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ANALYSIS OF THE EFFECTS OF THE MODULAR DESIGN MODEL OF CAR PRODUCTION ON WORKING CONDITIONS: THE CASES OF VW NAVARRA AND PSA VIGO

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ABSTRACT. Following the implementation of new systems of automobile manufacturing based on modular design, we undertook the study of changes in the working conditions of this sector. We choose to further explore these models of productive organization and their effects on working conditions in the automotive sector in Spain. Specifically, we focused on two of the most important plants in the Spanish automotive sector, PSA Vigo and VW Navarra, where new assembly systems have been applied on modular platforms. In our research, we adopted an analytical approach that would allow us address the complexity of this new production model, combining variables (profitability strategy, productive specialization, technical and social organization) and dimensions (within the Group, intra-company, inter-firm) through comparison of the two case studies. Our análisis represents a useful, functional way of studying the intrinsic organizational and productive aspects of current manufacturing processes, reflected in the working conditions and in the factors determining them.

Keywords: production model, automotive sector, labor conditions, salaries, Spain.

Introduction

For the past 100 years, the automotive sector has been a laboratory for transformations in production models, and the evolution of productive organization has had direct implications for labor relations. The main objective of this research is to discover the factors that affect and determine labor relations, both within parent companies and in their productive environments, as related to various strategies for business profitability. Conducting such an analysis through the disciplines of economics and sociology seems especially pertinent, placing the perspective of workers at the center of economic analysis and bringing production to the social level, thus giving prominence to relationships between the social agents involved. In this research, we seek

to analyze the links between the models of productive organization and the working conditions in two of the most important automotive plants in Europe: PSA Vigo and VW Navarra.

We have opted for a comparative case study methodology that allows us to identify the specific elements that characterize both manufacturing processes, as well as to identify distinctions and elements in common. We began by delimiting the analysis to a branch of special interest: the automotive industry. In Spain, manufacturing of vehicles and auxiliary parts and components is strategic to the overall industrial plan. Participation by this sector represents around 8.6% of GDP, and more than 19% of the total exports, also generating some 9% of employment in Spain's economy. To further deepen the analysis, we decided to shape the research by delimiting it not only by sector, but also by autonomous region. To this end we chose two assembly plants, PSA Vigo and VW Navarra, each sustaining great economic and social weight in their regions and in the sector, and representing 14.6% and 12.26% of the national automotive production, respectively. The time dimension of our analysis includes the period from 2005 to 2017 – sufficiently broad to capture the changes that occurred from before the 2008 economic crisis and into the current period.

Firstly, we carried out an exploratory phase at the sectorial and territorial levels, reviewing not only different sources – literature and related works, news, audited reports, trade union bulletins – but also analyzing technical and territorial specificities of the overall process (phases, materials, parts, etc.).

Once this first stage was finalized, we made six visits (of 4 to 7 days each) to PSA Vigo, VW Navarra, and seven companies from the supplier park. Across the various union organizations, we conducted more than 30 interviews with workers, union delegates, and management personnel from different companies. All the interviews were built around specific questionnaires addressed to the workers and management of both VW and PSA, as well as to their suppliers. The interviews and questionnaires were structured in four main blocks: general data, production process, the work organization model, and collective bargaining; these were adapted to each specific case depending on the profile of the company.

Also, thanks to data provided by the stakeholders interviewed, we have been able to access information on the workers from different companies and to perform fieldwork in the factories to observe processes directly. This more qualitative approach has been combined with the analysis of macroeconomic and microenterprise data, use of the ORBIS database, and reviews of reports, agreements, and audit results from each supplier company.

Because our general objective is to analyze the factors that affect and determine labor relations of the workers involved, we begin from the hypothesis that, in a context of increasing homogenization of organizational, productive, and technical capacities in the automotive sector, working conditions have become the main component for adjustment in terms of competitiveness, especially in the wake of the recent economic crisis.

