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Supply-side labor market reforms: A neglected cause of the productivity crisis

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Abstract
In spite of impressive stories about a *Second Machine Age* or *Industry 4.0*, growth rates of labor productivity in the US, Japan and Western Europe declined, during the last 10-15 years, to their lowest levels since World War II. Recent contributions on the productivity slowdown by mainstream economists produced an impressive amount of statistical data that certainly add to our understanding, but they fail addressing the negative impact of supply-side labor market reforms on innovation and productivity. I present theoretical arguments of how labor market deregulation can negatively influence innovation and productivity growth and I review empirical evidence.

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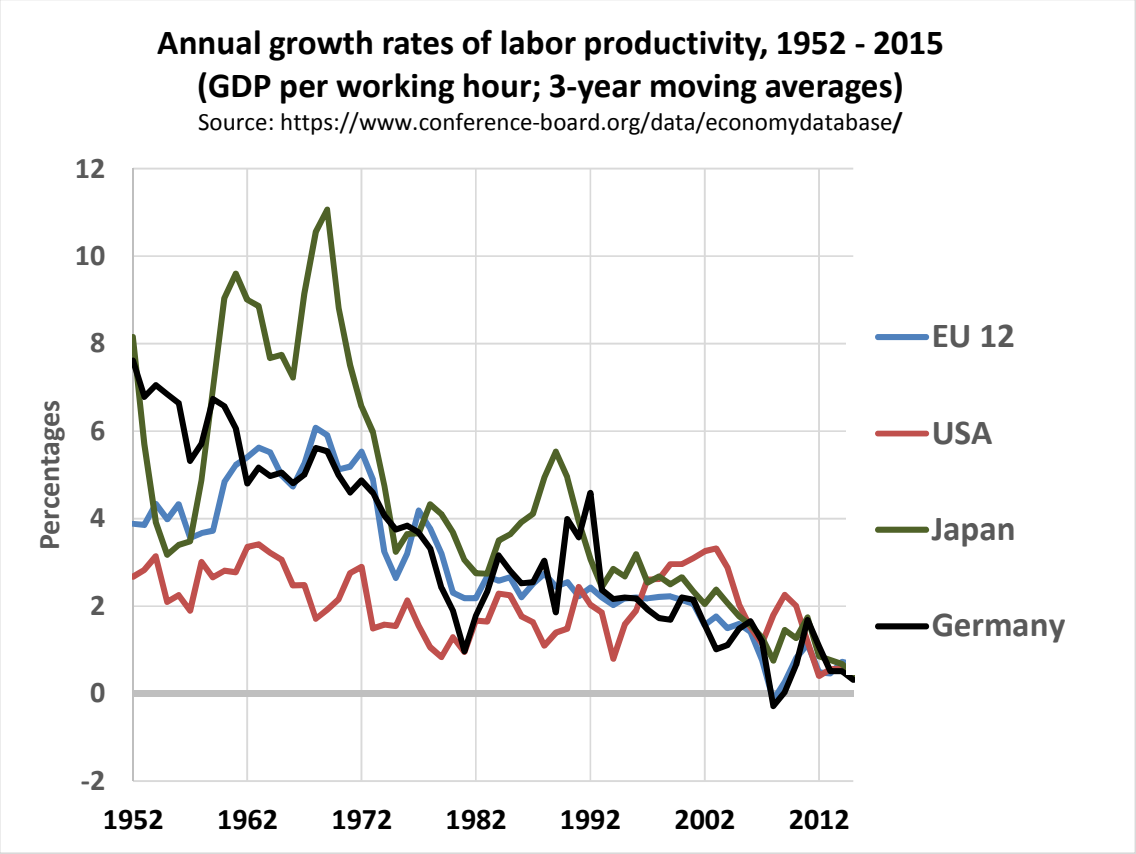
Key words: Varieties of capitalism; structural reforms of labor markets; innovation; productivity crisis

I Introduction: A labor productivity crisis

Figure 1 shows long run growth rates of labor productivity (i.e. GDP per labor hour) in the US, Japan and in Western Europe. During the 'Golden Age of Capitalism' in the 1950s and 1960s, we see high growth rates, followed by a tough decline in the early 1970s. The latter has also been interpreted as the fading of a long post-war Kondratieff upswing (Kleinknecht & Van der Panne 2015). From the 1970s onwards, growth rates in Japan and Europe still tend to be well above 2 per cent per year, but are persistently lower in the US. After 1995, US productivity performance resumes remarkably which has been ascribed to a successful IT sector. The renewed decline of US productivity growth after 2004/05 has been interpreted as signaling an exhaustion of the IT boom (Gordon 2016). Since 2004-05, we see an overall decline of productivity growth, growth rates converging towards the zero line.



