's alternative test for autocorrelation and the Engle's Lagrange multiplier test for autoregressive conditional heteroskedasticity were computed, which both remained insignificant for all regressions (see Table 26 and Table 27 in Appendix A).

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[23] Earlier models with capital operationalized as the growth rate of net capital stock per person engaged lead to coefficients for secondment in the same order of magnitude- however, with very insignificant coefficients for capital intensity growth.

[24] Previous tests with the growth rate of secondment intensity yielded regression results with very high R-squared values and showed signs of spurious regression, as the R-squared partly exceeded the Durbin-Watson dL-values. Consequently, it was refrained from including secondment intensity as a growth rate so that the absolute magnitude of secondment as a labour market phenomenon is not disguised in a growth rate.

[25] Capital intensity growth and labour productivity growth are also negatively correlated (see Table 7), but test with lags of capital intensity growth yield positive correlations between the first and second lag of capital intensity growth (0.4182 and 0.6005, respectively). Nevertheless, repeating the regression analysis with the first lag of capital intensity growth instead achieves no better results – all models lose their overall significance and none of the coefficients is significant either. Therefore, the analysis is based on capital intensity growth as opposed to a lag thereof.

Table 9.

National level: Regression results excluding lags of the dependent variable.

Variables	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
			Dependent Variable: Productivity gr			
Capital	-0.0870 (0.2100)	-0.1159 (0.2114)	-1.0797*** (0.2110)	-0.7047*** (0.1940)	-0.7138*** (0.1937)	-1.0955*** (0.1913)
Economy		0.0026 (0.0025)	0.0029* (0.0016)		0.0019 (0.0018)	0.0024 (0.0015)
Secondment			-2.9169*** (0.4957)			-2.0338*** (0.5848)
Regulation				-3.1586*** (0.6411)	-3.0997*** (0.6420)	-1.5946** (0.6761)
Constant	2.0292*** (0.4468)	2.0273*** (0.4460)	6.9194*** (0.8774)	4.7770*** (0.6406)	4.7244*** (0.6410)	6.8257*** (0.7962)
Observations	25	25	25	25	25	25
R-squared	0.0074	0.0541	0.6429	0.5281	0.5517	0.7206

Note. Standard errors in parentheses. gr = growth rate. All columns are estimated by OLS regression. Monetary values: 2010 Euros. *** p<0.01, ** p<0.05, * p<0.1. Period: 1991-2016.

"Productivity" abbreviates labour productivity growth and is defined as the growth of value added per hour worked. "Capital" represents the growth of net capital stock per hour worked. "Economy" is a control for economic activity. "Secondment" is number of secondment workers relative to the total number of people engaged. "Regulation" is a dummy for an increase in the maximum secondment duration, coded one as of 2001 (change from 12 to 24 month of maximum secondment duration.

In a well-fitted model, the residuals should not follow a pattern when plotted against the fitted values. Figure 19 contains residual-versus-fitted plots for two regression models of Table 9: In part (A) of the figure, secondment intensity, capital intensity growth and the control for economic activity were regressed on labour productivity growth (see column three). In the right part, secondment intensity, capital intensity growth, the control for economic activity plus a control for regulatory change were regressed on labour productivity growth (see column six).
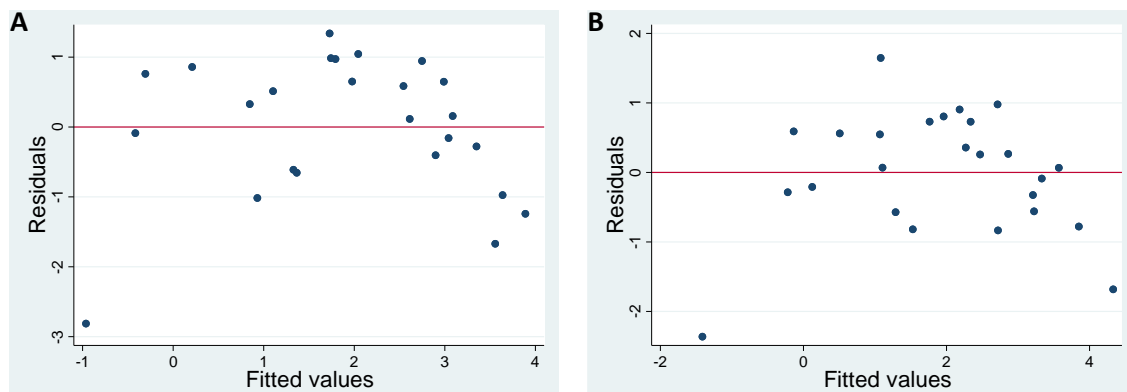
Figure 19. National level: Residual-versus-fitted plots for column three (A) and column six (B) of Table 9. Difference: (A) does not contain a control for regulatory change.

From the figure, it is evident that the inclusion of the control for regulatory change yields a more random distribution of the residuals (excluding the two outliers on the far left and far right, Figure 19 (B). Figure (A) shows a downward slope especially as of a fitted value of two. In conclusion, Figure 19 (B) appears to better meet the assumptions of the OLS-regression and is hence given priority.

7.1.3. Robustness

To test for the persistence of labour productivity growth it is recommended to include lags of the dependent variable into the regression, as countries with currently high labour productivity growth are more prone to high future labour productivity growth (Jansen, 2004). Therefore, up to five lags of the dependent variable were added to the regression equation. The first lag is not significantly different form zero, whereas the second lag only is significant in the absence of the control for regulatory change (see Table 30 in Appendix B). As of the second lag, the coefficients of additional lags are not significant either. The coefficient of secondment decreases as higher order lags are added.

Moreover, the sensitivity of the result with respect to different definitions of labour productivity was tested. So far, labour productivity was defined as value added per hour worked. Tests with gross output per hour worked most closely resembles the results in Table 9. But the other definitions are not far off either – labour productivity defined as value added per person engaged produces slightly higher coefficients for secondment intensity and regressions based on labour productivity defined as gross output per person produce lower coefficients for secondment intensity. Overall, these tests support the findings as different definitions of labour productivity yield results with the same sign and in the same order of magnitude.

7.1.4. Conclusion

This analysis is based on a time series for entire Germany that extends over the years 1991-2016. The data partly stems from the OECD STAN Database and is extended with statistics on secondment by the German Federal Employment Agency on the number of secondment workers. Regressing secondment intensity on labour productivity growth and controlling for capital intensity growth and regulatory changes, a coefficient of roughly minus three was found. Hence, an increase in secondment intensity of one percent point is associated with a decrease in labour productivity growth of three percent points.

Hence, we can reject the first null-hypothesis ("Higher levels of secondment intensity have no influence on labour productivity growth."); supporting the alternative hypothesis which claims that higher secondment intensities result in lower labour productivity growth. Having said this, it is not possible, based on this data set, to draw conclusions pertaining to the second, third and fourth group of hypotheses which treat moderating factors, supervision and characteristics of secondment.

7.2. Industry-Level: STAN Database

This short panel covers nine industries of the German economy for the years 2013-2015. Table 10 provides an overview over these industries:

Table 10.

Industry-panel: Nine Industries.

Category	Description
Category 1	Agriculture, forestry, livestock, gardening
Category 2	Raw materials, production, manufacturing
Category 3	Construction, architecture, mapping, facility engineering
Category 4	Natural sciences, geography, IT
Category 5	Transport, logistics, protection, security
Category 6	Commercial services, trade in goods, sales, hotel business and tourism
Category 7	Company organisation, accounting, law and administration
Category 8	Health, social affairs, education, upbringing
Category 9	Linguistic, human and social sciences, economic sciences,

7.2.1. Descriptive Statistics

Figure 20 aims at assessing stationarity of the dependent variable. It contains line plots of labour productivity defined as value added per person engaged in levels. Pronounced inter-industry

differences in the magnitude of productivity become evident - industry one (agriculture, forestry, livestock and gardening) has a labour productivity of roughly one fifths of the highest performing industry (number six; Commercial services, trade in goods, sales, hotel business and tourism).
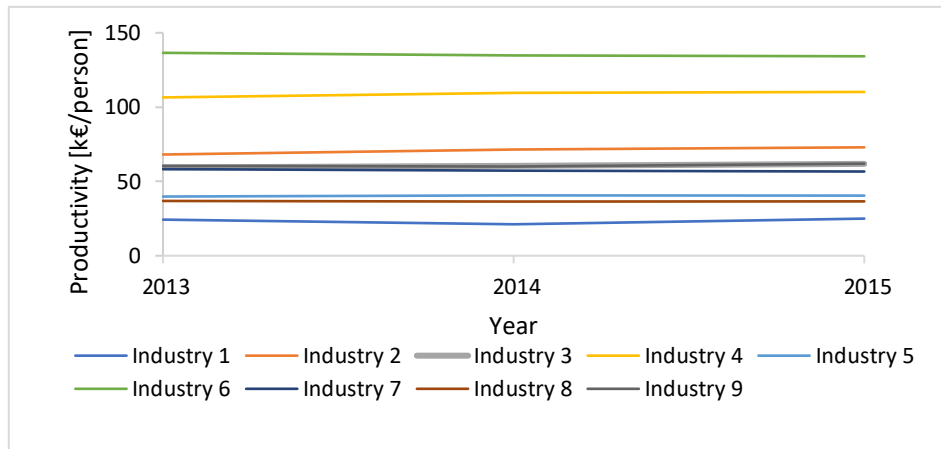

Figure 20. Industry-panel: Line plot of labour productivity defined as value added per person engaged.

There is no steep trend visible in the data, but still, the curves are upward sloping. To remove the trend, the data was expressed in growth rates (see Figure 21). The trend is no longer present, and the curves behave quite differently as compared to the previous figure. Industry one sees the most pronounced changes in labour productivity. Strikingly, the industries show quite different patterns in the development: some experience a dip in labour productivity growth in 2014, whilst others' labour productivity peaks in the same year.
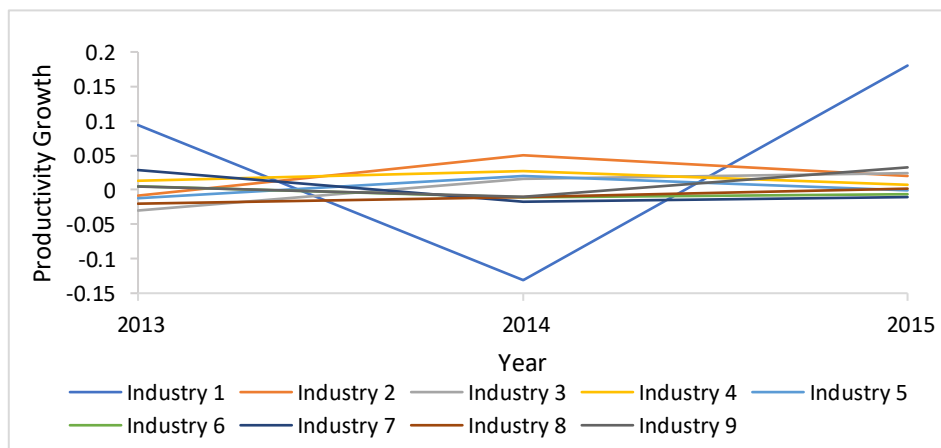

Figure 21. Industry-panel: Line plot of labour productivity defined as growth of value added per person engaged.

Obviously, that comes at the cost of one observation per industry which is a considerable loss given the limited amount of observations. Another assumption which needs to be tested for is normality.