This article is divided into three main sections. In section 2, we analyze the profitability strategies and the modularization of the production process. Once the essential characteristics of these production processes have been identified, we turn in section 3 to the working conditions; that is, those aspects of labor that affect economic, physical, and psychological conditions of workers. The third main focus of the article (section 4) is on the effects of adjustment on labor productivity in both cases (PSA and VW). Finally, we close the investigation with our conclusions, seeking to highlight the elements common to both cases as well as the main differences between them.

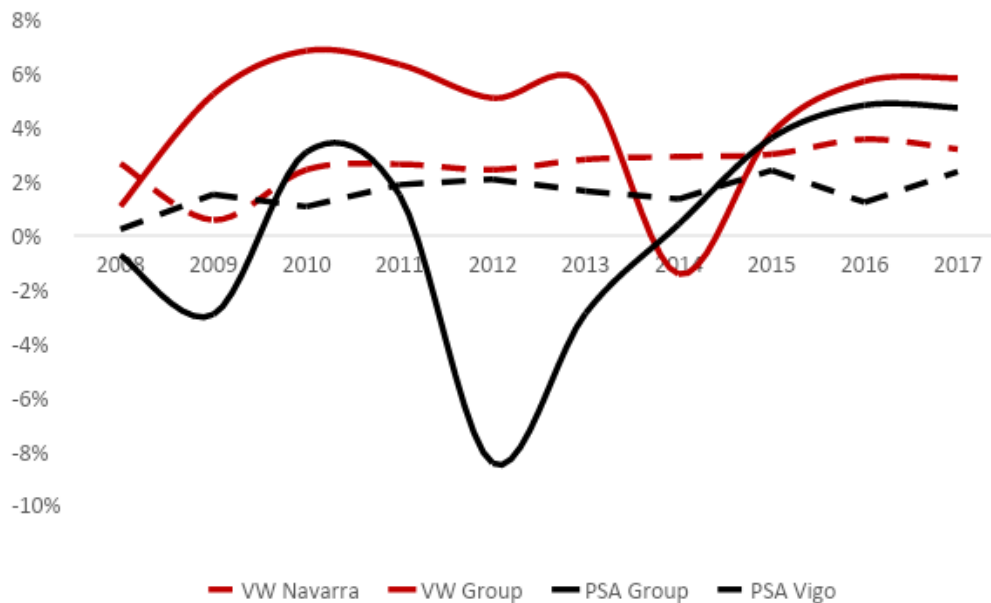
1. Business strategies and modularization of the production process

1.1. Profitability and business strategies in the context of the economic crisis

With the outbreak of the financial and economic crisis, the profitability strategies of the large automotive groups were affected in the context of recession and market uncertainty. However, the heterogeneity of the plants, specialized into different production segments within each automotive group, reveals the multiple effects of the slowdown and the decrease in global demand on sales and production within the sector.

In the case of the VW Group, we note that during the early years of crisis, the group continued to grow in both production and profitability, and that the effects of the global crisis began to be felt in 2012. Based on the data obtained, we observe a positive evolution of profitability at VW Navarra from the beginning of the crisis and through the launch of the Polo A05 model, with the factory's profits increasing throughout the crisis period.

With regard to PSA, during the early years of the global economic crisis the group presented a situation of relative vulnerability, reflected in negative rates of return that turned critical in 2012-2013. The PSA Vigo factory, however, managed to maintain positive rates of profitability throughout the economic crisis period, despite a reduction in its production levels seen mostly in the early years.



Graph 1. Operating profit margin in VW and PSA, 2005-2017

Source: authors' elaboration based on ORBIS database

The behavior of VW in Navarra and especially of PSA in Vigo during the economic crisis improved the results of both automotive groups. This was due in part to the fact that the general contraction in demand in both Spain and Europe as a whole did not profoundly affect demand for medium-range vehicles, in which both manufacturing plants are specialized. Significant demand for models of this category absorbed part of the declining demand for cars of higher quality and larger size in European markets. Indeed, sales grew, especially in the intra-community zone, which remains the main selling destination for both manufacturing plants.

