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Minimum Wages, Products and Productivity

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Minimum Wages, Products and Productivity

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We study the impact of changes in the minimum wage on the creation and destruction of products. Our identification strategy exploits as a quasi-experiment a large and 3-year predetermined increase in minimum wages during 1998-2000 in Chile and the differences in products exposure to these changes. Our results indicate that increases in the minimum wage affect the creation and destruction of products depending on their skills intensity. An annual nominal increase of 10% increases the probability of dropping unskilled labor products in 5 percentage points and reduces the probability of creating unskilled labor products in 3.3 percentage points.

I. Introduction

There is an abundant and controversial literature about the impact of legal minimum wages on labor markets; in particular, several studies have analyzed the effects on wages, employment, young workers' outcomes, poverty and inequality, among others. Recent literature reviews indicate that changes in minimum wages are associated with minor reductions in employment (Belman and Wolfson, 2014;

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Neumark, et al. 2014). In some cases, this effect has been found to be positive (Card and Krueger, 1995; Machin and Manning, 1996). The main explanation for these findings is that in monopsonistic markets, a rise in minimum wage reduces market power and firms expand employment (Schmitt, 2013)[1].

Surprisingly, there is not much evidence on the impact of the minimum wage using firm-level data. In recent papers, Mayneris et al. (2014) study how changes in minimum wages in China affect firm's productivity and survival, and Draca et al. (2011) look at the impact of the minimum wage on wages and profitability for U.K. firms. In the case of Chile, Álvarez and Fuentes (2018) find that increases in minimum wages reduce productivity, especially in unskilled intensive firms. The study of firm level responses contributes to a better understanding of the mechanisms behind the aggregate relationship between the minimum wage and employment. Microeconomic studies can also help to illustrate the heterogeneous impact of labor market policies and it would eventually be useful for implementing complementary policies oriented to minimize employment effects.

In the case of the minimum wage, it has been argued that small effects on employment, survival and profitability are due to the fact that firms respond taking different actions for minimizing the negative impact of the rise in wages. (Schmitt, 2013; Hirsch et al. 2015). Firms may face this negative shock by increasing their productivity[2]. The literature suggests that there are several ways in which firms can increase productivity when minimum wage is increased. Firms may invest in new technologies, probably more capital-intensive ones, to do a better and more careful selection of workers (Autor et al., 2007), or changing the product mix and concentrating their resources in their more productive products (Bernard et al.,

[1] See De Fraja (1999) for a model where this result is not due to monopsony.

[2] Other alternative, in less competitive industries, is that firms raise prices and trespass to consumers the increase in labor costs Aaronson (2001); Wadsworth (2010)

2010). Figure 1 shows evidence of this potential mechanism for manufacturing plants in Chile, indicating that firms that introduced product changes outperformed in terms of productivity to those not changing products.

[Insert Figure 1 Here]

Based on recent theoretical and empirical literature on multi-product firms, in this paper we analyze how changes in the minimum wage are associated with changes in the mix of products, i.e., the introduction of new products and the dropping of some of them, as a potential mechanism for avoiding the negative effects of labor market regulations. In these theoretical models (Bernard et al. 2010), firms endogenously sort across products and variations in the product mix may have important positive effects on firm and aggregate productivity. The creation and destruction of products may occur as a result of policy changes, such as trade liberalization (Bernard, et al. 2011) or the exposure to competitive pressures (Mayer, et al. 2014). In both models, and similar to what we expect in the case of a negative shock as the increase in the minimum wage, firms react by increasing the production of their most productive, and hence higher-profits goods, that would allow them to survive in the new environment.