As value added is, by definition, equal to National Income, such tiny rates of value added growth per working hour mean that very little is to be distributed (extra) between capital, labor and government. This reduces options for solving distributional conflicts, and it is no good message against the background of an ageing population in many countries. Under the existing social power relations, the productivity slowdown is likely to result in increased pressures towards cutting back on government budgets, as well as in tough downward pressure on wages, probably most felt in the lower ranges of the earnings distribution.

This paper is structured as follows: Section II discusses attempts at explaining the productivity slowdown after 2004/05. There appears to be strong evidence that the low productivity figures are real and cannot be ascribed to statistical mismeasurement. Section III discusses arguments of how and why supply-side labor market reforms can harm innovation and productivity. Here, I focus on the negative impact of flexible labor when long-run accumulation of (tacit) knowledge is important for innovative competencies. Section IV discusses counter-arguments and alternative interpretations by supply-siders. Section V cites empirical evidence, emphasizing that past research suffered from not controlling for the dominant innovation model in a sector. Section VI concludes by discussing implications for economic theory and policy.

II Attempts at explaining the productivity crisis

II.1 Is it a measurement problem?

An issue that tends to come first to our mind is: do statisticians measure productivity adequately? Is the productivity crisis real or is it a statistical artefact? This comes down to one key question: Could it be that, in the IT age, consumers enjoy much higher consumer surpluses compared to previous periods? In other words, could it be that most of the welfare gains from IT are not appropriated by producers, but by users, and thus are not measured as productivity gains? The coincidence of quality increases and declining prices of IT hardware and software is somehow suggestive here. Moreover, a number of products are given away for free (e.g. Gmail, Skype, Wikipedia). As far as such free services replace previously paid goods or services (e.g. subscription fees or printed lexica), their free distribution might actually *reduce* measured productivity, in spite of substantial welfare gains for their users.

There are three counter arguments here. First, the weight of free IT services in total National Product is fairly small, too small to have a significant impact on aggregate productivity figures (Hartwig & Kramer 2017). Second, even if it were true that undercounting of productivity growth is more serious with respect to IT when compared to older technologies, there remains the problem that we have to explain why productivity declined *around 2004/05*. It appears hard to make the case that e.g. hidden (unmeasured) quality improvements and/or higher consumer surpluses would apply to the post 2004/05 period, but *not* to IT in the years before. Byrne et al. (2016) argue that rather the opposite may hold, at least in the US. Besides, they note that the amount of possible mismeasurement related to IT is a fairly small fraction of total GDP. A similar argument about undercounting of productivity in the past, rather than in the present, is made by Gordon (2016), referring to historical case studies (2016: 528). Third, Syverson (2017) shows that differences in productivity growth across countries are *not* related to inter-country differences in either IT production or IT use, which further weakens the argument that mismeasurement of IT goods and services could explain the decline in measured productivity growth. In conclusion, it appears that the productivity crisis after 2004/05 as shown in Figure 1 is not a statistical artefact, but real.

II.2 Is it the by-product of a balance sheet recession?

Analyzing the long Japanese stagnation from 1990 to today, Richard Koo developed the hypothesis of a balance sheet recession. In his view, long stagnation periods come from over-speculation. During the build-

up of financial bubbles before 2008, lots of assets were bought (often on credit), hoping for further price increases. After the Lehman Crash, assets prices declined. Attempts to compensate for losses from asset price deflation result in increased savings, trying to consolidate balance sheets. While higher savings are rational at micro-level, they can be counterproductive at macro-level as we face the problem of a Keynesian savings paradox that can lead to longer periods of stagnation (Koo 2011). This is consistent with historical observations by Reinhart & Rogoff (2011) who also warn against longer recessions that can follow the implosion of major financial bubbles.

At this moment, it remains to be seen whether a scenario of long-run slow growth in Japanese style is realistic for the US or Europe. It could well be that *Quantitative Easing* by Central Banks will unleash the buildup of new financial bubbles that (partly) eliminate losses from asset price deflation after 2008. This might shorten the balance sheet recession. In any case, we have to note that, since the outbreak of the 'Great Recession' after the Lehman Crash in 2008, investment activity remained weak. As productivity improvements are also 'embodied' in new investment goods, the low investment ratios between 2008 and today certainly contributed to low productivity performance. So far, Koo's balance sheet hypothesis can add to our understanding of the severity of the productivity crisis.