Despite the good economic performance of these Spanish plants in the context of crisis, the broader downturn in the profitability of both automotive groups had as a consequence the

implementation of new strategies based on the permanent reduction of costs, with cost-restructuring measures put into effect at all the manufacturing plants of both groups. Thus at PSA Vigo, successive strategic plans developed during the crisis focused particular attention on changes that included a strong reduction in labor costs. A similar path was followed at VW Navarra, which was the first plant to promote MQB Modular Platforms as a principle and permanent cost-adjustment tool.

This strategy of profitability based on the permanent reduction of costs served the aim of restoring deteriorated short-term margins of profitability at both groups, emphasized by another context in which the homogenization of organizational and technical dimensions relegated plants in the sector to a secondary role in terms of short-term competitiveness. This aspect will be pursued in greater depth in the following section.

1.2. Modularization of the production process and its effects on competition

The effects of development of a given productive model, which is to say the technical organization of production, imply that limitations may arise in the medium-term operation of said model, favoring new forms of industrial inter-business organization. The concept of “lean production” (characteristic of the Japanese automotive industry model) refers specifically to a method of organization based on adjusting production to demand, both final and intermediate, involving the different companies that form part of a production chain as well as the various nuclei of activity within a single company. In short, this is a method that aims to reduce stocks and production costs alike (Coriat, 1993; Womack et al., 1991).

This strategy of cost-plus profitability based on economies of scale (i.e., permanent reduction of production costs by distributing fixed costs across the largest possible volume) proved limited, slowed by its own goal of offering a specific product to each client at the time demanded (Boyer and Freyssenet, 2003). This method of organizing work and production also clashed with the need to meet growing demand for market quality, and the need to supply diversified intermediate products in very short delivery times, ultimately resulting in “flux tendu” among companies and variants of just-in-time production methods (Durand, 2009).

In the context of local work environments, comprising the phases embedded in global value chains, hierarchical structures were established among companies whose market outlets were channeled through the company in charge, transferring market pressures down to the production costs of each auxiliary firm. This also implied the need for reliability and stability among network supplier contracts, which acted as a barrier to entry for new manufacturers of components and thus produced a certain distribution of bargaining power among the different actors.

This also ultimately implied that the competitiveness of each center would depend on the competitiveness of the whole, making it difficult to individualize or isolate the pressure on any particular provider.

In this way, the progressive development of production models based on lean manufacturing, and on just-in-time supply and assembly systems, generated their own conditions for transformation: the transition from mass production systems to the Japanese model was achieved through cascading externalization of the manufacture of parts for the same types of vehicle; but the conception of the vehicle itself remained based on ‘integral architecture’ – design oriented to assembly – allowing cars to be manufactured from the inside out. (Takeishi and Fujimoto, 2001; Fujimoto, 2007).

Little by little, such small modifications in automotive manufacturing supposed a qualitative change of model. Manufacturers became detached from the assembly of increasingly larger sub-assemblies – literally outsourcing whole segments of their assembly lines. This made

them more and more agile in view of short-time manufacture in order to serve the quantity and tastes of demand, while an increasingly significant portion of the final product was executed through more or less standardized modular sub-assemblies.

These sub-sets were then integrated into different vehicles. For example, at the beginning of the year 2000, the Volkswagen Group manufactured all models of all its brands on four distinct platforms; eventually it changed to a new conception based on modular architecture, itself based on assembly-oriented design (Design for Assembly, or DFA) (Tasalloti et al., 2016; Bogue, 2012). That transformation solved some of the aforementioned problems of lean manufacturing: it took advantage of the cost reductions implied by the standardization and simplification of tasks, without losing the competitiveness derived from the adaptation of a product to consumer tastes – i.e., “simplification and reduction of costs in engineering processes, design, and development; flexibility of production; and the search for economies of scale on a global level (greater purchasing power)” (Lampón & Cabanelas, 2014: 18).

Later, the VW and PSA Groups moved from a system of standardized platforms to modular platforms that can adapt to various models by way of a single, scalable design, thus facilitating changes in structural dimensions (such as front and rear overhang, track width, or wheelbase). This allows for not only assembly of a variety of models within a single segment (same basic size), but also assembly of models from different segments (different sizes) on the same platform.