We contribute to three strands of the literature. First, we analyze the heterogeneous effects of labor market regulations on productivity. by investigating how firms adjust internal resources to reduce the negative impact of this labor regulation. We infer that only some firms may be able to increase productivity. Second, in terms of impact evaluation of labor market policies, we provide novel firm-level evidence on the impact of minimum wages in a new dimension: creation and destruction of products. To the best of our knowledge, this is the first paper looking at this relationship. Third, regarding the literature of multi-product firms, we analyze an under-studied potential determinant of products creation and destruction. Most of the previous literature has focused on the effects of trade liberalization (Nocke and Yeaple, 2014; Goldberg et al., 2010; Mayer et al., 2014) and it shows, with the exception of Qiu and Zhou (2013), that changes in the product mix may have large and positive effects on productivity.

We take advantage of a large increase of the minimum wage in Chile taking place between 1998 and 2000. Interestingly, by the end of 1997 the Minister of Finance announced a predetermined increase in the minimum wage for this three-year period. This was in sharp contrast to how the policy was conducted in previous and subsequent periods where the Government announced and implemented the minimum wage on a yearly basis. This change is important for our identification strategy because current economic conditions, such as the evolution of TFP and other macro variables, should relate more closely to the annual, rather than to the triennial setting of the minimum wage.

As shown in Figure 2, the annual real increase in the minimum wage was, on average, 7.3% in 1998-2000 (approximately 10% in nominal terms), well above the increase in preceding and succeeding years. During the beginning of the 1990s, the minimum wage increased, on average, 4.2% per year and 2.5% per year only during the period 2001-2005[3].

[Insert Figure 2 Here]

Our identification strategy exploits as a quasi-experiment this large increase in minimum wages and the differences in products exposure to these changes. We consider as exposed products to those that are more intensive in unskilled labor (production or blue-collar workers) because these unskilled-intensive products should experience a large increase in production costs due to the increase in

[3] See Alvarez and Fuentes (2018) for a discussion on this issue and how the increase in minimum wage was well above the labor productivity growth.

minimum wage. In extreme, if products were produced only with skilled workers, who receive wages well above the minimum wage, these products would not be affected by this regulation.

As we do not observe product-specific input intensities, we take advantage of the information for single-product firms and we use them as a proxy for the unskilled labor–intensity of products produced by multi-product firms. The underlying assumption of this procedure is that for each produced product, multi-product firms use the same technology as single-product firms. In different frameworks, Ma, et al. (2014) and De Loecker, et al. (2016) use the same assumption.

Our results indicate that increases in the minimum wages augment the probability of destruction of products that are more unskilled labor–intensive. Similarly, the raise in minimum wage increase the probability of introducing products that are more intensive in skilled workers. We find that the impact is economically relevant. An increase of about 10%, as that occurred between 1998 and 2000, augments the probability of dropping unskilled labor products in 5 percentage points and reduces the probability of adding unskilled labor products in 3.3 percentage points. Our results are robust to several robustness checks such as, sample selection issues, controlling for confounding factors and to alternative definitions of exposure. We also show evidence that our findings do not seem to be explained by differences in previous trends for exposed and non-exposed firms.

The paper is structured as follows. In the second section, we present the data. In the third section, we discuss the methodology. In the fourth section, we present our basic results and the robustness checks. The fifth section concludes.

II. Data

We use data from the national annual manufacturing survey (Encuesta Nacional Industrial Anual, ENIA), managed by the official Chilean statistics agency (INE). The unit of observation is a plant with ten or more employees and there are on average more than 4,000 plants per year in the sample.

The ENIA, in addition to information on plant characteristics, provides data about plants' products. The latter information is contained in "Formulario Número 3" of the survey (Form 3, from now on, F3) and allows us to identify the specific goods that the plants produce[4]. The information on plant products is available up to 2003 but there was a change in products classification in 2001. Even though there are harmonization tables for the two product classifications, the prevalence of product mix changes that would result for 2001 seems too high to be reliable. For this reason, we consider plants that introduced product mix changes only during the period 1996-2000.