II.3 Is there an exhaustion of technological opportunities?

There is one problem with the explanation of low productivity growth by the balance sheet hypothesis: Figure 1 shows that the productivity slowdown started well before 2008. This hints to a role for 'structural' factors such as Gordon's (2016) observations about an exhaustion of the US IT boom. Another structural factor may be cuts in basic research during the period of supply-side economics, as acknowledged by the OECD (2015). The latter is enhanced by short-termism of management (e.g. Porter 1992). It might well be that the World-wide pool of breakthroughs in fundamentally new knowledge is too poor.

Besides poor investment in basic research, however, the lack of 'absorptive capacities' (Cohen & Levinthal 1989) in *using* the pool of basic knowledge might also be important. After having cut their basic research, firms miss an 'antenna' for absorbing the results of basic research done elsewhere. In order to absorb new knowledge from other's basic research, firms need engineers who perform basic research and therefore can read and evaluate research published in top journals. In other words, you need to perform basic research yourself in order to make use of findings from others' basic research. This is an important reason of why firms perform basic research that results mainly in scientific publications without immediate financial benefits to the firm (Rosenberg 1990).

III A new explanation: Supply-side labor market reforms

The rise of supply-side economics in the 1970s brought a ban on fiscal policy, a fierce attack on the Keynesian welfare state and strong pleas for structural reforms of labor markets. The latter focus on easier firing, trimming of social benefits and minimum wages, or the decentralization of wage bargaining. A key concern is about achieving more (downward) wage flexibility. How could such a policy influence innovation and productivity?

In the following, I summarize theoretical arguments under three headings: (1) Reforms change power relations between capital and labor, leading to weaker wage growth, which, in turn, reduces labor productivity growth through a slower speed of diffusion of labor-saving technology. (2) More flexible labor relations create unfavorable conditions for the management of innovation on the shop floor. (3) Decentralization of wage bargaining widens the gap between innovative leaders and laggards as it allows for a slower adoption of advanced process technology by the latter.

III.1 Weaker growth of wages and labor productivity at macro-level

Vergeer & Kleinknecht (2011) show that the five champions of supply-side labor market reforms of the 1970s and 1980s (i.e. US, UK, Canada, New Zealand and Australia) show a substantially weaker growth of real wages and of labor productivity, compared to Old Europe (2011: 272-274). Seemingly, structural reforms have changed power relations between capital and labor, resulting in modest wage growth. In a panel data analysis of 19 OECD countries (1960-2004), it turns out that low wage growth has a significantly negative influence on labor productivity growth, and the effects are substantial: A one-percent lower growth of real wages causes an 0.32 – 0.49% lower growth of GDP per working hour, depending on the specification (Vergeer & Kleinknecht, 2011, 2014).

Neoclassical theory offers three explanations for this finding. The oldest one is from Hicks (1932) on capital for labor substitution. A closely related explanation is about induced innovation (Samuelson 1965). A bit less known are vintage models of the capital stock that address a similar causality, but in a dynamic perspective. It can be argued that wage growth influences the speed of replacement of old vintages of capital stock by new (and more productive) ones: rapid wage growth triggers a more rapid scrapping of old vintages that become unprofitable due to their lower productivity (Tjan & Den Hartog 1980; Muysken & van Ardenne 1976).

A forth (rather evolutionary than neoclassical) explanation relates to Schumpeterian 'creative destruction'. It can be argued that innovative market leaders can easily pay higher wages, owing to their monopoly rents from innovation. But technological laggards may run into difficulties. Hence, an industry-wide aggressive wage policy by trade unions will enhance Schumpeterian creative destruction, which pushes the technological laggards towards either modernizing their equipment (and/or their product offerings) or going out of business.