To the extent that modular design yields the possibility of manufacturing different models of customizable vehicles (“mass customization”) through the assembly of standardized modules (front-end, cockpit, engine, chassis...), some of the advantages of economies of scale are thereby combined with the advantages of economies of scope. This has allowed models from the same segment (such as the Volkswagen Golf and Beetle and the Seat León) to share identical components at a rate of more than 60% (Lampón and Cabanelas, 2014: 15).

Regarding the governance of intra-chain relations in the case of the automobile, the strategy is set at group level and then developed specifically within each assembly plant, in factories whose output is the ‘final good’ (here, the assembly and final preparation of the vehicle). This strategy emanating from group level is transferred down to the set of suppliers that comprise the chain, given that the hierarchy of power is topped by the assembler, which is the main source of demand for suppliers. (Fine, 1998; Mc Alinden et al. 1999; Sturgeon and Florida, 2000).

In the case of VW and its specific strategy affecting the Landaben plant in Navarra (Spain), the new MBQ platform (replacing three prior platforms – PQ25 (B), PQ35 (C), and PQ46 (D)) will be used to manufacture 24 different models from 14 manufacturing plants in Europe alone, with a global productive capacity of 3,910,000 vehicles annually. According to the VW Group’s calculations, this will multiply by five the volume of orders to any single supplier and reduce by 20% the costs of purchasing components.

In the case of PSA, in 2013 a platform known as EMP2 (Efficient Modular Platform) was launched at Vigo (Spain) and at Sochaux (France), with the goal of expanding implementation to four more of the Group’s European plants. This new modular platform allows assembly of no less than 50% of all of the manufacturer’s vehicles (Lampón and Cabanelas, 2014: 22-23).

Thus there has developed a tendency toward eventual homogenization of the organizational and technical capacities available to manufacturers in the automotive sector.

On the one hand, as regards the architecture of the production process, many (and especially European) manufacturers have since the mid-1990s developed and adapted modularization within their production processes (Fujimoto and Takehisi, 2001). At the same

time, they have adopted systems of organization based on the just-in-time system. Implementation of these models of organization of production by (chiefly) European and American companies has now reached a certain level of maturity and no longer represents a source of differential competitive advantage among manufacturers.

On the other hand, the installation of a new generation of modular platforms (and the implications in terms of homogenization and standardization of technical capabilities at the assembly plants) likewise causes this competitiveness factor to play a less decisive role.

Meanwhile, the context of economic crisis has driven business groups of the automotive sector (specifically VW and PSA) to develop strategies with the aim of restoring levels of production and profitability damaged by the contraction of international demand. Working conditions, as an adjustable factor in the short term, offering fairly immediate results, have been established as the main component through which to influence strategies of profitability and competitiveness.

Also, given the framework of greater competition among plants of the same group, as a result of the greater standardization of technical capabilities, the main instrument of pressure by these groups for the adjustment of working conditions has been the launching of new models. The chief rationale for the awarding of new models to plants within a group has been based on an aggressive criterion of profitability, thus putting working conditions at the center of the adjustment focus.

2. Working conditions as an adjustment variable

As noted, in the context of economic crisis and the contraction of demand, the business strategies developed by both automotive groups have focused on the adjustment of working conditions, and this variable has taken on special relevance as a competitive advantage, in two senses. First, it offers a source of competitive advantage between distinct manufacturers, and second, it is a component through which to influence the competition among plants of the same group in the awarding of new models, always with the aim of extracting short-term profitability at the group level. The pattern of adjustment in working conditions at both VW and PSA plants has been supported by elements shared in common, although the degrees of intensity have been different. For purposes of clarity, we have grouped these adjustments into four categories: employment, flexibility, salaries, and intensity of work.

2.1. Employment

Since the beginning of the economic crisis, the level of employment has fallen drastically at the PSA Vigo factory, currently employing around 6,300 workers, compared to 9,907 in 2007. At the VW Navarra factory, jobs were continually lost from the year 2000 (more than 5,300 workers) until 2007 (3,900 workers). However, following an increase in production in 2010 and 2011, that number has since risen to a current total of 4,700 employees.