Products are defined according to a local classifications denoted by CUP (Unique Products Classification). The product information is more disaggregated than a seven-digit Second Revision International Standard Industry Classification (ISIC). Hereafter, we will refer to the more disaggregated definition of a product as "product" or "ENIA product." It is possible to assign the products to different seven-digit and more aggregate ISIC categories. We will refer to two-digit ISIC categories as "sectors" and four-digit ISIC categories as "industries." There are 10 sectors, 91 industries, 257 five-digit ISIC categories, 587 six-digit ISIC categories and 2112 ENIA products in the pooled 1996-2000 sample.

[4] It should be noted that more than 95% of the firms produced in a single plant in 1996, the only year with firm and plant level information available. For this reason, we will use the terms firm and plant interchangeably.

In Table 1, we present information on the number of plants and products per year under alternative product aggregations for the sample used in this study. It can be appreciated that the total number of firms decreased significantly over the years, by much more than the total number of products, which remained approximately constant considering the two extreme years in our sample. Consequently, the average number of products per firm decreased from 2.6 to 2.1 between 1996 and 2000.

[Insert Table 1 Here]

The data on plants' products by year allows us to identify the creation and destruction of a product over time. Thus, our definition of product creation (adding) considers the case of firms producing a product in year t, which was not produced in t-1. Similarly, product destruction (dropping) refers to a product that was produced in t-1 but not in t. In Table 2, we present information on the percentage of products added and dropped between two consecutive years in relation to the total number or plant-products observations in each year. On average, 21% add 15% of the plant-products in the sample were dropped and added every year, respectively. Approximately more than half of the products drop rate and two fifths of the entry rate come from the exit and entry of firms to the sample, correspondingly. Interestingly, the add and drop rates reach their lowest and greatest levels, respectively, in 1998, one year after the new three-year minimum wage policy was announced.

[Insert Table 2 Here]

In Table 3, we show the incidence and relevance of product mix changes across sectors. The data show that the incidence of product mix changes is higher in the Wood and Metallic sectors and lower in Food and Beverages.

[Insert Table 3 Here]

III. Methodology

We are mainly interested in analyzing how variations in minimum wage affect product switching. To do that, we estimate the following equations:

$$P\left(Entry_{pft}=1\right)= \alpha_{pf}+\alpha_{jt}+\delta_1(MW)_{t-1}*(Exp)_{p0}+X\beta_{ft}+\varepsilon_{pft}$$

$$P\left(Exit_{pft}=1\right)= \alpha_{pf}+\alpha_{jt}+\delta_2(MW)_{t-1}*(Exp)_{p0}+X\beta_{ft}+\varepsilon_{pft}$$

Where α_{pf} is a set of firm-product fixed effects, α_{jt} is a set of industry-year fixed effects for capturing shocks that are common to products belonging to the same industry j, MW is the minimum wage (in logs), Exp is our measure of exposure, and X is a vector of firms' characteristics. As it can be appreciated in the equations, we allow to the minimum wage affect with a one-year lag to entry/exit products decisions. The exposure variable is measured before the change in the minimum wage, specifically in 1996.

Given that increases in wages should affect more to unskilled-intensive products, we expect that an increase in the minimum wage reduces the probability of product entry (δ_1<0) and that increases the probability of product exit (δ_2>0). The interaction of minimum wage with exposure implies that the effect will be higher for unskilled-intensive products. In fact, the marginal change of an increase in the minimum wage will be given by:

$$Marginal\ Change\ =\frac{\partial P(entry\ or\ exit)}{\partial Log(Wmin)}=\delta*\omega$$

The model is estimated using a linear probability model, and not a Probit or Logit, because the linear model allows to introduce fixed-effects to control for unobserved heterogeneity.

Following Bernard et al (2006), who analyze the exposure of manufacturing plants in the U.S. to the imports competition from low-wage countries, our measure of exposure is given by:

$$Exp = \ log\ [Blue - collar\ wage\ bill\ /\ White - collar\ wage\ bill]$$

This measure, the wage-bill ratio between unskilled and skilled workers, captures both differences in wages and workers' intensity at the firm-level. In some of our regressions, we also introduce categorical variables according to the distribution of ω. In particular, we use a dummy for products with unskilled intensity in the superior third of the distribution. Also, we check the robustness of our results to changes in how exposure is measured and by doing some placebo tests.