III.2 Worsening conditions for innovation at micro-level

One might argue that the division between 'Liberal Market Economies' (LME; i.e. US, UK, Canada, New Zealand or Australia) versus 'Coordinated Market Economies' (CME, i.e. Old Europe or Japan) as proposed by Albert (1991) or Hall & Soskice (2001) gets gradually somehow blurred as some countries in Europe engage in labor market reforms that adopt (parts of) the supply-side policy agenda (as e.g. in Germany, Italy, or, more recently, in France). But even if such reforms do not take place, firms can engage in 'do-it-yourself' labor market reforms, e.g. by hiring people from manpower agencies, or by offering temporary contracts, or by hiring freelance workers. Notably the pressure from high unemployment made many

people accept such 'atypical' and often precarious jobs. Whatever be the route to more flexibility, there are a number of reasons to expect a negative impact of increased flexibility of labor on innovation and productivity, which can be summarized under eight headings:

First, easier firing will unavoidably lead to shorter job tenures, which make firm sponsored training less attractive to employers. Moreover, employees themselves might be more interested in *general* training that improves their employability on the external labor market, rather than in *firm-specific* training, if there is no perspective of staying longer in the firm (Belot et al. 2002).

Second, under shorter job tenures, historical memories of firms may become weaker, the firm turning from a learning into an unlearning organization. This has a negative impact on the development of routines, on learning-by-doing, or on learning from past managerial mistakes.

Third, easy firing will erode loyalty and commitment of workers. This can mean that technological knowledge and trade secrets are more easily leaked to competitors, thus increasing the problem of Pigouvian externalities.

Forth, reduced loyalty requires more monitoring and control. Naastepad & Storm (2006) show that Anglo-Saxon *Liberal Market Economies* have substantially higher percentages of managers in their personnel than firms in Old Europe or Japan.[1] Thicker management layers are probably a good indicator of social distrust. They not only create high overhead costs, but are also an impediment to creative people.

Fifth, Joseph Schumpeter described two different models of innovation. Schumpeter (1912) described the inventor/entrepreneur of the 19th century ('Schumpeter I model'). Schumpeter (1943) admired the large corporation with market power, arguing that the innovative process itself had undergone an innovation: Individual inventors have been replaced by the professional R&D lab of the large corporation ('Schumpeter II model'). Schumpeter's two innovation models have been at the basis of an older literature on whether market power is conducive to innovation (e.g. Kamien & Schwartz 1982; Scherer 1992).

More recent literature worked out Schumpeter's idea in a different direction, emphasizing that both models are associated with different knowledge bases. Schumpeter I innovators rely heavily on general (and generally available) knowledge, while the professional R&D lab relies more on firm-specific knowledge that has been accumulated over longer periods (see e.g. Breschi et al. 2000; or various chapters in Hanusch & Pyka 2007). Much of the accumulated knowledge is 'tacit'. Tacit knowledge tends to be poorly documented and ill-codified; as it is based on personal experience, it tends to be 'embodied' in workers (Polanyi 1966).

The latter implies that, under a Schumpeter II innovation model, well-protected insider positions and long job tenures are attractive to employers, as they greatly enhance the accumulation and protection of precious knowledge. In a neoclassical perspective, however, insider positions are a labor market rigidity that prevents the efficient allocation of scarce resources. In a Schumpeterian perspective, insider positions are crucial for managing and protecting a firm's knowledge base. In this context, it is interesting to note that

[1] Kleinknecht et al. (2016) show with firm-level data (representative of all organizations that employ labor in the Netherlands), that higher shares of flexible labor (on various definitions) correlate with higher percentages of managers in total personnel.

there is evidence from innovation surveys, showing that loyalty of people and long job tenures are actually more important than patent protection for protecting an innovator's lead above imitators.[2]

Sixth, thanks to Adam Smith's famous pin factory parable, economists recognize the advantages of division of labor and specialization for productivity. Notably under a Schumpeter II model, technicians are needed who are sometimes deeply specialized. Narrow specialization makes them more valuable to the firm, but it also restricts their options on the external labor market in case of firing. For your external employability, having a broad working experience is better than having spent many years on a narrow specialism. Hence, greater job security may enhance specialization in a Schumpeter II model.

Seventh, the option of easy firing gives more power to managers towards the shop floor. This can favor autocratic management practices as people will not so easily contradict their bosses. As a consequence, management receives poor feedback from the shop floor, which may have a direct impact on technology diffusion. For example, Lorenz (1999) argues that, for the implementation of automation technology, one often needs the tacit knowledge of the people who do the work that is to be automated. If these people have no safe insider position, they will refuse collaborating. More generally, under easy hire and fire, people have motives for hiding information about how their work could be done more efficiently.[3]

Eighth, another aspect of a culture of fear is that people who search for solutions of problems will tend to opt for the least risky solutions. More risky solutions might be more rewarding to the firm, but also carry a larger risk of failure that can be punished by firing (Acharya & Krishnamurthy 2010). Analyzing US patent and patent citation data, Acharya & Krishnamurthy find that an improvement of firing protection in the US lead to higher numbers of patents and more highly cited patents.[4]