One element common to both cases has been changes to the contractual composition of the staff, with increases in part-time and temporary work; adaptation of the workforce through external flexibility mechanisms has affected between 10% and 12% of the staff at VW Navarra. In years with the highest volume of production (2009 and 2010), the proportion of temporary workers has been as high as 22%, further strengthening the strategy of labor flexibility. In the case of PSA Vigo, temporary employment has likewise increased in recent years, reaching one-third of the workforce in 2018, and part-time work has doubled since the beginning of the crisis, reaching 75%. This contractual heterogeneity facilitates the productive reorganization of staff in the face of oscillating demand in order to assume the lowest possible costs.

Similarly, the issuance of Employment Regulation Files (EREs), whether for suspension or termination, has become a common policy for both groups in order to adapt production volume to demand at all times, especially at Vigo. In the case of PSA, six waves of ERE implementation have been implemented from 2011 to present, most of them temporary but affecting the workforce continuously throughout the period. In the case of VW Navarra, only one temporary ERE has been implemented, motivated by the engine-supply problem following the diesel-emissions scandal suffered by the German group. However, while this practice has not been common at VW Navarra, many supplier companies within the industrial park have in recent years been affected by EREs (whether total or partial), as well as by suspensions and reductions of workdays, despite the growth in production volume over the same period.

Across the entire supply chains of both factories the pattern of adjustment in levels of employment has been similar, while the drag-effect of the assembly factories on production by suppliers has been strong. Likewise, in the context of the just-in-time supply system and fluctuations in demand, carried along the chain, adjustment of the workforce has been articulated through EREs and through part-time and temporary contracts, all of which have increased significantly in the supplier sector.

2.2. Flexibility

One aspect most affected has been flexibility in the organization of work. In recent years a battery of measures to enhance flexibility have been deployed to harmonize the organization of work with the needs of production through flexible management of the workforce. Two of the main mechanisms implemented in the two cases under study have been related to the promotion of irregular working hours and the variability of the work calendar.

These measures allow the introduction of changes to the distribution of the workforce throughout the workday via mechanisms of ‘prior notice’. These changes can arise in the very short term – even during a single working day, which management may expand in accord with production needs. In addition, the irregular distribution of working hours increasingly affects a larger percentage of the workforce.

Moreover, the variability of work schedules allows management to schedule changes to the annual calendar of working days, based on production needs. Such changes can be motivated, for example, by changes in market forecasts, thereby facilitating the adjustment of the productive plan to fluctuations in anticipated demand.

Continued use of the ERE instrument has proved functional to the flexible adjustment of organizational structures to productive needs throughout the period. At both PSA Vigo and VW Navarra, an additional ‘bag of hours’ mechanism permits the adjustment of working hours of each employee, causing them to work more days, or more hours in a given day, whenever the workload demands it; this is compensated by fewer working hours when the opposite situation occurs. In short, these mechanisms in combination with the changes to the employment structures indicated above have given management of the labor force much more flexibility, thus incurring lower costs.

It is essential to point out that the adoption of these flexibility mechanisms in a general way across the entire workforce has been made possible by regulatory changes that have taken place in the Spanish labor market since the beginning of the crisis, mainly between 2009 and 2012, articulating a much more flexible labor framework.

2.3. Salaries

Salary costs at the assembly factories of PSA Vigo and VW Navarra, as well as in the groups of suppliers supplying both plants, constitute a main component by which to influence the adjustment strategy. During the period of economic crisis, and specifically from 2014, a process of moderation has been developed – including wage devaluation in some cases – conditioned by the strategies of both business groups. Salary adjustments have been consolidated in two ways: by untying wage increases from factors of productivity and inflation, and through changes in salary structures for the various professional categories.