Given that for multi-product firms, we only observe the wage-bill ratio at the firm-level and not at the product level, as desired, we use the product information of this ratio for single-product firms. Under the assumption that unskilled intensity for a determined product is similar between single-product and multi-product firms, we can define our measure of exposure as the average for single-product firms that produce the same product that multi-product firms[5].

The rationality behind this assumption can be explained considering the case of a firm producing two products, denoted by 1 and 2. The wage-bill ratio of the firm (ω_f), will be the weighted average of the wage-bill of the workers utilized in the production of both goods. This is:

$$\omega_f = \alpha_1\omega_1 + \alpha_2\omega_2$$

When $\alpha_1 \rightarrow 1$, then $\omega \rightarrow \omega_1$.

[5] Ma et al. (2014) use a similar assumption for unobserved capital intensity of new exporters in China. De Loecker et al. (2016) rely on the same assumption to estimate product-level production functions.

Then if the multi-product firm produces product p, then we use the average of the exposure variable across all of single-product firms that produce p. To be consistent, we compute this variable also for the first year of our sample period. In the case that we were not able to find single-product firms producing some products, we use the information for single-product firms producing those products defined at higher levels of aggregation, i.e. at the 6-digit and 5-digit ISIC levels. Overall, we are able to identify the product exposure variable for more than 93% of the observations in our sample.

Figure 3 presents evidence of how good is our prediction of the wage-bill ratio for multi-product firms. The solid line shows the Kernel density of the observed exposure variable across plants in 1996. The dashed line shows the Kernel density of the corresponding predicted exposure computed as a weighted average of the product level exposure values obtained using our proposed measure. It can be observed that the methodology predicts reasonably well the observed distribution of the exposure variable.

[Insert Figure 3 Here]

IV. Results

Table 4 presents our basic results for product destruction and creation. We present results using the continuous measure of exposure as defined in the previous section with and without control variables. We also use a discrete measure of exposure Q3EXP, which is a dummy equal to 1 if the product is in the upper tercile of the distribution of the exposure variable and 0 otherwise. Our findings for product destruction suggest that an increase in minimum wage raises the probability of dropping products, and the impact is higher for more unskilled labor-intensive products. In the case of product creation, the parameter for the interaction between minimum wage and exposure is negative and significant, indicating that an increase in labor costs reduce the probability of introducing a product that is more intensive in unskilled labor. In term of the control variables, their introduction does not affect the sign and significance of our variables of interest. These results show that larger and more productive firms are less likely to drop products.

[Insert Table 4 Here]

The quantitative impact is relevant. Evaluating the results with the dummy for exposure, an increase of 10% in nominal minimum wage, raises the product destruction of unskilled labor-intensive products in about 5 percentage points, compared with a sample average for plants in the third quartile of the exposure variable of 22%. In the case of product creation, the impact is slightly lower – about 3.3 percentage points – and the sample average is 15%. Then, these results indicate that changes in minimum wages generate changes in the product mix according to our expectations.

We undertake several robustness checks of our results. First, we only run the model for surviving firms, because product destruction and creation can be driven by exit and entry of the firms. The results, presented in Table 5, are very similar to those of Table 4 and indicate that a 10% increase in minimum wage raise in 3.1 percentage points the probability of dropping unskilled labor-intensive products and a 2.7 percentage points decrease in the probability of adding unskilled labor-intensive products. This, compared with the average 9.5% and 9.7% product drop and add rates among survivors in the treated group in the data, suggests the existence of relatively larger effects of the minimum wage among survivors than in the whole sample.

[Insert Table 5 Here]

Second, we check that our results are not driven by a differential behavior of single versus multiple products plants. Table 6 and Table 7 reports the estimation results of our base model for the sample of single and multi-product plants, respectively. The results are qualitatively the same as those of Table 4, but with reduced statistical significance (especially for single-product plants) perhaps due to the reduced sample size.