In Figure 22, several histograms with different transformations of the data are shown to assess normality:
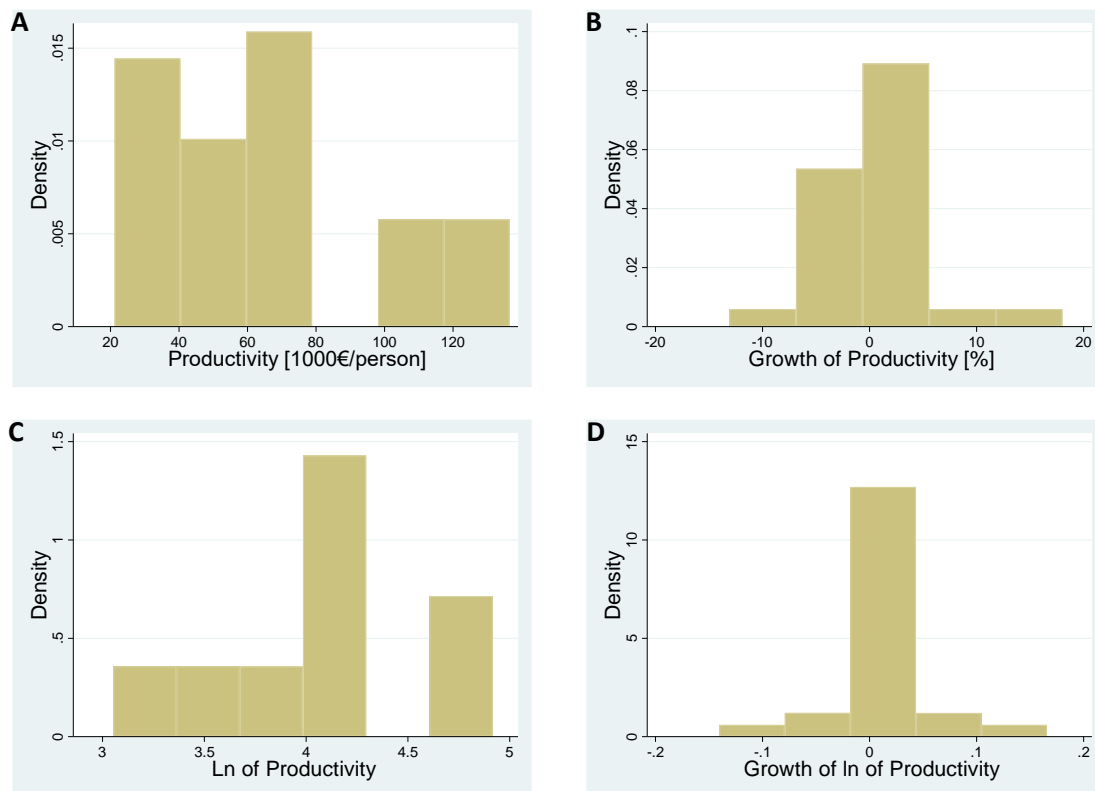
Figure 22. Industry-panel: Histograms of productivity defined as value added per person engaged (A), the growth rate thereof (B), natural logarithm (ln) productivity defined as value added per person engaged (C) and the growth (first difference) thereof (D).

Only productivity growth (Figure 22 (B)) and the growth of the natural logarithm of productivity (Figure 22 (D)) slightly resemble a normal distribution – (D) is a somewhat more symmetric but still far from a normal distribution. Therefore, the analysis will be based on the growth of productivity. Therefore, Table 11 presents a final description of all variables:

Table 11.

STAN data on industry level: Variable description.

Variable	Unit	Remarks
Productivity	[%]	Growth of (value added per number of people engaged)
Capital	[%]	Growth of (net capital stock per number of people engaged)
Economy	[%]	Percentage difference between the growth of value added and the trend growth of value added
Secondment	[%]	Number of secondment workers relative to all people engaged
Duration 24	[-]	Dummy for regulatory change, coded 1 as of 2002

Note. All monetary values are deflated to 2010 Euros.

In the next figure a scatter plot of labour productivity growth over secondment intensity is shown to assess heteroskedasticity and the correlation between the two (see Figure 23).
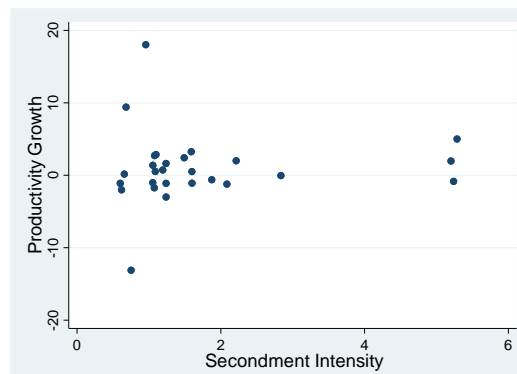
Figure 23. Industry level: Scatter plot of labour productivity growth over secondment intensity.

Most of the observations are in the range of secondment intensity equalling between zero and three percent with three observations exceeding five percent. Generally, the scatter plot shows a slight upward trend in labour productivity with increasing secondment intensities. It is questionable whether the outliers at roughly one percent of secondment intensity already indicate heteroscedasticity.

Table 12 contains correlations between the variables under consideration. Secondment intensity ("Secondment") is only marginally positively correlated with the dependent variable labour productivity growth ("Productivity"). Capital intensity growth is highly correlated with labour productivity growth as expected from the literature study in chapter 2. Intuitively, one would expect the control for economic activity ("Economy") to be positively correlated with labour productivity growth, but this is not the case.

Table 12.

Industry-level: Correlations of all regressors.

	Productivity	Secondment	Capital gr	Economy	Supervision
Productivity	1.0000				
Secondment	0.0635	1.0000			
Capital	0.5292	0.0756	1.0000		
Economy	-0.1640	0.0341	-0.0805	1.0000	
Supervision	-0.0843	0.0898	-0.0990	-0.0864	1.0000

Note. "Productivity" abbreviates labour productivity growth and is defined as the growth of value added per person engaged. "Capital" represents the growth of net capital stock per hour worked. "Economy" is a control for economic activity. "Secondment" is number of secondment workers relative to the total number of people engaged. "Supervision" refers to the ratio of employees in management positions to the total number of people engaged.

Table 13 contains a panel data summary of the underlying data.

Table 13.

Summary statistics industry-level analysis.

Variable		Mean	Std. Dev.	Min	Max	Observations
Productivity	overall	0.9521	5.0178	-13.1057	18.0227	N = 27
	between		1.7169	0.9852	4.7755	n = 9
	within		4.7389	-16.9292	14.1992	T = 3
Secondment	overall	1.7216	1.3876	0.6009	5.6113	N = 36
	between		1.4419	0.6244	5.3344	n = 9
	within		0.1565	1.5015	2.2522	T = 4
Capital	overall	-0.0113	1.4422	-2.1268	3.9307	N = 27
	between		1.1345	-1.3756	2.1065	n = 9
	within		0.9444	-2.7476	2.5545	T = 3
Economy	overall	86.8826	157.1183	-340.5264	467.6285	N = 36
	between		49.1103	-15.6838	154.4448	n = 9
	within		149.9369	-344.0568	464.0981	T = 4
Supervision	overall	5.7943	3.9674	1.1695	12.7608	N = 27
	between		4.1290	1.1749	12.7265	n = 9
	within		0.0570	5.6430	5.9367	T = 3

Note. "Productivity" abbreviates labour productivity growth and is defined as the growth of value added per person engaged. "Capital" represents the growth of net capital stock person engaged. "Economy" is a control for economic activity. "Secondment" is number of secondment workers relative to the total number of people engaged. "Supervision" refers to the ratio of employees in management positions to the total number of people engaged.

7.2.2. Results

Firstly, all variables were tested with the Breitung unit-root test as this test is a reasonable choice for most situations (Hlouskova & Wagner, 2006). The null hypothesis which entails that the panels contain a unit root could not be rejected in any of the cases (for detailed test results see Appendix

C). Table 14 contains pooled-OLS regression results on industry-level based on STAN- data. The models presented here were also estimated using fixed-effects and random effects. Pooled OLS emerged as the preferred method after testing for random-effects versus OLS with the Breusch-Pagan Lagrangian multiplier test, for random-effects versus fixed-effects with the Hausman tests and the F test that all fixed effects are zero. Heteroskedasticity is no problem as the Breusch-Pagan / Cook-Weisberg test remains insignificant in all regressions (for detailed test results see Appendix C Table 32). Robust standard errors are used to correct for autocorrelation.

The regressions were built up starting from capital intensity growth, as this is key variable in productivity theory. It is defined as the growth of net capital stock per worker and it is significant at five percent in all regressions. The coefficient's magnitude is almost independent of the other variables which were added subsequently – it amounts to roughly 1.8. Secondment intensity is significant in none of the models as its p-value does not fall short of 0.854. Hence, we cannot reject the null of the first hypothesis, which postulates that higher levels of secondment intensity have no influence on labour productivity growth. The control for economic activity is significant in the third and fourth regression, yet with a coefficient of almost zero and significance only at the 10 percent level. Neither can we draw conclusions with respect to the role of supervision in the relation between secondment and labour productivity as supervision intensity has a very insignificant coefficient (see hypothesis three).

Table 14.

STAN data on industry-level: regression results.

Method	(1) POLS	(2) POLS	(3) POLS	(4) POLS
Variables		Dependent variable: Productivity		
Capital	1.8412**	1.8350**	1.7992**	1.7801**
	(0.6716)	(0.6932)	(0.7143)	(0.7294)
Secondment		0.0866	0.1049	0.1227
		(0.4977)	(0.4860)	(0.4757)
Economy			-0.0040*	-0.0042*
			(0.0022)	(0.0023)
Supervision				-0.0603
				(0.1255)
Constant	0.9729	0.8233	1.2011	1.5355
	(0.8370)	(1.5423)	(1.5588)	(2.1754)
Observations	27	27	27	27
R-squared	0.2800	0.2806	0.2957	0.2979

Note. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ Monetary values: 2010 Euros. Estimated by pooled OLS with robust standard errors.
"Productivity" abbreviates labour productivity growth and is defined as the growth of value added per person engaged. "Capital" represents the growth of net capital stock per person engaged. "Economy" is a control for economic activity. "Secondment" is number of secondment workers relative to the total number of people engaged. "Supervision" refers to the ratio of employees in management positions to the total number of people engaged.

Moreover, the R-squared of the first model is already quite high (0.28) given that the variance is only explained with one independent variable. But extending the model with more variables in the subsequent models only leads to slightest improvements. The residuals of that model are plotted in Figure 24. At first glance, the residuals do not seem perfectly randomly distributed – the point cloud appears to be downward sloping. Nevertheless, that trend is rather modest, and the fitted model seems solid.
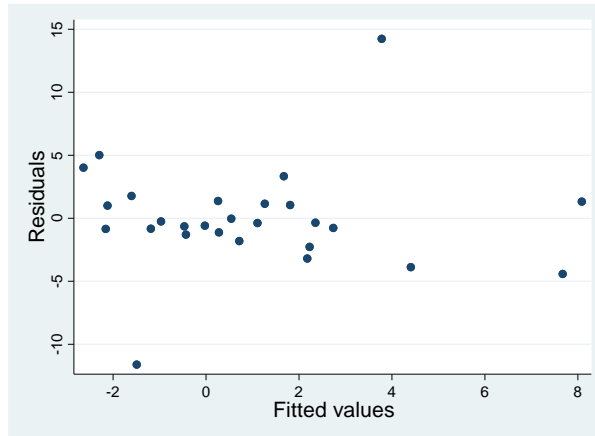
Figure 24. Residuals plot concerning model four of Table 14.