Both at PSA Vigo and VW Navarra and in their productive environments, during the early years of the economic crisis the rate of annual salary increases was strongly reduced, compared to the pre-crisis period. Essentially from 2014, growth of salaries has been disconnected from productivity, reflecting continued growth in both cases, as well as from growth of inflation. This policy of wage moderation and devaluation is confirmed in the different collective agreements negotiated at both plants during this period. The bulk of the salary adjustment at VW Navarra was negotiated in the agreement covering the years 2013 to 2017, and at PSA Vigo in two agreements finalized in 2012 and 2016. In the case of Navarra, both the assembly plant and its suppliers experienced a turning-point in 2011: wages have gone from annual increases of between 3% and 5% to stagnation, or even salary losses.

Adjustment has been similarly consolidated through the modification or elimination of several remuneration supplements. In the case of PSA Vigo, supplements such as that for consistent presence (representing €498.73 per year for production operators) were eliminated, while others such as working weekends or habilitation programs were reduced, affecting staff who remain ‘in training’ for a certain period. A very similar situation has unfolded at VW, and even more profoundly in the supplier companies – especially those engaged in more labor-intensive practices – which have seen significant decreases in both base and variable salaries.

The adjustment of salary costs has been further assisted by the introduction of new professional categories for entry, faced by new personnel and associated with substantially lower remuneration levels. This has been the case at both assembly plants and has become a common policy also affecting the suppliers that make up the chain, mediated by pressures exerted by the group and by sectorial strategies promoted by employers’ association in each territory.

2.4. Intensity of work

In both production chains there has been a huge increase in the intensity and pace of work. Also, in a context of an increased work pace and fewer employees, it should be noted that the workload has become unbalanced. Different vehicle models circulate through the same assembly line, requiring greater or lesser attention, and there is no logic to the sequence of vehicles entering the line, leading to bottlenecks and periods of higher work intensity.

In the context of the just-in-time supply method, the intensification of work rhythms and the increase in production shifts at both factories imply that suppliers must adapt and operate according to the productive needs of the plant, despite a reduced capacity to manage labor flexibly. In this sense, the intensity of work has become in recent years a main source of conflict, not only within both factories but in the overall automotive sectors in Navarra and Galicia, the autonomous region in which Vigo is located.

This process of intensification of work pace has caused a worsening of the occupational health of workers across the board, as confirmed by data extracted from the Institute of Occupational Health and Safety of Galicia (ISSGA) and the Navarra Institute of Occupational

Health (INSL). In the case of Vigo, the number of annual work accidents in the Galician automotive sector has been increasing since 2012 (a 75% jump in work-related accidents per year for the five years observed, almost half occurring at Vigo). During these years, approximately 50% of work accidents reported in the Galician automotive sector have cited 'overload' as their main cause [3]. The injuries most frequently sustained due to accidents in the automotive sector in Galicia have been sprains and strains (about 60% of total), followed by superficial injuries (about 30%) [4]. Meanwhile, psycho-social infirmities related to anxiety, stress, and depression have also increased. In the case of Navarra, as in Vigo, strong intensification in the work pace has given rise to increased accidents and severity of injuries. Beginning in 2005, the accident frequency index and the severity of accidents both grown considerably; this trend was reversed from 2009 into 2012. However, in more recent years, the number and severity of accidents has again been on the rise, along with incidence of sick leave. This has been true not only at the assembly plants but among suppliers, where 80% of workers interviewed cited the problem of increasing sick leave motivated by physical fatigue, injuries, and psychological pressures. Aware of the need to reduce these indices, all workers interviewed alleged that the companies are not advancing the necessary measures to address this trend.