III.3. Decentralized bargaining curtails the diffusion of advanced process technology

Decentralization of wage bargaining, from national or industry-level bargaining to firm- or person-level bargaining has a prominent place on the supply-side reform agenda. In Europe, industry-level bargains are often imposed by government directives on everyone in the industry, including non-unionized workers. Neoclassical economists have always interpreted this as a labor market rigidity that supports a trade union

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[2] In *Community Innovation Survey* data in the Netherlands, it turned out that among the mechanisms for protecting monopoly rents from innovation against imitators, 'time lead on competitors' and 'secrecy' ranked first and second. 'Keeping qualified people in the firm' ranked third and 'patent protection' forth (Brouwer & Kleinknecht, 1999). One should note that the second and third ranked factors depend on loyalty and commitment of workers that will diminish under flexible hire and fire practices (see also Svensson 2011).

[3] Smulders et al. (2013) show empirically that tenured workers take substantially more initiatives for innovative activities in Dutch firms, compared to flexible workers.

[4] Exploiting time-series variation in changes of dismissal laws, they conclude that 'innovation and growth are fostered by stringent laws governing dismissal of employees, especially in the more innovation-intensive sectors. Firm-level tests within the United States that exploit a discontinuity generated by the passage of the federal *Worker Adjustment and Retraining Notification Act* confirm the cross-country evidence' (2010: 1).

wage cartel. Under decentralized bargaining, unions could sacrifice wage claims in firms that are in trouble, thus protecting jobs, while claiming higher wages in profitable firms.

This has, however, a negative impact on the Schumpeterian process of 'creative destruction': Firms making monopoly profits from innovation are charged with high wage claims, while technological laggards are remunerated by workers willing to sacrifice wages in order to rescue their jobs. This has a negative impact on innovation in two ways: (1) Innovators loose (part of) their monopoly profits that are an incentive for accepting high risks and uncertainties; and (2) laggards have lower incentives modernizing their equipment and/or their product offerings. Decentralized wage bargaining may be one explanation for the OECD's (2015) observation that the gap in productivity growth between innovative pioneers and laggards has substantially widened over recent years.

IV. Counter-arguments by supply-siders

A number of arguments have been made in the literature about favorable effects of flexible labor relations for innovation. These can be summarized under eight headings:

First, strong firing protection will slow down the reallocation of labor from old and declining sectors to new and dynamic ones (e.g. Nickell and Layard, 1999).

Second, the difficult or expensive firing of redundant personnel can frustrate labor-saving innovations at the firm level (Bassanini and Ernst, 2002; Scarpetta and Tressel, 2004).

Third, well-protected and powerful personnel could appropriate rents from innovation through higher wage claims, thus reducing incentives for taking innovative risks (Malcomson, 1997).

Fourth, firms will more easily engage in risky new ventures if they are sure they can easily quit their personnel in the case of failure (Bartelsman *et al.*, 2012).

Fifth, easier termination of less productive job matches increases the chance that people will find jobs in which they are more productive. When scrutinizing the economic impact of political party programs for the 2012 national elections in the Netherlands, the *Central Planning Office* (*CPB*, The Hague) used this argument, attributing in its macro-econometric model positive productivity effects to policy proposals towards easier firing.

Sixth, higher labor turnover enhances the inflow of 'fresh blood': People with new ideas and new networks may foster innovation. Moreover, there is less chance that employees will be entrenched in safe jobs, gradually losing their creativity.

Seventh, the (latent) threat of easy firing may prevent 'shirking'.

Against such arguments, several objections are possible. As to the first argument, emerging new industries obviously offer better career opportunities and higher pay than declining industries. Why should we not rely that such incentives will make people move voluntarily into new industries? Is strict firing protection in

the coal mines indeed the reason that people do not move into the IT industry?

As to the second argument, rates of job turnover have been estimated as being around 9–12%, thus offering some potential for downsizing without forced leave.[5] Moreover, if firing is difficult, firms have incentives to invest in functional flexibility by means of training, which allows labor to be shifted from old to new activities in internal labor markets. In other words, a lack of *external (or numerical)* flexibility will enhance *internal (or functional)* flexibility.[6]

The third argument about workers capturing profits from innovation may indeed be relevant under decentralized wage-bargaining that is typical of deregulated Anglo-Saxon labor markets. 'Rhineland'-type labor markets rely more on industry-level bargaining in which wage bargains are often imposed by government on *everyone* in a sector. Moreover, according to the above-mentioned vintage models, such a labor market rigidity may actually increase investments and enhance technology diffusion, as technological laggards may be forced making productivity-increasing investments in response to rising wages.