Technical aspects aside, pooled OLS will not necessarily estimate what one would expect in panel data analysis. Pooled OLS treats panel data as one big cross section and does not make allowance for the group structure of the data. Therefore, the trend in the pooled data might substantially differ from estimates within groups. For the sake of simplicity, the regression models are reduced to labour productivity growth as the dependent variable and secondment intensity as independent variable, see Table 33 in Appendix C. Barring statistical significance, pooled OLS estimates a coefficient of 0.23 for secondment intensity, whilst fixed-effects arrives at 6.09. How come that the fixed-effects regression model returns a coefficient that is roughly 25 times higher? Figure 25 contains linear predictions estimated with fixed-effects (group-wise) and with pooled OLS. It becomes evident that disregarding the panel structure of the data has strong implications for the results. This is to say that – based on this short panel – the explanatory power of estimations is limited.
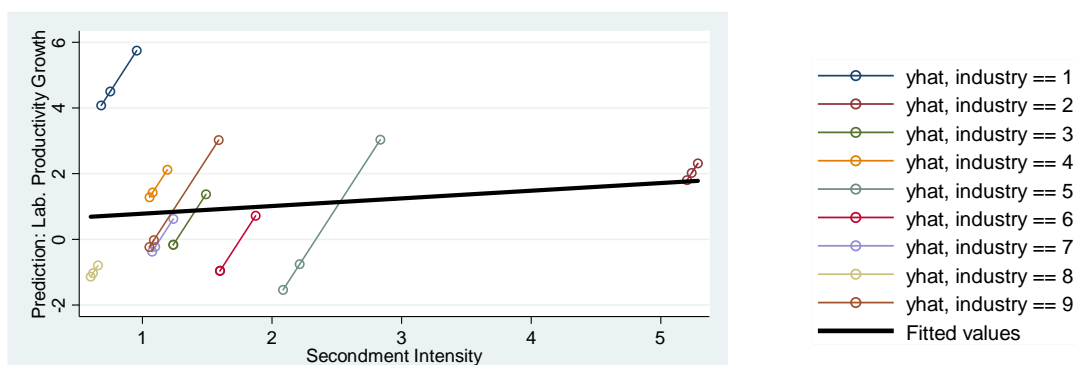

Figure 25. STAN industry data, comparing predictions: Fixed-effects versus pooled OLS

7.2.3. Robustness

Based on the STAN industry data set, labour productivity can also be defined as gross output per person engaged (as opposed to value added per person engaged). The models in Table 14 were re-estimated with this second definition of labour productivity as the dependent variable. All other parameters were left the same (pooled OLS, robust standard errors). The results are depicted in Table 34 in Appendix C. In all models, capital intensity growth is highly significant (at one percent), but with a coefficient of close to one. Secondment intensity's coefficient is almost twice as high (between 0.14 and 0.17), but it is insignificant in all regressions. From this test, it can be concluded that the findings are not dependent on the definition of the dependent variable – yet is not possible to re-estimate the models with a different concept in the denominator (such as hours worked).

Testing the results with the "leave one out" method as done by Vergeer and Kleinknecht (2017) aims at testing whether the estimations are dependent on the presence of a certain group in the data. Applying this method to model (4) in Table 14, it must be concluded that the results are dependent on the presence of industry one in the data. Without industry one (agriculture, forestry, livestock, gardening), capital intensity growth's coefficient drops to 0.404 (as compared to roughly 1.8) and its statistical significance vanishes (as compared to significance at the five percent level). Nonetheless, excluding industries two till nine lead similar results as in Table 14 column (4). The critical case (without industry one) is shown in Table 35 in Appendix C.

7.2.4. Conclusion

The analysis of the influence of secondment intensity on labour productivity growth was conducted based on a short panel covering nine industries and the years 2013-2015. The panel relies on data from the OECD STAN database which was complemented with statistics form the German Federal Employment Agency. The data allows for two definitions of labour productivity: (1) value added per person engaged and (2) gross output per person engaged. The first definition is given more weight as it reflects productivity more precisely. By comparison, gross output double accounts (or multiply accounts) for economic activity as it does not correct for intermediate inputs.

Relying on value added per person engaged as definition for labour productivity (definition one), the estimations for secondment intensity are not significantly different from zero so that the null hypothesis "Higher levels of secondment intensity have no influence on labour productivity growth" cannot be rejected. Neither can we infer that supervision intensity plays a role in the relation between secondment intensity and labour productivity growth (null of the third hypothesis:

"In the relation between secondment intensity and labour productivity growth, no change of supervision intensity or management layer thickness can be observed").

Overall, analyses based on gross output per person engaged support these findings. Also, the significance of capital intensity growth is in line with standard macro-economic theory (Syverson, 2011). However, the findings are dependent on the presence of industry one in the data set (Agriculture, forestry, livestock, gardening). As of here, the analysis will shift to firm-level data.

7.3. Industry-Level: IAB Establishment Panel

This section is the first to present results based on firm-level data – nevertheless, the analysis still takes place on industry-level but relying on much more detailed segmentation. It uses 43 industry categories and covers the years 2010-2015 (inclusively) which is equivalent to 258 observations. The data set was created by aggregating firm-level data of the Institute for Employment Research by year and industry category. The industry categories rely are aggregated from between 68 (public administration, defence) and 6166 observations (retail, petrol stations).

The following variables were included in the analysis (see Table 15):

Table 15.

IAB industry-level data: variable description.

Variable	Unit	Remarks
Productivity	[%]	Labour productivity growth, first difference of ln (sales/all persons engaged)
Investment	[%]	Growth of the ratio total investments per person engaged
Academics	[%]	Percentage share of people with an academic degree.
Secondment	[%]	Number of secondment workers relative to all people engaged
Working hours	[h]	Average contractual weekly working hours per industry
Age	[years]	Average firm age per industry.

7.3.1. Descriptive Statistics

Figure 26 and Figure 27 show kernel density plots of two operationalizations of labour productivity: In the former, the growth rate of labour productivity is shown, whereas in the latter, labour productivity has been transformed with the natural logarithm (the growth rate is approximated by first differencing). It becomes clear that logarithmic transformation somewhat improves the distribution even if it remains leptokurtic.
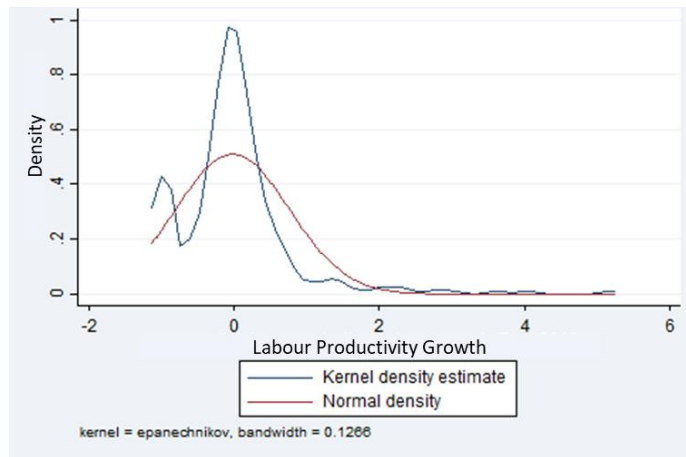
Figure 26. IAB industry-level data: Kernel density plot of labour productivity growth.
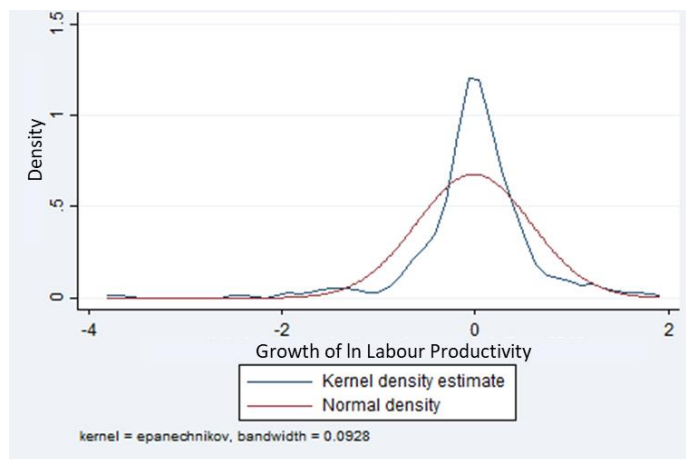

Figure 27. IAB industry-level data: Kernel density plot showing the growth rate of the natural logarithm of labour productivity.

The following graph depicts a scatter plot of the key independent variable secondment intensity and the dependent variable labour productivity growth (see Figure 28). It shows heteroskedasticity, as the variance close to zero is a lot higher than at higher secondment intensities. The explanatory power of the figure is somewhat limited because it does not include 23 observations. These had to be removed to meet the result censoring requirements by the IAB[26].

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[26] A point in a diagram must never be aggregated from less than 20 firms.
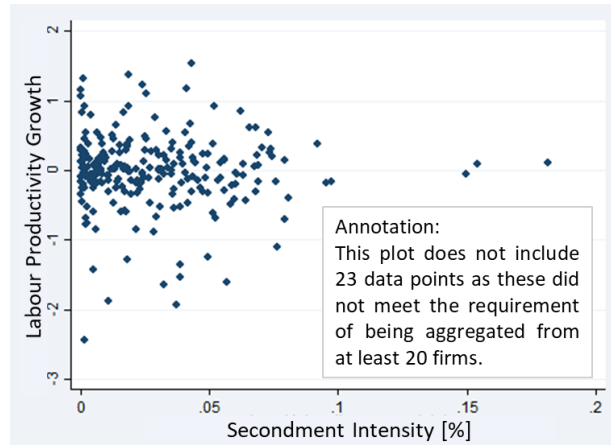
Figure 28. IAB firm-level data: Scatter plot of labour productivity growth over secondment intensity.

Table 16 contains a correlation matrix of all relevant variables. Firstly, it is evident from the table that secondment intensity and labour productivity growth are slightly negatively correlated. In line with macro-economic theory, investment intensity growth (a proxy for capital) is positively correlated with labour productivity growth. Against the background of "beneficial constraints", it is rather surprising that working hours are positively correlated with labour productivity growth. Counterintuitively, the share of academics in the total labour force is negatively correlated with labour productivity growth.

Table 16.

IAB industry-level data: Correlations

	Prod.	Secondm.	Invest.	Superv.	Working hours	Age	Academics
Prod.	1.0000						
Secondm.	-0.0866	1.0000					
Invest.	0.1885	0.0102	1.0000				
Superv.	-0.0897	-0.1033	-0.0153	1.0000			
Working hrs	0.0907	0.0253	-0.0330	0.0884	1.0000		
Age	0.0094	0.3254	-0.0565	-0.0221	0.1050	1.0000	
Academics	-0.1250	-0.1513	-0.0052	0.0155	-0.0998	0.1096	1.0000

Note. Prod. = Productivity; Secondm. = Secondment; Invest. = Investment; Superv. = Supervision.

Table 17 contains panel summary statistics[27]:

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[27] The number of observations between the variables differs for two reasons: Firstly, the business volume is asked for the previous year and secondly, growth rates are calculated. Each of the two drops 43 observations.