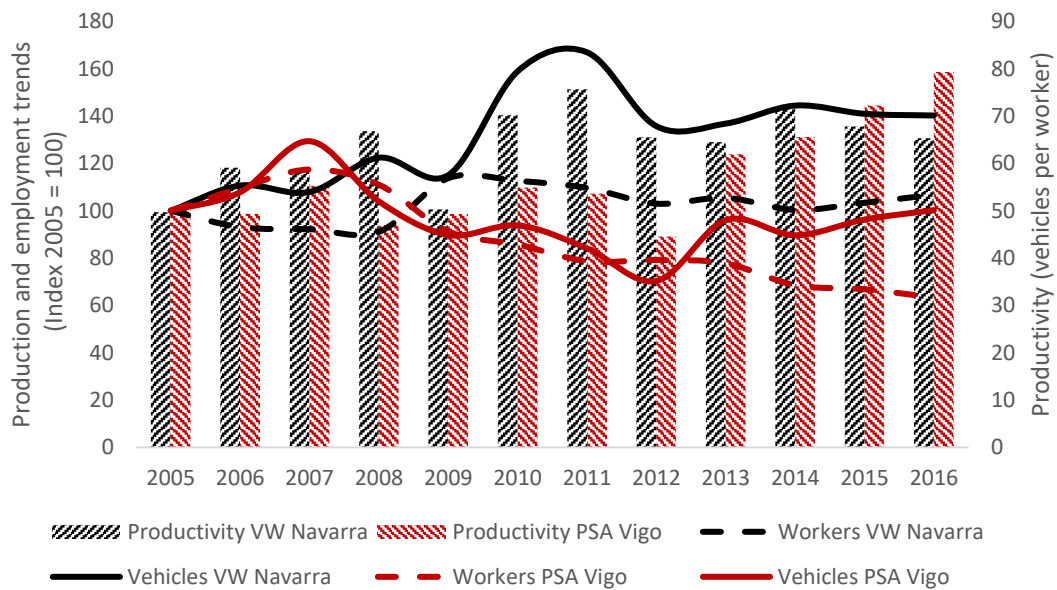
3. Effects of adjustment on labor productivity

The conceptualization of labor productivity and especially its measurement involve methodological difficulties that have long been subject to debate in the economic literature. In this section we attempt an approximation of the behavior that has characterized labor productivity at VW Navarra and PSA Vigo.

Having taken the automotive manufacturing plant as our unit of analysis, we here seek to measure productivity in physical terms; the final product can be considered homogeneous, yielding a relatively accurate measurement of production, regardless of price fluctuations that may affect this component as a numerator when selecting a monetary variable. On the other hand, the number of employees has been used as a denominator, thus demanding several qualifications. First, it must be noted that the chosen variable is registered in annual terms, but that fluctuations in the volume of employment over the interval of each year have not been accounted for; neither is the contractual composition of the workforce here valued, although that factor (highly heterogeneous, for example, in terms of the workday lengths of employees) is particularly relevant to both cases. Nor do we consider here the distribution of staff between production and administrative functions, despite varying relevance to the production process.

At the PSA Vigo factory, labor productivity has fluctuated; although relatively stable during the 2005-2012 period, it saw sustained growth during subsequent years. In 2012 the trend changed due to a divergence between the two variables that compose the quotient from which productivity is calculated. On the one hand, following a decline in the early years of the economic crisis, the manufacture of vehicles at the Vigo factory returned in 2012 to production levels similar (though somewhat lower) to those registered before the outbreak. In contrast, the number of employees at the factory has experienced gradual but sustained decline from the beginning of the crisis to the present.

In the case of VW Navarra, labor productivity has been evolving since 2002, following a path of continued growth except in the launch period. Growth was especially strong between 2010 and 2015, responding to the combination of an increase in production volume and a progressive decrease in the workforce.



Graph 2. Productivity trends in VW and PSA

Source: authors' elaboration based on VW Navarra and PSA Vigo reports data

In short, the adjustment in working conditions at both plants and the severe intensification of work pace have proven determining factors in the strong increase in productivity. Productivity levels at both plants are remarkably high in comparison with others from their sector in Spain and across Europe.

Although productivity in the overall vehicle manufacturing sector in Spain for the last ten years has been between 37 and 40 vehicles per worker per year, at the Vigo plant this range is between 50 and 80 vehicles, peaking in 2013. At the VW Navarra factory, the rate is approximately 70 vehicles per worker per year. The main difference between the average and these cases is due to the fact that manufacturers in Spain have generally increased, not decreased, their numbers of employees. Regarding workers within the sector by autonomous region, Navarra produces 25.2 vehicles per worker per year, while Galicia this produces 25.6 vehicles, compared to the national average of 16.4 vehicles per worker. It may be conjectured a priori that, while these higher rates of regional productivity may be due to a number of factors, relative importance may be assigned to those factors that have driven increases in productivity at the VW Navarra and PSA Vigo plants.