[Insert Table 6 Here]

[Insert Table 7 Here]

Third, we also estimate the model to analyze the effect of the minimum wage on changes in the exported product mix (see Table 8). Typically, firms export their most productive products, which are less likely to be affected by changes in the minimum wage. Also, the existence of fixed costs of exporting, would suggest more persistence of selling products in international markets. The evidence suggests some support for this idea. We find that exported products are not affected by changes in minimum wage.

[Insert Table 8 Here]

We also investigate if products that were exported in 1996, were more or less likely to be dropped with the large minimum wage increases and if this effect depends on the exposure variable also. We estimate a model with a triple interaction (our exposure variable, the minimum wage and a dummy “Exported Product” indicating if the product was exported in 1996). Table 9 presents the results. First, the coefficient of the interaction term Exported Product and MW shows that exported products in 1996 were less likely to be dropped later on.

Second, as expected for unskilled intensive products, the coefficient of triple interaction term suggests that this effect was attenuated in more exposed products. Summarizing, the results of Table 8 and Table 9 indicate that exported products were less affected by the minimum wage increases.

[Insert Table 9 Here]

Fourth, given that this period coincides with the Asian crisis that affected Chile, and that more unskilled intensive products may be more affected by the contraction in the economic activity, we introduce an interaction term between sectorial GDP growth and our measure of exposure. Table 10 shows the results. Previous evidence by Bernard and Okubo (2016) find that recessions are periods of increased product creation and destruction in Japan. In our case, the negative coefficients for the interaction terms of our exposure variable with the growth of GDP (dGDP Sector) are therefore consistent with their evidence. More interestingly, including this interaction term does not affect our main results related to the effect of variations in the minimum wages on products creation and destruction. We performed a similar exercise using the interaction of our exposure variable with aggregate GDP growth and the results are basically unchanged.

[Insert Table 10 Here]

Fifth, given that firms may change products according to their product scope, we also introduce an interaction term of the minimum wage with a measure of distance to the product scope. We define product scope as the plant's average 7-digit ISIC codes. Distance to scope is the log difference between the product code and the plant's product scope. The larger this variable the more different the product from the plant's product mix. The intuition is that variations in the last digits of the firms' product code imply lower dispersion in a product scope than variations in the 6 or 5-digit level of their ISIC codes. We would expect that increases in the minimum wage would lead to increased destruction of products away from the scope and reduced creation of those products.

In Table 11 we show our findings in the case of including the interaction between the minimum wage and distance to scope. An alternative explanation for our previous findings is that an increase in labor costs may induce firms to rationalize the product mix and concentrate resources on the products closer to their scope or competence as modelled by Eckel and Neary (2010). We find, as expected in the case that firms specialize in core competences, that the parameter for the interaction term is negative for product creation and positive for product destruction. More importantly, our results for the interaction effects of the minimum wage and unskilled labor-intensity holds.

[Insert Table 11 Here]

These last results do not necessarily imply that the large increase in the minimum wage only affected the creation and destruction of products away from the core competencies of the Chilean firms. On the contrary, if we restrict the attention to the effect of the minimum wage on core products mix changes we also find a significant impact on those more unskilled intensive. We define core products to those representing at least 75% of the firm sales. The results are shown in Table 12 and suggest that the minimum wage led also to core products mix changes.

[Insert Table 12 Here]

We present in Table 13 a placebo test to check that our results are not driven by any potential spurious relationship between the minimum wage and changes in the product mix. To do that, we generate random allocations of products unskilled-intensity (exposure) for multi-product firms. Our findings indicate that the interaction between minimum wages and these randomly assigned intensities is not significant. Then, changes in minimum wages seems to be effectively associated with variation in product mix that are dependent on the unskilled workers' intensity of the products.