Table 17.

IAB industry-level data: Summary statistics.

Variable		Mean	Std. Dev.	Min	Max	Observations
Productivity	overall	-0.0143	0.5893	-3.7052	1.8146	N = 258
	between		0.0980	-0.2903	0.1984	n = 43
	within		0.5813	-3.4611	2.0587	T = 6
Secondment	overall	0.0261	0.0269	0	0.1815	N = 344
	between		0.0222	0	0.0904	n = 43
	within		0.0156	-0.0564[a]	0.1173	T = 8
Supervision	overall	0.4622	0.6819	0	4	N = 344
	between		0.1900	0.375	1.375	n = 43
	within		0.655	-0.9128[a]	3.087	T = 8
Investment	overall	0.0989	1.1617	-1	9.1256	N = 301
	between		0.2540	-0.2153	0.9374	n = 43
	within		1.1342	-1.8386	8.2870	T = 7
Working hours	overall	39.3299	0.6527	35.23	41.088	N = 344
	between		0.5546	36.9143	40.522	n = 43
	within		0.3532	35.8837	40.6289	T = 8
Academics	overall	0.1368	0.1260	0.0049	0.6618	N = 344
	between		0.1197	0.0101	0.5196	n = 43
	within		0.0430	-0.0618	0.4111	T = 8
Age	overall	13.45515	2.37886	8.358025	19.09091	N = 344
	between		1.848413	9.479793	16.49375	n = 43
	within		1.52055	7.955046	17.7852	T = 8

Note. [a] The negative minimum value is no mistake. The within transformation demeans the data. It subtracts the group mean and subsequently adds the overall mean.

"Productivity" abbreviates labour productivity growth and is defined as the first difference of ln (sales/all persons engaged). "Investment" is a proxy for capital and is defined as the growth of the ratio of investments to total number of people engaged. "Secondment" is number of secondment workers relative to the total number of people engaged. "Working hours" is a control for contractual working time. "Age" is a control for average firm age within an industry. "Academics" is the share of people with an academic degree per industry.

7.3.2. Regression Results

Overall, Table 18 shows that regressions based on an industry sample are not very informative relating to the influence of secondment intensity on labour productivity growth. In column one, the growth of investment intensity was regressed on labour productivity growth using fixed-effects with robust standard errors. This yields a coefficient of 0.1074 which is not significantly different from zero. Adding secondment intensity to the regression yields a coefficient of -6.8905 for secondment. Still, none of the coefficients is significantly different from zero. Only the extension of the model with a control for average working hours and average firm age (column three) results alters the overall picture – however, only with respect to that control and not with respect to secondment.

Also, year dummies were added in column three as the hypothesis that the coefficients of the year dummies are jointly equal to zero was rejected at the five percent significance level (p-value = 0.0314) (Torres-Reyna, 2007). In these three models, the F test that all u_i are equal to zero could not be rejected which lead to repeating the analysis based on OLS regression. In column four of Table 18, investment was regressed on labour productivity growth using pooled OLS with robust standard errors. The coefficient of investment is of comparable magnitude as compared to fixed-effects. Estimating a bigger model (column five) results in significance of secondment at the 10 percent significance level (T statistic of almost 2). Also, the control for the share of academics in the labour force is significant at the five percent level. At the first glance, it is not very plausible that the share of academics is negatively associated with labour productivity growth. But since it is regressed on the growth rate of labour productivity, it might be possible that a higher shares of people are more common in service-related industries, where the capital-labour substitution tends to be lower (Naastepad & Kleinknecht, 2004). Based on the regression in column five, we can reject the null of the first hypothesis ("Higher levels of secondment intensity have no influence on labour productivity growth"), albeit at low significance levels (10 percent).

In summary, there is only weakest evidence of a negative relationship between secondment intensity and labour productivity growth (at the 10 percent significance level with a T statistic of almost 2).

Table 18.

IAB industry-level data: regression results.

Variables	(1)	(2)	(3)	(4)	(5)
Method	FE	FE	FE	POLS	POLS
	Dependent Variable: Productivity				
Investment	0.1074	0.1141	0.188	0.0960	0.0997
	(0 .1403)	(0.1292)	(0.1218)	(0.1217)	(0.1171)
Secondment		-6.8905	-5.6860		-2.9247*
		(6.4919)	(6.2730)		(1.5232)
General controls	No	No	Yes	No	Yes
Academics	No	No	No	No	Yes
Year Dummies	No	No	Yes	No	No
Constant	-0.0446	0.1391	-8.971	-0.0413	-3.1773
	(0.0396)	(0.1952)	(9.8470)	(0.0374)	(2.0512)
Observations	258	258	258	258	258
Industries	43	43	43		
R-squared	0.0428	0.0706	0.0808	0.0355	0.0746

Note. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ Monetary values: 2010 Euros. Columns one and two estimated with fixed-effects, column three additionally with time-fixed effects, column four and five with pooled OLS. Period: 2010-2015.

"Productivity" abbreviates labour productivity growth and is defined as the first difference of ln (sales/all persons engaged). "Investment" is a proxy for capital and is defined as the growth of the ratio of investments to total number of people engaged. "Secondment" is number of secondment workers relative to the total number of people engaged. "General controls" comprises a control for the contractual working time ("working hours") and a control for average firm age within an industry ("age"). "Academics" is the share of people with an academic degree per industry. "Year Dummies" are yearly dummies (time-fixed effects).

The Modified Wald statistic for group-wise heteroskedasticity is used on all regressions - the rejection of the null (homoskedasticity) at the one percent significance level lead to the specification of robust standard errors in all models. It was attempted to test for autocorrelation, but, to the best of my knowledge, none of the tests ran error-free in attempts to run them on test-data. Therefore, the tests are not included in the do-file as the risk of causing an error and stopping the whole program. Robust standard errors are used anyway – therefore, there is some tolerance for autocorrelation.

7.3.3. Robustness

King and Roberts (2015) write about the link between robust standard errors and model misspecification. A serious difference between robust and classical standard errors is a strong sign of "misspecification that extends beyond what the procedure corrects, which means that some

estimates drawn from it will be biased – often in a way that can be fixed but not merely by using robust standard errors" (p. 160).

Table 19 compares two fixed-effects regressions – the first one with classical standard errors, the second one with robust standard errors. Following King's and Robert's argument, we see robust standard errors which are roughly 2.5 times higher than the classical ones – a clear indication of model misspecification.

Table 19.

IAB industry-level data: Comparison of classical and robust standard error as an indicator of model misspecification.

	(1)	(2)
Method	FE	FE robust
Investment	0.1172	0.1172
	(0.0350)	(0.1307)
Secondment	-6.7985**	-6.7985
	(2.7473)	(6.4539)
Constant	0.2844	0.1391
	(0.1169)	(0.1952)
R-squared	0.0918	0.0918

Note. (Robust) standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$ Monetary values: 2010 Euros. Estimated with entity and time fixed-effects. 258 observations across 42 industries. "Productivity" abbreviates labour productivity growth and is defined as the first difference of ln (sales/all persons engaged). "Investment" is a proxy for capital and is defined as the growth of the ratio of investments to total number of people engaged. "Secondment" is number of secondment workers relative to the total number of people engaged.

What could be the problem? Table 29 show that the transformed data still does not closely resemble a normal distribution. Other transformations than the just the natural logarithmic might be more suitable.

If lack of time is a problem, as King and Roberts (2015) continue, "then robust standard errors may be useful as a shortcut to some information, albeit under greater (model misspecification) uncertainty than necessary" (p. 164). Also, how to improve the model is not yet evident, and given the time-consuming procedure to obtain new results, it seems reasonable to use the (weak) evidence which can be derived from the models with robust standard errors.

7.3.4. Conclusion

This section aimed at answering the research questions based on an industry panel which was created by aggregating IAB firm-level data along an industry classification system with 43 categories, covering the years 2010-2015 inclusively.

Some sort of model-misspecification seemed to be present in the model, which surfaced through big differences between robust and classical standard errors. Nevertheless, based on classical standard errors, some weak evidence was found that in this sample, higher levels of secondment intensity are associated with lower labour productivity growth during the observed period. The null "Higher levels of secondment intensity have no influence on labour productivity growth" could be rejected, albeit at the low significance level of 10 percent and with a T statistic of close to two, which is not very meaningful given the relatively high number of observations. Due to a coding error, no conclusions can be drawn with regard to supervision intensity.

7.4. Firm-level: IAB Establishment Panel

This section presents the results of statistical analysis based on micro-data from the Institute of Employment Research. After making allowance for the caveats which apply to the data set (see subsection 6.2.5 to 6.2.6) such as missing values regarding the number of employees and limiting the data to the years for which data on secondment is available, between 8200 and 1060 observations per year remain. The following variables were included (Table 20).

Table 20.

IAB firm-level data: variable description

Variable	Unit	Remarks
Productivity	[%]	Labour productivity growth, first difference of ln (sales/all persons engaged)
Investment	[%]	Growth of the ratio total investments per person engaged
Academics	[%]	Percentage share of people with an academic degree.
Secondment	[%]	Number of secondment workers relative to all people engaged
Working hours	[h]	Contractual weekly working hours
Profit	[-]	Categorical variable indicating profitability
Size	[-]	Categorical variable indicating firm size
Age	[years]	Firm age

7.4.1. Descriptive Statistics

Secondment categories were created to visualize the number of firms that fall in a certain range of secondment intensities. In other words, firms were aggregated based on their share of secondment workers (for instance secondment intensity between zero and five percent). Figure 29 only contains firms with secondment workers as these are much less than the number of firms without secondment workers and both are difficult to visualize next to each other.
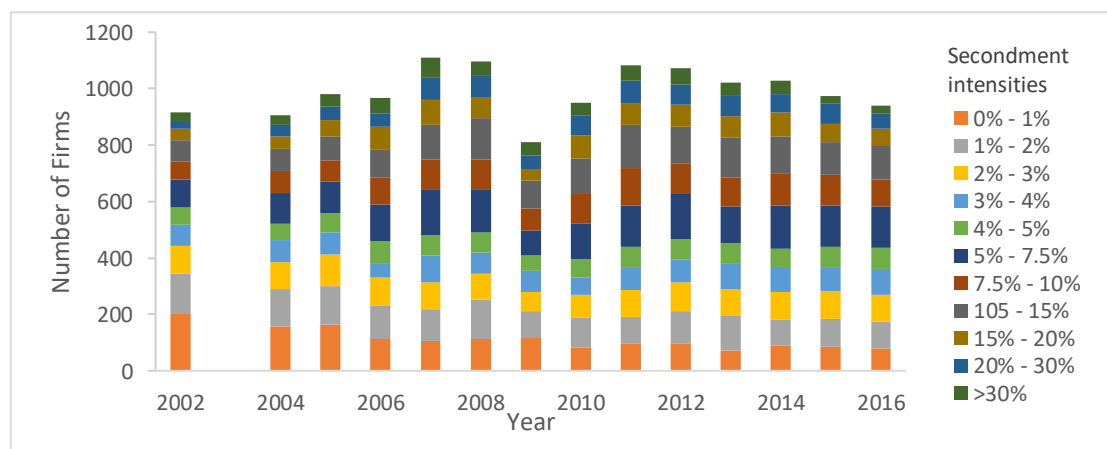

Figure 29. Number of observations per secondment intensity category based on the total number of people engaged, excluding firms with no secondment workers.