The fourth argument about encouraging new ventures: This may be relevant as it allows part of the entrepreneurial risks to be shifted to employees which might encourage startups. On the other hand, firing protection in Europe is usually build up during many years of service in the same firm. People in start-ups that go bankrupt within a few years have only minor claims against the firm.

As to the fifth and sixth argument about job matches and inflow of 'fresh blood': whether this is favorable to innovation or not depends on whether firms can rely on readily available *general* knowledge in Schumpeter I model, or whether they are dependent on continuous accumulation of (tacit) knowledge in a Schumpeter II model.

In addition to these six counter-arguments, there is a serious argument, coming from the OECD's Economics Department that propagated the deregulation of labor markets during many years. OECD economists noticed in the OECD Employment Report (2003) that '*… a weak trade-off may exist between gains in employment and productivity…'*. Further, they argue that this has to do with newly created jobs for low-qualified workers:

'For example, decentralisation of wage bargaining and trimming back of high minimum wages may tend to lower wages, at least in the lower ranges of the earnings distribution. Similarly, relaxing employment protection legislation ... may encourage expansion of low-productivity/low-pay jobs in services' (OECD 2003: 43; Box 1.4).

As a justification for the deregulation of labor markets, they argue that such low-productive jobs are created in countries with *flexible* labor markets and *not* in the regulated labor markets of Old Europe. In the

[5] Kleinknecht *et al.* (2006) report that, on average, 9–12% of a firm's personnel in the Netherlands leave voluntarily each year, the exact percentage depending on the state of the business cycle. Nickell and Layard (1999, p. 363) report that this figure amounts to more than 10%.

[6] Acemoglou and Pischke (1999) emphasize that wage compression in rigid German labor markets enhances training for highly educated *and* for low-educated workers, while in the liberalized US system mainly highly educated workers receive training.

latter, labor is (too much) protected and hence expensive, keeping low-qualified people out of work. In this view, the productivity crisis is just a negative by-product of job creation in the low-wage segment.

There is a certain plausibility to this argument, but one question remains: Should we speak about low productive *people* or about low productive *jobs*? Our above-named arguments suggest that the *jobs* are low-productive. The mix of low wages and easy-to-fire people is a brake on the diffusion of labor-saving technology. There is less training and old vintages of capital goods are only slowly replaced by new and more productive ones; and the Schumpeterian process of creative destruction does not work, which increases the probability of survival of less talented entrepreneurs. All this has favorable employment effects, at least in the short run. But it also creates a lock-in of people in low-productive work and firms are under-utilizing their talents. It seems therefore appropriate speaking about low-productive *jobs* rather than about low-productive *people*.

Finally, the OECD researchers provide no empirical support for their hypothesis that low-productive jobs would have a significant influence on overall labor productivity growth. The only test available arrives at insignificant outcomes.[7] There are of course people with low productivity. The question is, however, whether such people cannot better be helped by subsidizing their work. This is probably more efficient than bringing down economy-wide productivity growth through a supply-side reform program.

[7] Vergeer & Kleinknecht (2014) have tried to test the OECD hypothesis. They included the growth of numbers of workers (which is supposed to be higher if more low-productive jobs are created) as an explanatory variable in their productivity equation. The variable had the expected negative sign, but the coefficient was much too small to be significant.

V Empirical evidence

Many empirical studies used country or sector data, trying to find a relationship between measures of labor market flexibility (e.g. the OECD's Employment Protection Legislation Index) and figures on productivity or innovation (e.g. Buchele & Christiansen 1999; Nickell & Layard 1999; Bassanini & Ernst 2002; Scarpetta & Tressel 2004; Auer et al. 2005; Storm & Naastepad 2012). Some, but not all, studies find negative relationships. Many studies with firm-level data also find a negative relationship between measures of 'low road' personnel policy and innovation or productivity (e.g. Huselid 1995; Michie & Sheehan 2001, 2003; Kleinknecht et al. 2006; Zhou et al. 2011; Lucidi & Kleinknecht 2010; Cappellari et al. 2012; or Franceschi & Mariani 2015). But some also arrive at insignificant results (e.g. Arvanitis 2005) or conclude that the relationship may be non-linear: a low share of flexible workers has favorable effects while a higher share has unfavorable effects (e.g. Serano & Altuzarra 2010; Hirsch & Mueller 2012).