[Insert Table 13 Here]

In Table 14, we consider instead as exposure variable, the "bite" of the minimum wage, defined as the fraction of workers earning one and up to 1.2 minimum wages in 1996 at 3-digit ISIC level industries, using individual data from the 1996 National Survey of Social-Economic Characterization (CASEN). We use the continuous value of this fraction. The results are presented in Table 14 for both for the total sample (columns 1 to 4) and the sample of surviving firms between two consecutive years (columns 5 to 8). The results are unchanged and confirm the findings that an increase in minimum wage is associated with dropping unskilled-intensive products and adding more skilled-intensive products.

[Insert Table 14 Here]

Our final experiment consists of estimating our model using a more restrictive definition for product mix changes, that is considering only product additions and dropping at the more aggregate 6-digit ISIC level. That is, it could be the case that a firm creates a product at the 7-digit level but not at the 6-digit level, if the created product has the same 6-digit code than the rest of the prevailing products of the firm. Considering too disaggregate definitions of product may also be related to spurious product innovations that the 6-digit product definitions help to mitigate. Table 15 presents our findings using this alternative aggregation for defining products. The results, again, are mostly unchanged.

[Insert Table 15 Here]

An important concern with differences-in-differences approaches is that the estimated impact could reflect uncontrolled previous trends in the interest variable for treated and control groups. Table 16 present the results of our difference-in-difference regression with treatment effects varying over time. The coefficients of interest are the interactions between our exposure variable Q3EXP and the different years covered in our sample. The reference years are 1996 for Drop and 1997 for Entry, the first years we can measure product exit and entry in our sample. The results show that for product exit, the coefficients are positive and statistically significant only from 1998, the first year of the minimum wage policy change, but not before. For product entry, the negative coefficient is significant in 2000 but not before. Figure 4 presents a graph of the treatment effects over time for both products drop and add, using 95% confidence intervals. These results indicate that, before the policy change, there were not statistical differences in product creation and destruction between both groups of firms, suggesting that the impact that we find is not driven by differences in previous trends.

[Insert Table 16 Here]

[Insert Figure 4 Here]

In sum, our general evidence seems to be robust and consistent with the idea that low employment effects of minimum wages at the firm-level might be explained by firms' adjustments in the product mix aimed to increase productivity. In fact, as we show before, during this period of minimum wage increases, firms that introduced changes in the product mix outperformed in terms of productivity to those that did not introduce variation in their products.

V. Conclusion

There is a large debate on the effects of minimum wages on employment, but few empirical evidence about how firms respond and adjust to these shocks. We contribute to this literature by studying the impact of changes in minimum wage on the product creation and destruction at the firm level. Our identification strategy exploits as a quasi-experiment a large and 3-year predetermined increase in minimum wages during 1998-2000 and the differences in products exposure to these changes.

Our main results indicate that an increase in the minimum wages effectively increase the destruction of products that are more unskilled labor – intensive and that firms introduce products that are more intensive in skilled workers. The impact is economically relevant. In our basic regressions, we find that an annual nominal increase of 10% as that occurred between 1998 and 2000 raises the probability of dropping products of low skill intensity in 5 percentage points and decrease the probability of adding those sort of products in 3.3 percentage points. Our results are robust to sample selection issues, controlling for confounding factors and to alternative definitions of exposure.

Then our evidence is consistent with the idea that low employment effects of higher minimum wage at the firm-level may be explained by adjustment mechanisms for increasing productivity. In our case, previous evidence has shown that changes in the product mix may be an important way to increase productivity, by reallocating resources within the firm. Obviously, there are other adjustment mechanisms that may be explored. However, it seems that product creation and destruction is a relevant and robust one.

REFERENCES

Aaronson, D. 2001. “Price pass-through and the minimum wage” Review of Economics and statistics, 83(1), 158-169.

Álvarez, R., and R. Fuentes. 2018. “Labor market regulations and productivity: Evidence from Chilean manufacturing plants” Forthcoming, Economic Development and Cultural Change.

Autor, D. H., W. Kerr and A. D. Kluger. 2007. “Does Employment Protection Reduce Productivity? Evidence from US States.” The Economic Journal 117(521): 189-217.