It becomes evident that, similarly to the statistics based on data by the German Federal Employment Agency, the number of firms with secondment workers decreases in the wake of the financial crisis. Figure 30 shows a kernel-density plot of labour productivity growth. A comparison of the normal density (red) and the density of labour productivity growth shows that it is far from a normal distribution. We observe many distinct values for labour productivity with a density of close to zero.
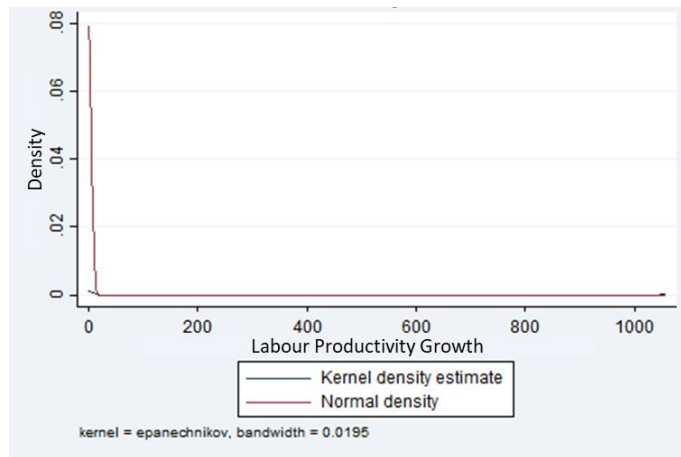
Figure 30. IAB firm-level data: Kernel density plot of labour productivity growth.

Therefore, labour productivity is transformed with the natural logarithm and the growth rate is approximated by means of first differencing. Figure 31 contains a kernel density plot of the transformed variable:
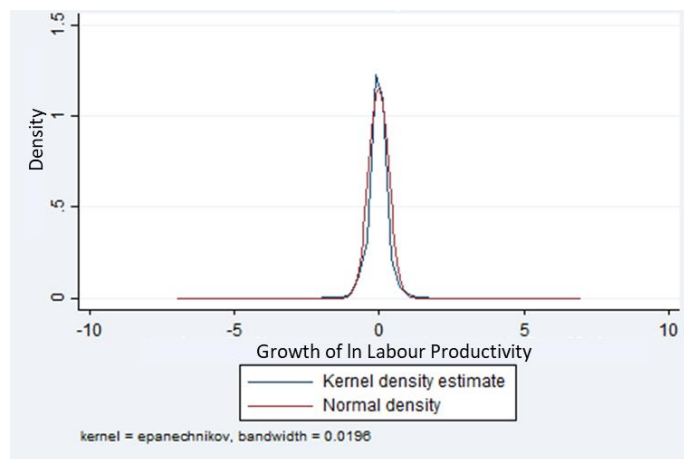

Figure 31. IAB firm-level data: Kernel density plot showing the growth rate of the natural logarithm of labour productivity.

The difference between the two figures is distinct: After logarithmic transformation and differencing, the variable resembles the normal density quite closely. Therefore, the transformed variable was chosen for further analysis.

As of now, the growth of the natural logarithmic transformation of labour productivity will be regarded as "productivity" respectively "labour productivity growth.

Table 21 contains a correlation matrix with all but the categorical variables (Stata does not compute correlations for categorical variables). Secondment intensity and Productivity are negatively

correlated, and so are firm age and productivity. Working hours and productivity are positively correlated. It is a little surprising that longer working hours are associated with higher labour productivity growth considering that many companies (and some countries) experiment with shorter working hours specifically to increase productivity (Weller, 2017).

Table 21.

IAB firm-level data: correlations.

	Prod.	Secondm.	Investm.	Superv.	W. Hours	Age	Academics
Prod.	1.0000						
Secondm.	-0.0429	1.0000					
Investm.	0.1400	-0.0203	1.0000				
Superv.	0.1250	-0.1732	0.0607	1.0000			
W. Hours	0.0166	-0.0292	0.0063	0.0532	1.0000		
Age	-0.0169	-0.0169	-0.0088	-0.1036	0.0578	1.0000	
Academics	0.0022	-0.0021	-0.0391	-0.0944	-0.0199	0.0843	1.0000

Note. Prod. = Productivity; Secondm. = Secondment; Invest. = Investment; Superv. = Supervision; W. hours = Working hours

The following table contains a panel summary of all variables which will be used for analysis in the later part of this section (see Table 22). Remarkably so, there are no firms older than 26 years in the sample. The variable "working hours" specifies the contractual weekly working hours. It is difficult to imagine someone signing a contract with 91 nominal hours. Investment has a very high mean given that it is defined as the growth of the ratio of investment-total employment. The standard deviation is even 10 times higher. All this is not unrealistic as small firms might invest much in one year and then not at all for a couple of years.

Table 22.

IAB firm-level data: summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Productivity	overall	-0.0109	0.3473	-6.9452	6.9648	N = 47240
	between		0.2710	-6.4592	4.1062	n = 12881
	within		0.3020	-6.4968	4.4312	T = 3.6674
Age	overall	11.5983	6.4777	0	26	N = 71064
	between		6.1749	0	26	n = 22134
	within		2.7075	-5.1156	29.5983	T-bar = 3.2106
Secondment	overall	0.0099	0.0443	0	0.9524	N = 124130
	between		0.0390	0	0.8333	n = 36852
	within		0.0266	-0.5799	0.6570	T-bar = 3.3683
Investment	overall	8744.6320	37583.88	1.0839	5439410	N = 41792
	between		34679.93	2.7143	3034353	n = 15090
	within		22537.16	-2396312	2413801	T = 2.7695
Profit	overall	2.9073	1.1052	1	6	N = 71359
	between		1.1078	1	6	n = 20163
	within		0.6626	-0.3427	7.0184	T = 3.53911
Academics	overall	0.0701	0.1603	0	1	N = 115718
	between		0.1651	0	1	n = 33495
	within		0.0612	-0.5975	0.9792	T-bar = 3.45478
Working hours	overall	39.3072	2.8238	0	91	N = 103675
	between		2.7250	0	91	n = 34636
	within		1.7276	-2.2928	75.0572	T-bar = 2.9933
Size control	overall	2.9932	2.0684	1	10	N = 125452
	between		2.1778	1	10	n = 37224
	within		0.2875	-1.5068	6.9932	T-bar = 3.3702

Note. "Productivity" abbreviates labour productivity growth and is defined as the first difference of ln (sales/number of persons engaged). "Investment" is a proxy for capital and is defined as the growth of (investments / number of people engaged). "Secondment" is the number of secondment workers relative to the total number of people engaged. "Profit" is a categorical variable indicating a qualitative judgment of profitability ranging from 1 ("very good") to 5 ("defective"). "Working Hours" captures the contractual working time. "Age" indicates firm age. "Academics" is the percentage of employees with an academic degree. "Size control" is a categorical variable for firm size.

7.4.2. Regression Results

The fixed-effects estimator seems appropriate for analyses based on this data set. Fixed-effects analyses the relation between the dependent and independent variables within entities (Torres-Reyna, 2007). Also, fixed-effects lends itself for models where on expects some features of the individual to bias the independent or dependent variable. It removes time-invariant features of the individual and is suitable when unknown time-constant disturbances are alleged.

Table 23 compares five fixed-effects regression models and shows that higher secondment intensity is associated with lower labour productivity growth. In all models, the dependent variable is labour productivity growth which is defined as the first difference of the natural logarithmic transformation of turnover per person engaged. The key independent variable is secondment intensity (the ratio of secondment workers to the total number of people engaged in a firm). The simplest model only contains investment intensity growth next to secondment (see column one). In some models, "general controls" (firm age and the share of academics in the total labour force) and a firm-size control are added. Pertaining to firm size, the smallest firm size category is the reference category (on a scale from one to ten). Categories indicating bigger size all have increasingly positive coefficients which are significant at the one-percent level (except for the last two categories capturing firms with more than 1000 employees), which is in line with other empirical studies[28]. The dependent variable does not provide insights into profitability[29] – therefore, a categorical variable for profitability is added in columns three to five. The highest profitability judgement is the base category (category) with a coefficient of zero, and deviations from that have an increasingly negative coefficient. Profitability is significantly different from zero at the one percent level – yet, its interpretation remains somewhat diffuse due to the qualitative nature of the variable. Still, the algebraic sign is both logical and also described in the literature[30]. In the last column, a variable for the contractual weekly working hours was added. Generally speaking, the addition of the controls somewhat decreases secondments coefficient, but most noticeably, the standard errors increase as the models become less precise. Still, secondment's coefficient of roughly -1.1 (in the most complete model in column five[31]) remains statistically distinguishable from zero (at the one percent level) and is only slightly lower as compared to the simple model in column one.

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[28] Pagano and Schivardi (2003) find that firm size and productivity growth are positively correlated, larger firms are associated with higher productivity based on data on European countries in the 1990s. The finding is robust to modifications regarding the firm size measure, the composition and length of the panel.

[29] Profit is a qualitative judgment of the firm's profitability by the interviewee. Answers range from "very good" (one) to "defective" (five).

[30] Lindbeck (1983) argues lower profitability is associated with slower output growth as past or present products might become unprofitable. Moreover, and provided that the required rate of return remains constant, one would expect a decline in investment growth. Nonetheless, profitability fluctuations that do not fall short of certain satisfactory profitability level may only moderately affect investment growth.

[31] Methodology-wise, the model is tested using the Hausman test for fixed-effects versus random-effects. The null that the different in the coefficients is not systematic is rejected at the one percent significance level (prob>chi2=0.0000), concluding that fixed-effects is appropriate. The F test that all u_i are zero is rejected at the one percent significance level (prob> F=0.0002).

A joint test to establish whether all year dummies are equal to zero is used to establish weather time fixed-effects are necessary (Torres-Reyna, 2007). The null hypothesis that the coefficients of the year dummies are jointly equal to zero was rejected in all five models (at one percent significance in each of the cases). Each model was also tested for heteroskedasticity using the Modified Wald statistic for group-wise heteroskedasticity. The rejection of the null (homoskedasticity) lead to the specification of robust standard errors in all models. It was attempted to test for autocorrelation, but, to the best of my knowledge, none of the statistical tests implemented in Stata copes with panels which are this unbalanced.

As secondment intensity is highly significant across all regression in Table 23, it is possible to reject the null hypothesis that higher levels of secondment intensity have no influence on labour productivity growth. Based on this sample and the period of observations, the conclusion is that firms with higher secondment intensities show lower labour productivity growth. More specifically, an increase of secondment intensity of one percent point is associated with roughly 1.1 percent points lower labour productivity growth.

Table 23.

IAB firm-level data: regression results.

Variables		(1)	(2)	(3)	(4)	(5)
Method		FE	FE	FE	FE	FE
Variables			Dependent Variable: Productivity			
Investment		0.0002**	0.0002	0.0002	0.0002	0.0009**
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0004)
Secondment		-0.9976***	-1.1383***	-1.1896***	-1.1812***	-1.0629***
		(0.0996)	(0.1241)	(0.1201)	(0.1192)	(0.146)
Profit	P=2			-0.0851***	-0.0857***	-0.083***
				(0.0161)	(0.0161)	(0.0149)
	P=3			-0.1537***	-0.1537***	-0.1515***
				(0.0172)	(0.0172)	(0.0173)
	P=4			-0.1822***	-0.1836***	-0.1729***
				(0.0204)	(0.0205)	(0.0218)
	P=5			-0.2121***	-0.2155***	-0.2173***
				(0.029)	(0.0289)	(0.0312)
Working hours		No	No	No	No	Yes
General controls		No	Yes	Yes	Yes	Yes
Size Control		No	No	No	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes	Yes
Constant		0.0061	0.033	0.1559***	-0.0107	0.008
		(0.0100)	(0.0269)	(0.0296)	(0.0415)	(0.1281)
Observations		21330	11878	11818	11805	9946
Firms		7729	4654	4632	4627	4203
R-squared		0.0162	0.0214	0.0398	0.047	0.0458

Note. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 Monetary values: 2010 Euros. Estimated with time and entity fixed-effects with robust standard errors. Period: 2005-2015; column 5: 2007-2015.