Meanwhile, according to data extracted from OICA and Eurostat, the average productivity in automotive assembly plants throughout Europe has been still lower, at between 15 and 17 vehicles produced per worker per year, and at about 7 vehicles produced per worker per year in the whole of the European automotive sector.

Conclusion

The automotive industry has historically been a vanguard sector in terms of evolving models of productive organization, making it a rich field for the observation and analysis of trends in manufacturing industries worldwide.

In this study we have sought to examine how changes in the models of productive organization influence working conditions, with analysis centered on the current period of economic instability. To this end, we have focused on the model of productive organization in the automotive sector, including its most recent innovations, such as the implementation of

modular platforms. In a context of fragmentation of international production, we have valued the importance of profitability strategies developed by the large business groups involved, which (within the framework of global production chains) have shown an ability to coordinate and, in some ways, exercise effective operational control across the whole chain.

In a sector where the model of productive organization has been based on a system of 'lean production', few disruptive organizational innovations have occurred in recent decades. At a technological level, the implementation of a new generation of modular platforms has generated a trend toward homogenization and standardization of conditions in the sector, intensifying competition among manufacturers as well as among plants within each given group. In that context, labor conditions have been established as the main adjustment variable in terms of competitiveness, especially during the economic crisis.

Through analysis based on two case studies (the PSA Vigo and VW Navarra assembly plants), we have seen how the current competitiveness strategy has depended heavily on the adjustment of working conditions. In both cases, numbers of workers have been substantially reduced, labor flexibility mechanisms have been increased, wage containment has been achieved and, above all, workloads have intensified severely.

These adjustments in working conditions have driven both plants to unusually high levels of productivity, above the averages of their respective manufacturing groups and even higher relative to other automotive manufacturers.

It is worth noting that some differences have been detected in the intensity of these strategies. Although internal flexibility and varied contracting approaches have allowed both automotive companies under study to follow profitability strategies driven principally by the reduction of labor costs, in the case of PSA Vigo, labor flexibilization measures have been stronger than at VW Navarra. At Vigo, internal flexibility mechanisms such as the extension of workdays and the intensification of pace, along with external flexibility (via temporary staff) and flexibility in salaries, have not stemmed the use of dismissal mechanisms or EREs. At VW Navarra, a similar path has been followed, but with fewer flexibilization measures imposed. These changes seem to have had both direct and indirect impacts on the labor conditions (physical, psychological, remunerative) experienced by workers.

As this research remains in progress, we should add that one of the main elements we have identified as a differentiating variable between the two cases is the role played by union strength, which has served as a buffer against the worsening of working conditions. While union strength has deteriorated in both regions, the workers at PSA Vigo have seen much more drastic adjustment and flexibilization, while in Navarra unions have shown a greater capacity to forestall the increased flexibilization of labor relations.

Elements such as the increasing fragmentation and externalization of production, the segmentation of workers collectives within companies, relationships of dependency and subordination on the part of suppliers vis-à-vis the manufacturers, and competition among plants of the same group for the assignment of production (often conserving jobs at the expense of working conditions) all increasingly serve to hinder union action and to weaken collective bargaining, undoubtedly making these issues central to understanding the continued deterioration of working conditions.

In short, given the results obtained, we are observing two general tendencies that overlap and that seem to coincide in both studies. In the first place, there has been in recent years a gradual worsening of workplace health and safety conditions as well as a deterioration in wage conditions for the majority of workers involved in production at both Vigo and Navarra. Moreover, growing segmentation of the workforce has resulted in the coexistence of distinct working conditions within the same manufacturing process. These two trends appear to have

consolidated in the wake of reforms to labor legislation and as a result of both profitability strategies and the requirements of the current model of productive organization.

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