Belman, D. and P. J. Wolfson. 2014. “What does the minimum wage do?” WE Upjohn Institute. Kalamazoo, Michigan.

Bernard, A. B., J. B. Jensen and P. K. Schott. 2006. “Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of US manufacturing plants” Journal of international Economics, 68(1), 219-237.

Bernard, A., S. Redding and P. K. Schott. 2010. “Multiple-Product Firms and Product Switching” American Economic Review 100(1): 70-97.

___________________ . 2011. “Multiproduct Firms and Trade Liberalization” Quarterly Journal of Economics 126(3): 1271-1318.

Bernard, A. and T. Okubo. 2016. “Product Switching and the Business Cycle” NBER Working Paper 22649.

Beyer, H. 2008. “Mercado del Trabajo y Salario Mínimo” Puntos de Referencia No. 93, Centro de Estudios Públicos.

Card, D. and A. B. Krueger, A. B. 1995. “Myth and measurement: the new economics of the minimum wage” Princeton University Press.

De Loecker, J., P. Goldberg, A. Khandelwal and N. Pavcnik. 2016. “Prices, Markups and Trade Reform” Econometrica 84(2), 445-510.

De Fraja, G. 1999. “Minimum wage legislation, productivity and employment” Economica, 66(264), 473-488.

Draca, M., S. Machin and J. Van Reenen. 2011. “Minimum wages and firm profitability” American economic journal: applied economics, 3(1), 129-151.

Eckel, C., and J. P. Neary. 2010. “Multi-product firms and flexible manufacturing in the global economy” The Review of Economic Studies, 77(1), 188-217.

Goldberg, P., A. K. Khandelwal, N. Pavcnik and P. Topalova. 2010. “Multiproduct firms and product turnover in the developing world: Evidence from India” The Review of Economics and Statistics, 92(4), 1042-1049.

Hirsch, B. T., B. E. Kaufman and T. Zelenska, 2015. “Minimum wage channels of adjustment” Industrial Relations: A Journal of Economy and Society, 54(2), 199-239.

Ma, Y., H. Tang, and Y. Zhang. 2014. “Factor intensity, product switching, and productivity: Evidence from Chinese exporters” Journal of International Economics, 92(2), 349-362.

Machin, S., and A. Manning. 1996. “Employment and the introduction of a minimum wage in Britain” The Economic Journal, 106(436), 667-676.

Mayer, T., M. J. Melitz, and G. I. Ottaviano. 2014. “Market size, competition, and the product mix of exporters” The American Economic Review, 104(2), 495-536.

Mayneris, F., S. Poncet, S., and T. Zhang. 2014. “The cleansing effect of minimum wage Minimum wage rules, firm dynamics and aggregate productivity in China” CEPII Working, No. Paper, 16.

Nocke, V., and S. Yeaple. 2014. “Globalization and multiproduct firms” International Economic Review, 55(4), 993-1018.

Qiu, L. D., and W. Zhou. 2013. “Multiproduct firms and scope adjustment in globalization” Journal of International Economics, 91(1), 142-153.

Schmitt, J. 2013. “Why does the minimum wage have no discernible effect on employment?” Center for Economic and Policy Research, 22, 1-28.

Wadsworth, J. 2010. “Did the national minimum wage affect UK prices?” Fiscal Studies, 31(1), 81-120.