"Productivity" abbreviates labour productivity growth and is defined as the first difference of ln (sales/all persons engaged). "Investment" is a proxy for capital and is defined as the growth of the ratio of investments to total number of people engaged. "Secondment" is number of secondment workers relative to the total number of people engaged. "Profit" is a categorical variable indicating profitability ranging from 1 ("very good") to 5 ("defective"). "Working Hours" captures the contractual working time. "General Controls" are a variable indicating firm age and the percentage of employees with an academic degree. "Size Control" is a factor variable capturing firm size. "Year Dummies" are yearly dummies (time-fixed effects).

Secondment intensity categories have been created earlier to visualize the development of secondment intensities over time. These categories were also regressed on labour productivity

growth as a categorical variable to investigate whether the influence of secondment intensity on labour productivity depends on certain levels of secondment intensity. Table 36 in Appendix D shows that the negative relation between secondment intensity and labour productivity growth is only significantly different from zero if it exceeds five percent. For this reason, we can reject the hypothesis that certain levels of secondment intensity play no role in the relation between labour productivity growth and secondment intensity.

This finding is limited by the somewhat arbitrary creation of categories which followed the guidelines of the IAB to achieve publishable results, rather than any logical or methodological considerations[32]. The bottom line is that the negative influence of secondment intensity on labour productivity growth might only surface at secondment intensities exceeding a few percent. Accordingly, the bottom line is not to pin down the threshold at exactly five percent.

The inclusion of supervision intensity would have reduced the number of observations by roughly two thirds as the variable is most of the values are missing respectively non-responses.

7.4.3. Robustness

Robust standard errors were used to correct for heteroskedasticity and potential autocorrelation. According to Angrist and Pischke (2008), the most common approach to deal with autocorrelation is to use clustering on a higher level. Instead of robust standard errors, it was attempted to cluster standard errors on industry level (based on the same classification as in the panel in section 7.3) and on firm size using the option "vce(cluster *clustervariable*)", but none of the attempts was successful[33,34]. Model misspecification as described by King and Roberts (2015) is no problem here as robust and classical standard errors tend not to differ much.

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[32] Secondment intensity categories are optimized to contain at least 20 firms per year and secondment intensity category, so that the results are graphically presentable, according to the rules of the FDZ (Hochfellner, Müller, Schmucker, & Roß, n.d.)

[33] Both attempts produced the error "panels are not nested within clusters", which means that the entities belong to more than one category (e.g. firms change industry over time). Hence, the possibilities to compare different ways of coping with heteroskedasticity and possible autocorrelation are limited.

[34] For now, attempts to run the regressions on a subsample of the data were unsuccessful. Randomly resampling the data had a negative influence on the length of the panels. The average number of observations per entity is almost three (in the original state), resampling the observations seemed to significantly lower the quality of the data.

7.4.4. Conclusion

The analysis of the influence of secondment intensity on labour productivity growth is conducted based on a firm-level data set by the Institute for Employment Research (IAB) which belongs to the German Federal Employment Agency. After preparing and cleaning of the data, between 9900 and 21300 observations remained, depending on the variables in the model.

Based on fixed-effects (both time and entity) with robust standard errors, the regressions yield highly significant coefficients for secondment intensity, allowing to reject the null that higher levels or secondment intensity have no influence on labour productivity growth. In this sample and during this period of observation, firms with one percent point higher secondment intensity show roughly 1.1 percent points lower labour productivity growth. Categorizing firms along their secondment intensities suggests that the negative influence of secondment intensity on labour productivity growth only surfaces only at higher secondment intensities.

7.5. Summary and Consolidation of the Results

Regression analyses based on a time series for entire Germany and the years 1991-2016 show that a one percent point increase in secondment intensity is associated with roughly 2 percent point decrease in hourly labour productivity (based on value added per hour worked). Furthermore, the findings are not much dependent on the definition of labour productivity as tests with labour productivity defined as (1) value added per person engaged and (2) gross output per person engaged have shown (the former yields slightly higher coefficients, the latter slightly lower coefficients).

The same data has been analysed on industry level – disaggregated into nine industry categories covering the years 2013-2015 (27 observations). Here, the statistical significance of capital intensity growth shows that the model itself has some explanatory power, albeit not pertaining to secondment. In none of the models, secondment is statistically distinguishable from zero.

Based on data of the German Institute for Employment Research, another industry-level data set is created by aggregating firm-level data along a 43-category industry classification system (258 observations, years 2010-2015). Regression analysis resulted in weak evidence of a negative association between higher secondment intensities and labour productivity growth. The evidence is weak because the coefficient of roughly -2.9 is only significant at the 10 percent level with a T-statistic of roughly two. The models were not informative pertaining to supervision due to a technical problem with one macro.

Much more expressive are the regression results which were founded on firm-level data (between 9900 and 21300 observations, covering the years 2005-2015 respectively 2007-2015). Here, a negative association between secondment intensity and labour productivity growth was found. In this sample, firms with a one percentage point higher secondment intensity than average show roughly 1.1 percentage point lower labour productivity growth. Categorizing firms according to their secondment intensity and subsequently regressing these secondment intensity categories on labour productivity growth delivers evidence that the negative influence of higher secondment intensities only surfaces at secondment intensities exceeding a roughly five percent (based on this specific categorization).

The baseline is that regressions relying on three different data sets yield comparable results with respect to secondment intensity. All significant models point in the same direction as they deliver evidence of a negative relation between secondment intensity and labour productivity growth. Looking at the magnitude of the coefficients, there is no denying that there are considerable differences. On national level, the coefficient is estimated at approximately -2; based on industry-aggregated firm-level data, the coefficient is estimated at -2.9 but only weakly significant and on firm-level, regressions yielded a coefficient of -1.1. Speaking in magnitudes, the highest coefficient (on industry-level aggregated firm-level data) is roughly 2.6 times higher than the lowest estimate (firm-level data). The latter, however, is only weakly significant should not distract from the fact that the other two estimates are reasonably close – considering that they cover very different periods and totally different aggregation levels. After all, we would expect population coefficient to lie somewhere between -1.1 and roughly -2.

In conclusion, there is evidence to reject the null of the first hypothesis ("H1.0: Higher levels of secondment intensity have no influence on labour productivity growth"). The second null hypothesis states that regressions on different aggregation levels lead to no different results. Regarding the algebraic sign, the hypothesis cannot be rejected. Whether the magnitudes differ significantly could be established with a F test (this, however was not possible due to delays caused by censoring of the results). The third group of research questions revolves around other variables. Depending on the regression, a control for regulatory changes and the profit situation of a firm were found to be significant. (This is not to say that insignificant control variables play no role.)

The fourth group revolves around the characteristics of secondment intensity. Tests with secondment intensity categories have shown that the negative influence of secondment intensity only surfaces at higher secondment intensities. With respect to tenure, however, the underlying data is not informative.

8. Discussion

Four different data sets have been analysed in view of the research objective: All significant models estimated the coefficient for secondment 3to be negative. It is expected that the population coefficient lies somewhere between -1.1 and roughly -2.

The findings cannot be disregarded as being merely based on a general economic upswing or downswing. In particular, the time series for entire Germany (1991-2016) covers several economically distinct periods. It starts off in 1991, only shortly after German unification and covers the years when Germany was deemed the Sick Man of Europe. Subsequently, it witnesses the recovery of the German economy in the early 2000s, the recent financial crisis and Germany's strong economic performance in recent years. This means that the relation described above at least cannot be dismissed as having occurred only during one particular business cycle pattern.

Discussion of Empirical Findings and Technical Aspects of the Models

Frome a technical perspective, the regression models would be expected to be in line with previous empiric findings, such as capital-labour substitution. For the Netherlands, the latter has been estimated to be roughly 0.3 and one might expect the German capital-labour substitution to be similar (Naastepad & Kleinknecht, 2004). However, in the national-level analysis this does not prove to be the case as the coefficient is estimated at -1.0. Lags of capital intensity growth were considered a possible explanation. Nevertheless, re-estimating the models with lagged capital intensity growth yielded no better results.

On the contrary, estimates relying on the short industry panel based on STAN data result in a positive coefficient for capital intensity growth of about 1.8, and here, capital intensity growth is the only reasonably significant variable. Estimates with industry-aggregated firm-level data yield coefficients for capital intensity growth which are close to the estimate for the Netherlands but then again, these coefficients are not statistically significant. Analysing the biggest data set, one can see partly significant coefficients for capital that are almost zero. There is no satisfying explanation of why the estimates for capital intensity growth should deviate on national and industry-level (based on nine industries).

Regarding the estimates on firm-level, there is one possible explanation regarding the deviation of capital intensity growth's coefficient from other empirical estimates: Here, the corresponding variable is named "investment" since the total investments of a firm are used as a proxy for capital stock. As Mueller (2008) explains, this approach is based on the assumption that investment

expenditure reflect depreciation. Hence, investment and capital stock must be proportional and consequently, it is by assumption not possible to add net investments to replacement investments. Mueller's argument might explain at least some of the deviations.

The most obvious limitation of these findings refers to causal inference. No lags are included between independent and dependent variable – therefore, no causality can be inferred from the analysis. Nevertheless, the condition that there is correlation between the dependent and independent variable is met.

Chapter 4 showed that most regulatory changes up until the year 2011 seemed to be designed to facilitate secondment. So, what would it do if not rise? One could argue that a rise in secondment is coinciding with a general trend in productivity growth, especially if only the time-series for entire Germany is considered. This argument is not convincing as the general association between secondment intensity and labour productivity growth is observed based on three different data sets. Another aspect relates to the sampling method. The firm-level data relies on stratified random sampling, but the sample size itself is reduced substantially due to a minimum amount of required information (for instance observations with no information on the number of employees must be disregarded). Hence, for general randomness of the data, one must assume that gaps in the data are random, too. Therefore, it cannot be excluded that there is some sort of bias due to the data preparation process.

With respect to the productivity ratio, the firm-level analysis (and also the industry-aggregated firm-data) uses total revenues in the numerator. Firms' shift toward lower-productivity and lower-skilled activities might result in higher revenues for the firm at large, but probably not per person engaged. The same holds for value added in the numerator (national-level data). Generally, relying on a monetary concept in the numerator is desirable if differences in product quality are totally reflected in prices because it allows for the comparison of many different outputs across firms and industries (Syverson, 2011). However, it can be problematic if prices reflect market power rather than product qualities, which cannot be ruled out.

The implications of using different productivity measures have already been discussed – in this case, hours versus persons engaged. Both measures, however, are not quality-adjusted as opposed to for instance wage bills, which "capture marginal products of heterogenous labor units" (Syverson, 2011, p. 331). Nevertheless, wage bills do not lend themselves to this project as secondment workers are not reflected in the wage bill. Hence, the productivity ratio would go up by definition if wage bills were used as an input. In like manner, any unmeasured variations in inputs will surface in the productivity measure. In regressions where the coefficients are estimated

114

with fixed-effects, this unobserved heterogeneity is removed (assuming that it is constant over time).