A common weakness in all these studies is the neglect of controlling for the dominant innovation model in a firm's sector of principal activity. Drawing from the above-named distinction between Schumpeter I and Schumpeter II models, Kleinknecht et al. (2014) have classified sectors by the degree to which either of the two innovation models is more relevant. It turned out that the probability of a firm having innovative activities is negatively related to shares of flexible personnel in sectors that tend towards the Schumpeter II model, while in the Schumpeter I sectors, flexible work is insignificant. This result has meanwhile been independently confirmed by Wachsen & Blind (2016) for the probability of innovation, and by Vergeer et al. (2015) for labor productivity growth. Lisi & Malo (2016) report somehow comparable results: Temporary contracts have a negative impact on productivity in 'skill intensive' sectors, but have weaker negative effects in less skill-intensive sectors.

VI Discussion and conclusions

The above hints to a dilemma for trade unions and all others who are concerned about unemployment. If deregulation of labor markets brings down labor productivity growth, this means that deregulation has favorable employment effects: At a given rate of GDP growth, it is the growth of GDP per working hour that determines how many working hours are needed. It is hence a trivial fact that deregulated labor markets create more jobs per unit of GDP growth. But the problem is then, that low labor productivity growth leaves little room for wage claims. As a consequence, trade unions have little to offer to workers and this has negative consequences for trade union membership.

Moreover, since value added is the cake that can be distributed between labor, capital and government, low productivity growth implies that there is very little that can be distributed (extra) each year. Under the given power relations in the era of supply-side economics, the productivity crisis can be expected to result mainly in two developments. First, there will be increased pressure towards cutting back on the public sector, notably on welfare state provisions. Second, low productivity gains almost unavoidably create a growing class of working poor and a breakdown of the middle class. All this brings trade unions and classic social-democratic parties in Europe under pressure; at the same time, it provides a favorable breeding place for populism.

An additional question here is, whether labor-intensive growth in deregulated economies indeed brings down unemployment rates. Some have argued that this is the case, trying to show that deregulation of labor markets causes lower rates of unemployment (e.g. Nickell et al. 2005). Others have questioned the evidence provided, arguing that the results of regression estimates are not robust. Outcomes can change decisively if small details of the regression specification (Vergeer & Kleinknecht 2013), or the selection of countries or time periods are changed (Baker et al. 2005; Howell et al. 2007; Baccaro & Rei 2007).

It is of course true that, owing to low labor productivity growth, you get more jobs for each per cent of GDP growth. There are, however, at least three reasons of why this does not need to translate into lower unemployment rates. First, during many years, the deregulated Anglo-Saxon economies have increased their labor supply through a generous immigration policy. Second, supply-side reforms have changed power relations such that trade unions can hardly push anymore for shorter working hours. Actually, in some cases, standard working hours have been increased rather than shortened. Third, Central Banks believe in the theory of the NAIRU.[8] This is certainly not a hot topic at this moment, but if, at some time in the future, unemployment should fall below the NAIRU rate, Central Banks have, in principle, the task of avoiding an 'overheating' of the business cycle by means of restrictive monetary policies that raise unemployment rates. In conclusion, it is by no means sure that the low-productive and hence labor-intensive growth in deregulated Anglo-Saxon labor markets will, in the end, lead to lower unemployment.

On the other hand, in periods when labor productivity growth in Europe was still high (as in the 1970s to 1990s) it led to an almost stagnating growth of total hours worked in the total economy (see Vergeer & Kleinknecht 2011). Nonetheless, there was only moderate unemployment, and this was achieved through shorter working hours per worker. For example, an average German worker worked 2.181 hours per year in 1960; but only 1.371 hours per year in 2015.[9] This helped achieving moderate unemployment rates, in spite of a growing labor supply due to women entering the labor market, or labor migrants coming from Southern Europe. In principle, having a high speed of diffusion of labor-saving technology thanks to high wages, powerful trade unions and strict regulation of labor markets does not need to lead to high structural unemployment, provided that the high productivity gains are not exclusively used for wage increases, but also for financing adequate labor time policies.