Is "negative" really negative?

On a national level, productivity was based on hours worked. In this context, a negative coefficient for secondment intensity means that productivity growth per hour decreases. Falling hourly productivity still allows for a net rise in output – the growth of hours worked just needs to outpace the negative trend of hourly productivity growth. In all other regressions, similar coefficients for secondment intensity were estimated relying on a per-person definition of labour productivity – showing that the growth of hours worked did not exceed the decrease in productivity. This surely is not in the interest of society at large. Bassanini et al. (2009) stress that labour productivity growth was responsible for at least 50% of GDP per capita growth within the majority of OECD countries. Most of these countries are characterized by an ageing population which underlines the importance of further productivity growth and increasing participation rates of under-represented groups in the labour market to maintain and even raise living standards. In this context, the results show that secondment does nothing to help increase labour productivity growth – leaving us with the second option of increasing participation rates of the under-represented. Here, the descriptive analysis in chapter 4 shows that secondment employees are mostly recruited from the unemployed. If these persons wouldn't find employment otherwise, then secondment's negative coefficient might not be as negative as it seems at the first glance: the creation of lower-productivity employment possibilities might decrease average productivity per person (or per hour), but generally speaking, it might be a good thing. The number of working poor and people with insecure jobs indeed increased after the reform package which also liberalised secondment, but Germany's large low-wage sector precedes these reforms (Odendahl, 2017). Therefore, Germany's big low-wage sector cannot be blamed on the growth of secondment intensity.

On the other hand, the Agenda 2010 reforms introduced a "negative income tax" which tops up low-wage earners' salaries (see subsection 3.3.1) if their salaries don't meet the subsistence minimum (Odendahl, 2017). If this applies to many secondment workers, then the previous argument falls short indeed – the inclusion of under-represented groups through secondment would not help in maintaining living standards if their subsistence depended on government subsidies. We have seen that the median salary of a secondment worker amounts to only 1816 Euro – not even 60 percent of the median salary across all industries and sectors. The subsistence minimum in German

law of obligation[35] was set to approximately 1070 Euro (cecu.de, 2018) which is not a very far cry from the net salary of an average secondment worker[36].

In earlier chapters, it has been outlined how long-lasting labour relations limit technology transfer through labour movement and that this issue is addressed through inter-company relations and closer cooperation (Hall & Soskice, 2001) (see section 3.1). Considering that secondment workers must be subjected to the same working conditions as permanent employees after nine months of tenure at the host firm, it seems reasonable to assume that secondment workers are constantly on "job-rotation". Therefore, it is also possible that secondment workers contribute to knowledge transfer by picking up best-practices and recent findings and introduce these at their respective deployment location. By and large, other scenarios are more likely: considering that the median salary in secondment is not even 60 percent of the median salary of the entire workforce, it is much more likely that the majority is deployed in low-productivity and low-creativity areas (cycled processes et cetera).

An earlier study concludes that in the Dutch economy during the period 1998-2008, companies rely primarily on secondment workers for flexibility reasons – as opposed to temporary contracts, which are mostly used to reduce wage costs (A. Kleinknecht et al., 2014). Even if the purpose of our study was not to investigate the reasons which motivate firms to rely on secondment workers, it is difficult to believe that this finding also holds for Germany. Subsection 3.3.2 presented that the long-term unemployed can take up employment for less than the minimum wage. As many secondment workers are recruited from within the unemployed and as the deployment of secondment workers is heavily skewed towards low-wage tasks, there is a chance that the exception to the minimum wage is applied. Another empirical study finds causality in either way between wage growth and labour productivity growth (Vergeer & Kleinknecht, 2017). If that is the case, secondment could have a negative influence on labour productivity growth through the wage route. But the consequences would reach further than that: Using a panel of 19 OECD countries, Vergeer and Kleinknecht (2010) show that slow wage growth is associated with an ageing capital stock – another way through which secondment intensity's negative association with labour productivity growth could come into effect. All in all, it remains doubtful how negative secondments coefficient really is. Nonetheless and having regard to Bassanini et al.'s argument, I am inclined to argue that we

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[35] The amount mentioned in German law of obligation seems more realistic as compared to the fiscal subsistence minimum (tax exemption) which in 2017 was set to 735 Euro per month or 8820 Euro per year (cecu.de, 2018).

[36] Approximately 1280 Euro, estimated based on the following assumptions: Single, 25 years old, no premia and thirteenth salary (brutto-netto-rechner.info, 2018).

should strive for increased participation of the under-represented *and* per-person productivity growth – therefore, negative remains negative.

So Small, Yet So Important?

How can something so small as secondment (2.3 percent of the total labour force in 2016) have such a big influence on firm's productivity? By regressing secondment intensity categories on labour productivity growth, it has been shown that the negative association of increasing secondment intensity only comes into effect if secondment intensity exceeds roughly five percent. In this context, secondment may be seen more as a proxy for changes in the institutional context rather than an independent labour market phenomenon. In Verburg et al. (2005), Storm and Naastepad argue that high-trust management-worker relations lead to higher labour productivity growth. Together with Wolfgang Streeck's notion of "socially institutionalized constraints […] that may be economically beneficial" (1997, p. 195) (or "beneficial constraints") one could argue that rising secondment intensities represent the erosion of the institutional context which was earlier described as "the German model". The bottom line of this approach is that good economic performance is impossible without appropriate embeddedness in a "well-integrated society" (p.199).

The German institutional context is described as relying heavily on training, long and sometimes even career-long labour relations, and high levels of both functional specialisation and hierarchical integration (the moving up of shop-floor workers into managerial positions) (Lazonick, 2007). Stability and security of tenure, in "model Germany", give production worker the courage to engage in process improvement as they don't feel to threaten their own positions. High secondment intensity might represent the erosion of all that – possibly leading to an environment where workers are mostly concerned with their own situation rather than with company matters.

Codetermination is another clear example of how the erosion of "beneficial constraints" might take place. The details of codetermination often depend on the number of employees of a company and in this context, a firm could rely more heavily on secondment employees to keep down the official number of employees. Still, secondment workers can be taken into account in codetermination, but this is not necessarily the case (Wassermann & Rudolph, 2007).

Outlook

Regarding the underlying set of hypotheses, the next step would be to further investigate the association between secondment intensity and labour productivity growth. Lags of both the independent and dependent variables should be included and interactions between variables could

be used to better understand the coherences. Moreover, and to increase robustness, a subsample could be created to test whether the findings still hold based on the sub-sample. The size control which has been used so far is a categorical variable. It is worth testing whether other indicators of firm-size such as number of employees or turnover would yield similar results. So far, the general number of "flexible workers" has not been accounted for – hence, the regressions should be repeated with a control for freelancers and interns.

As the IAB establishment panel contains roughly 50 variables on operational investment and innovation, the next step could be to analyse the influence of secondment intensity on labour productivity with respect to innovative behaviour.

The data use agreement with the IAB comprises two data sets: Firstly, the IAB establishment panel, which much of this project is based on, and secondly, the "Linked Personnel Panel", which has not been used yet. The latter allows for merging of individual and establishment data and creates the opportunity to simultaneously observe employer and employee. For instance, one could investigate whether higher secondment intensity is associated with concerns about job security or different levels of commitment in employees.

9. Conclusion

This thesis sets out to investigate the question: "What is the influence of secondment intensity on labour productivity growth in Germany? In answering this question, secondary data on firm-level, industry-level (two data sets, based on nine and 43 industries) and national level was used, and the results were estimated with fixed-effects and pooled ordinary-least-squares regressions.

Scientifically, this study resulted in evidence supporting the hypothesis that higher secondment intensity levels are associated with lower labour productivity growth. This finding is supported by significant regression results on three aggregation levels. With respect to the magnitude of the coefficient for secondment intensity, it is expected that the population coefficient lies somewhere between -1.1 (estimated on firm level) and -2.0 (estimated on national level). Regressions with a categorical variable indicating certain levels of secondment intensity support the hypothesis that the influence of secondment intensity on labour productivity growth depends on the actual level of secondment. The evidence suggests that the negative influence of secondment is significant only as of secondment intensities exceeding five percent. The findings, however, do not yet permit causal inferences as no lags of the independent variable were included.

From a monetary-policy perspective, it might make no difference whether rising secondment intensities lead to lower labour productivity growth or whether it just represents a firms' deliberate shift towards lower-productivity activities. from a macro-economic perspective and following the NAIRU-logic, labour productivity growth is essential to accommodate wage growth. Regardless of whether this evidence shows a deliberate shift towards lower productivity activities or not – lower productivity growth can accommodate less wage growth. And that, in turn, is not in the interest of the labour force or the country at large.

From a practical perspective, no causal inference à la "rising secondment intensities lead to lower productivity in general" is possible. Regressions based on secondment intensity categories have shown that the negative association takes effect at higher secondment intensities. Therefore, secondment is worth considering for "flexibility reasons". When secondment becomes "structural" (in that sense that the composition of the labour force relies considerably on secondment), then the management should consider whether the firm really wants to depart onto a "lower productivity growth route", possibly also associated with ageing capital.

From this research, it is evident that higher secondment intensities are associated with lower labour productivity, but it provides no indication of *why* this is occurs. I argue that secondment might be a proxy for broader institutional changes away from the classical "model Deutschland" towards a

more liberal institutional context or worse labour relations. Future research might investigate whether this "lower productivity growth route" is associated with a certain type of innovative behaviour.

Given the negative correlation of secondment intensity and investment intensity growth, one could hypothesise that firms rely on secondment workers to address productivity pressures (for example circumventing company collective agreements) instead of approaching the challenges by some sort of innovative behaviour. The IAB establishment panel contains roughly 50 variables revolving around operational investment and innovation and should allow to dive deeper into that question.

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132

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Appendix A Matching Industry- and Occupation Classification Systems (Documentation)

The subsequent table was created based on the following logic: Column ① contains industry subcategories which have been exported from the stan database. The subcategory definitions in ISIC rev.4 together with the definitions of the main categories in KldB 2010 have been used to assign each of the categories in column ① to the main industry categories in KldB2010 in column ②. These two classification systems rely on different logics, so that some subcategories in column ① matched with several main categories partially, but none of them completely, which resulted in assigning them to several categories. As explained earlier, it has been attempted to rely on the highest levels of aggregation as possible. Column ③ indicates whether a subcategory has been considered in compiling the main industry categories according to KldB 2010. If the more aggregate level was considered, then the less aggregate subcategories weren't to avoid double accounting (and vice versa). If a subcategory was considered, then it was market with "Y" (yes) and its final category was reported in column ④, if not, it was market with "N" (no). Column ⑤ contains information on which period the data covers and whether it relies on estimates or not. Column ⑥ shows whether a subcategory's data covers all variables ("Y" for yes and "N" for no) and if not, column ⑦ points out which variables are missing or not fully covered based on a code (please find the legend at the bottom of the table). Missing variables or limited variable coverage are also indicated by means of colour in column ③ (limited variable coverage is only significant if the subcategory has been considered, as indicated in column ③). Green background colour indicates that no variables are missing, red colour indicated the opposite. Red fill colour in column ⑦ indicates that the limitations in data coverage are relevant.

Table 24.

Exemplary table: Matching of KldB 2010 and Isic Rev4.

Industry Subcategory Description (STAN Data Base) ①	Matching with Category ②	Considered for New Cat. (Y/N) ③	Assigned to Category ④	Period of Data Coverage ⑤	Data Type	All Variables Covered? ⑥	Missing / Covered Variables ⑦
[...]							
D68: Real estate activities [L]	6	Y	6	1991-2016		Y	
D69T82: Professional, scientific and technical activities; administrative and support service activities [M-N]	7	N		1991-2016		Y	
D69T75: Professional, scientific and technical activities [M]	7	N		1991-2016		Y	
D69T71: Legal+accounting activ.; activities of head offices; management consult. activ.; architecture+eng. activ.; technical testing+analysis	7	N		1991-2015		Y	
D69T70: Legal and accounting activities; activities of head offices; management consultancy activities	7	Y	7	1991-2015		N	b
D69: Legal and accounting activities	7	N		2008-2015	a	N	c
D70: Activities of head offices; management consultancy activities	7	N		2008-2015	a	N	c
D71: Architectural and engineering activities; technical testing and analysis	2; 3; 4	Y	2; 3; 4	1991-2015		N	b
D72: Scientific research and development	2; 3; 4; 9	Y	2; 3; 4; 9	1991-2015		Y	
D73T75: Advertising and market research; other professional, scientific and technical activities; veterinary activities	2; 8; 9	N		1991-2015		Y	
D73: Advertising and market research	9	Y	9	1991-2015		N	b
D74T75: Other professional, scientific and technical activities; veterinary activities	2; 8	N		1991-2015		N	b
[...]							

Note. Y = Yes, N = No. a: Estimates based on detailed Structural Business Statistics (SBS) or industry census data: either published by OECD (ISIC Rev.4) and/or Eurostat (NACE Rev.2) or drawn directly from national sources (and converted from national industry classifications to ISIC Rev.4) b. missing: hours worked - total engaged, hours worked - employees; c. missing: gross output (volumes, deflators), intermediate inputs (volumes, deflators), value added (volumes, deflators), net operating surplus and mixed income, consumption of fixed capital, hours worked - total engaged, hours worked - employees, gross fixed capital formation (volumes, deflators), gross capital stock (current, volumes), net capital stock (current, volumes).

Table 25.

Time Series: Results of the Durbin-Watson d-statistics for the regressions in Table 9.

	(1)	(2)	(3)	(4)	(5)	(6)
K, n	2, 25	3, 25	4, 25	3, 25	4, 25	5, 25
d-Statistic	1.598	1.516	2.128	1.612	1.538	2.293
Autocorrelation?	No	No	No	No	Ind.	Ind.

Note. K= number of regressors, n=number of observations, No=absence of autocorrelation, Ind.=test indifferent.

Table 26.

Time Series: Results of Durbin's alternative test for autocorrelation for the regressions in Table 9.

	(1)	(2)	(3)	(4)	(5)	(6)
Lags (p)	1	1	1	1	1	1
Chi2	0.842	1.272	0.250	0.706	0.982	0.654
df	1	1	1	1	1	1
Prob > chi2	0.3588	0.2595	0.6173	0.4006	0.3217	0.486

Note. H0 = No serial correlation. df = degrees of freedom.

Table 27.

Time Series: Results of the Engle's Lagrange multiplier for autoregressive conditional heteroskedasticity effects for the regressions in Table 8.

	(1)	(2)	(3)	(4)	(5)	(6)
Lags (p)	1	1	1	1	1	1
Chi2	0.000	0.005	0.050	0.151	0.091	0.001
df	1	1	1	1	1	1
Prob > chi2	0.9911	0.42	0.8231	0.6975	0.7625	0.9807

Note. H0 = no autoregressive conditional heteroskedasticity effects. df = degrees of freedom.

Table 28.

Time Series: Results of the Durbin's alternative test for autocorrelation for the regressions in Table 30.

	(7)	(8)	(9)	(10)
Lags (p)	1	1	1	1
Chi2	0.8714	1.600	2.571	3.931
df	1	1	1	1
Prob > chi2	0.982	0.2060	0.1088	0.0474

Note. H0 = No serial correlation. df = degrees of freedom.

Table 29.

Time Series: Results of the Engle's Lagrange multiplier test for autoregressive conditional heteroskedasticity effects for the regressions in Table 8.

	(1)	(2)	(3)	(4)	(5)	(6)
Lags (p)	1	1	1	1	1	1
Chi2	0.000	0.005	0.050	0.151	0.091	0.001
df	1	1	1	1	1	1
Prob > chi2	0.9911	0.42	0.8231	0.6975	0.7625	0.9807

Note. H0 = no autoregressive conditional heteroskedasticity effects. df = degrees of freedom.

Table 30.

Time Series: Regression results including lags of the dependent variable.

	(7)	(8)	(9)	(10)
Method	OLS	OLS	OLS	OLS
VARIABLES	Dependent variable: Productivity gr			
Capital gr	-1.1120***	-1.1157***	-1.0450***	-1.0828***
	(0.2202)	(0.2001)	(0.2541)	(0.2344)
Economy	0.0030*	0.0024	0.0018	0.0014
	(0.0017)	(0.0016)	(0.0018)	(0.0016)
Secondment	-2.8720***	-2.0395***	-3.1417***	-2.3756***
	(0.5230)	(0.6037)	(0.5178)	(0.6083)
Productivity gr L1	0.0151	-0.0371	-0.0600	-0.0959
	(0.2092)	(0.1915)	(0.2024)	(0.1870)
Productivity gr L2			-0.3999*	-0.3251
			(0.2214)	(0.2070)
Regulation		-1.5666**		-1.3865*
		(0.7005)		(0.6850)
Constant	6.8363***	6.8600***	7.8217***	7.7098***
	(0.9998)	(0.9087)	(1.0712)	(0.9868)
Observations	24	24	23	23
R-squared	0.6541	0.7293	0.7201	0.7771

Note. L1 = first lag, L2 = second lag and so forth. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

"Capital gr" represents the growth of net capital stock per hour worked. "Economy" is a control for economic activity. "Secondment" stands for the number of secondment workers relative to the total number of people engaged. "Regulation" is a dummy for an increase in the maximum secondment duration in 2002.

Table 31.

STAN industry data: Breitung unit-root test

Variable	Statistic	p-value
Productivity	-0.8069	0.2099
Secondment	-0.8363	0.2015
Capital	0.245	0.5968
Supervision	0.6476	0.7414
Economy	-1.0591	0.1448

Note. H0: Panels contain unit roots. Ha: Panels are stationary.
"Productivity" abbreviates labour productivity growth and is defined as gross output per person engaged. "Capital" represents the growth of net capital stock per hour worked. "Economy" is a control for economic activity. "Secondment" is number of secondment workers relative to the total number of people engaged. "Supervision" refers to the ratio of employees in management positions to the total number of people engaged.

Table 32.

STAN industry Data: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity.

Statistics	(1)	(2)	(3)	(4)
chi2(1)	0.54	0.45	0.6	0.84
Prob> chi2	0.4629	0.5046	0.4393	0.3581

Note. H0: Constant Variance.

Table 33.

STAN Industry data: Fixed effects versus pooled OLS.

	(1) POLS	(2) FE
Method		
Variables	Productivity	Productivity
Secondment intensity	0.2330	6.0914
	(0.5601)	(4.7824)
Constant	0.5497	-9.5687
	(1.7949)	(8.2600)
Observations	27	27
R-squared	0.0040	0.0424
Number of industries		9

Note. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Estimated by either pooled OLS or fixed-effects both with robust standard errors
"Productivity" abbreviates labour productivity growth and is defined as gross output per person engaged. "Secondment" is number of secondment workers relative to the total number of people engaged.

Table 34.

Industry-level OLS regression results based on labour productivity defined as <u>gross output</u> per person.

Method Variables	(1) POLS Productivity	(2) POLS Productivity	(3) POLS Productivity	(4) POLS Productivity
Capital	1.0233*** (0.2981)	1.0131*** (0.2961)	0.9896*** (0.2888)	0.9688*** (0.2998)
Secondment		0.1427 (0.2488)	0.1547 (0.2177)	0.1742 (0.2161)
Economy			-0.0026 (0.0018)	-0.0028 (0.0020)
Supervision				-0.0659 (0.0756)
Constant	0.6825* (0.3522)	0.4359 (0.6223)	0.6833 (0.6632)	1.0487 (0.9374)
Observations	27	27	27	27
R-squared	0.4021	0.4090	0.4391	0.4514

Note. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Monetary values: 2010 Euros. Estimated by pooled OLS with robust standard errors.
"<u>Productivity</u>" abbreviates labour productivity growth and is defined as gross output per person engaged. "<u>Capital</u>" represents the growth of net capital stock per hour worked. "<u>Economy</u>" is a control for economic activity. "<u>Secondment</u>" is number of secondment workers relative to the total number of people engaged. "<u>Supervision</u>" refers to the ratio of employees in management positions to the total number of people engaged.

Table 35.

STAN industry data robustness test: Dependence of the results on the presence of industry one.

	Capital	Secondment	Economy	Supervision	Constant
Coefficient	0.4040	0.4080	-0.0046**	-0.0583	0.6176
Standard Error	(0.2823)	(0.3173)	(0.0020)	(0.0847)	(0.7667)

Note. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Estimated with robust standard errors based on pooled OLS based on the STAN industry data set but excluding industry one (agriculture, forestry, livestock, gardening) and hence with eight groups and 24 observations. R-squared = 0.3346.
"<u>Productivity</u>" abbreviates labour productivity growth and is defined as gross output per person engaged. "<u>Capital</u>" represents the growth of net capital stock per hour worked. "<u>Economy</u>" is a control for economic activity. "<u>Secondment</u>" is number of secondment workers relative to the total number of people engaged. "<u>Supervision</u>" refers to the ratio of employees in management positions to the total number of people engaged.

Table 36.

IAB firm-level data: regressing secondment categories on productivity

	Dependent Variable: Productivity
Investment	0.0002**
	(0.0001)
Secondment categories	
$0 < sec. < 0.01$	-0.0179
	(0.0163)
$0.01 \leq sec. < 0.02$	-0.0032
	(0.0145)
$0.02 \leq sec. < 0.03$	-0.0167
	(0.0154)
$0.03 \leq sec. < 0.04$	-0.0247
	(0.0165)
$0.04 \leq sec. < 0.05$	-0.0167
	(0.0203)
$0.05 \leq sec. < 0.075$	-0.0415***
	(0.0157)
$0.075 \leq sec. < 0.1$	-0.0694***
	(0.0186)
$0.1 \leq sec. < 0.15$	-0.0828***
	(0.0209)
$0.15 \leq sec. < 0.2$	-0.1451***
	(0.0288)
$0.2 \leq sec. < 0.3$	-0.1975***
	(0.0286)
$sec. > 0.3$	-0.4476***
	(0.0592)
Constant	0.005062
	(0.0100)
Observations; Firms	21330; 7729
R-squared	0.0150

Note. Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Estimated with time and entity fixed-effects. "Productivity" is defined as the first difference of ln (sales/all persons engaged). "Investment" is a proxy for capital and is defined as the growth of the ratio of investments to total number of people engaged. "Secondment" is number of secondment workers relative to the total number of people engaged. "sec." abbreviates secondment and can assume values from 0 to 1.