Finally, the above observations also form a challenge to neoclassical thinking. It is a merit of Josef Schumpeter that he recognized as early as 1943 that there is a discrepancy between neoclassical (static) efficiency ('how to allocate scarce resources efficiently?') and dynamic efficiency ('how to make resources less scarce through innovation?'). What is good for static efficiency can be counter-productive for dynamic efficiency and vice versa. Hence neoclassical theory has little to offer for an innovation policy agenda:

"Perfect competition … is a condition for optimal allocation of resources … But … introduction of new methods of production and new commodities is hardly conceivable with perfect … competition … And this

[8] *NAIRU* stands for: *Non-Accelerating Inflation Rate of Unemployment*, which means that, for the sake of keeping inflation constant, the Central Bank should strive for an unemployment rate that is high enough to prevent wage increases that could push up inflation (for a thorough criticism of NAIRU theory, see Storm & Naastepad 2012).

[9] The Conference Board Total Economy DatabaseTM (Adjusted version), November 2016, http://www.conference- board.org/data/economydatabase/.

means that the bulk of … economic progress is incompatible with it. As a matter of fact, perfect competition is and always has been temporarily suspended whenever anything new is being introduced …" (Schumpeter 1943, S. 104-105).

There are several examples of a trade-off between static and dynamic efficiency. For example, in neoclassical theory, monopoly power is undesirable, as it leads to welfare losses. From a Schumpeterian perspective, large firms with monopoly power are valued much more positively, due to three reasons: (1) Large firms reaping monopoly profits from innovation can more easily finance risky innovation projects and can more easily absorb losses from failed projects. (2) Due their size, large conglomerates usually have a whole portfolio of innovative projects running at the same time. A broadly diversified portfolio reduces innovation risks and thus assures continuity of the firm and its innovative efforts. (3) Innovation itself can be defined as a deliberate attempt at creating an imperfect market with high entry barriers. The unique knowledge embodied in a new product or process serves as a market entry barrier. The higher the entry barrier, the higher are the monopoly profits – and the higher is the incentive to invest in highly risky innovative projects.

In conclusion, once we recognize the high risks and uncertainties of innovative projects, we have also to accept that firms need the prospect of high monopoly profits in order to accept those potential risks. This means that, under perfect competition without entry barriers in which everyone tends to earn a 'normal' profit, innovation will hardly occur. The innovative process benefits from imperfect markets and it creates imperfect markets as its result.

A similar argument can be made about centralized wage bargaining. As already discussed above, this is a labor market rigidity that, in neoclassical theory, hinders the efficient allocation of scarce resources, but it enhances the diffusion of labor-saving process technology. This holds, in particular, if there is an additional labor market rigidity: government imposing the bargained wage increases on *everyone* in the sector. Moreover, strong firing protection and long job tenures are valued negatively in neoclassical theory. In an innovation perspective, however, this is an investment in the loyalty and commitment of personnel, which has a number of advantages for knowledge management, for using knowledge from the shop floor, for risk-taking by employees, for limiting the leaking of trade secrets, for limiting numbers of managers that can impair the autonomy of professionals, etc., as discussed above.

The above arguments are an admittedly hard message to market fundamentalists: market imperfections can be extremely useful for innovation, while impeding the efficient allocation of scarce resources. Dealing with innovation, we have to recognize that market failure is not just a rare exception. This has a lot to do with the public goods character of knowledge that makes it hard protecting property rights and assuring the appropriation of innovation benefits by the innovator. Searching for solutions, one often tries to repair one market imperfection by introducing another one. For example, trademarks, copyrights or patents give a degree of monopoly power to creative people, thus creating welfare losses, but they are highly desirable incentives for investment in creative but highly risky and uncertain solutions.

To conclude, the above may shed some light on the observation that, in spite of a highly flexible labor market, the US did quite well during the entrepreneurial phase of IT ('Schumpeter I') during the 1980s and 1990s (e.g. in Silicon Valley). Our outcomes might, however, also be an explanation of why, during a long period, a broad range of classical industries in the US had hard times competing against Japanese and German suppliers, thus creating the US Rustbelt. Under highly flexible labor markets, admired by

neoclassical economists, the US fail mastering the Schumpeter II innovation model. This can explain the difference between Wolfsburg and Detroit. It is likely that successful Silicon Valley firms are now gradually shifting towards a Schumpeter II innovation model. This means that path-dependent learning, accumulation of (tacit) knowledge, longer job tenures and loyalty of personnel are becoming increasingly important. Our results suggest that the US hire and fire labor market with frequent job changes is no longer an optimal environment for those firms. The rigid German labor markets *before* the (Hartz) labor market reforms (2003-5) would have provided them a better environment.

VII Literature

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