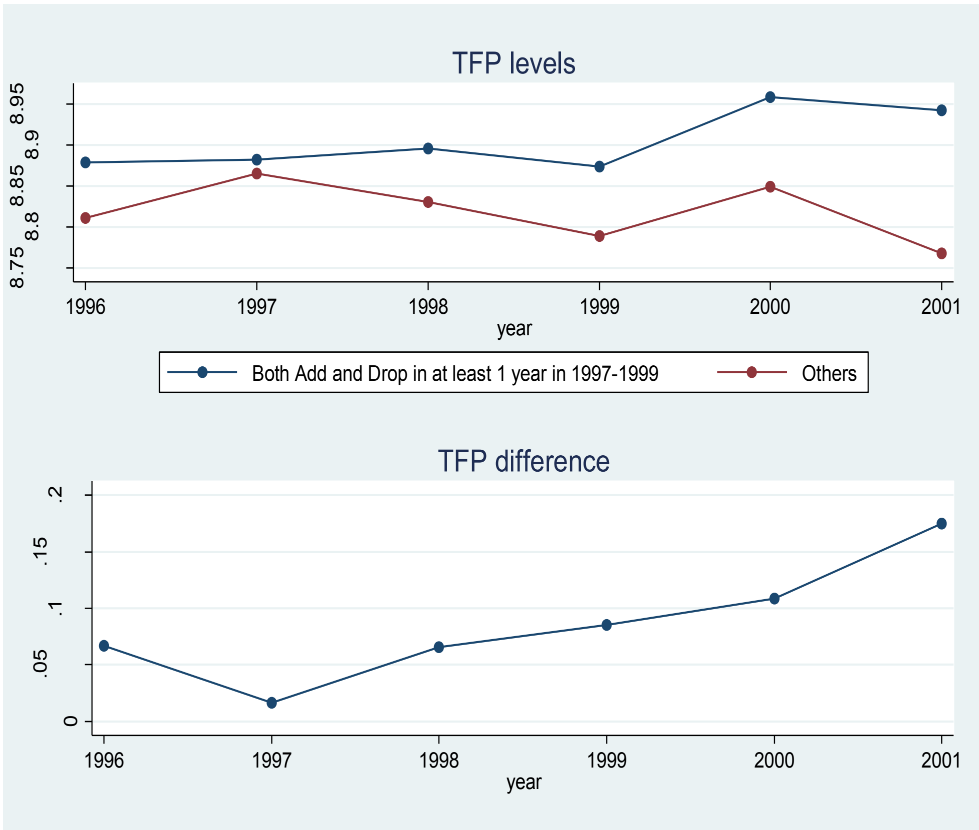

FIGURE 1. PRODUCTIVITY EVOLUTION AND PRODUCT CREATION AND DESTRUCTION

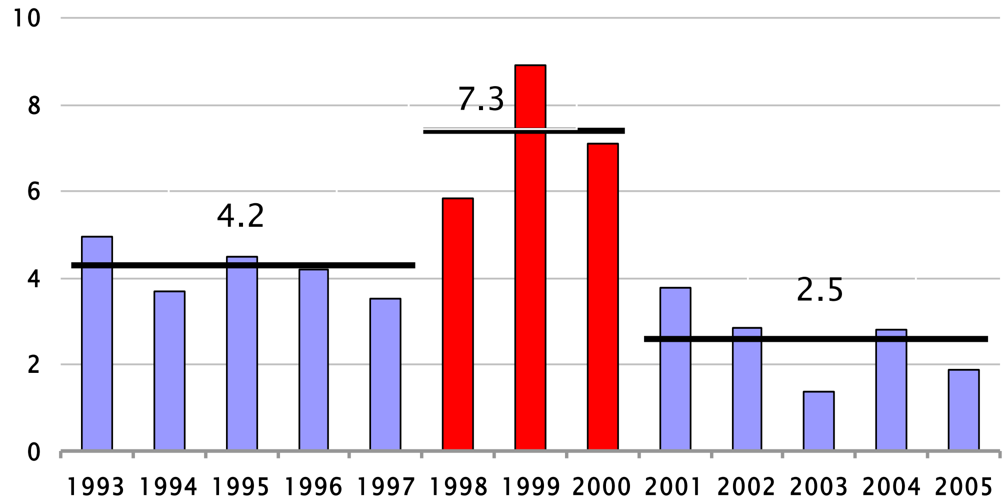

FIGURE 2. REAL MINIMUM WAGE GROWTH RATE: 1993-2005

Source: Authors Elaboration based on Beyer (2008)

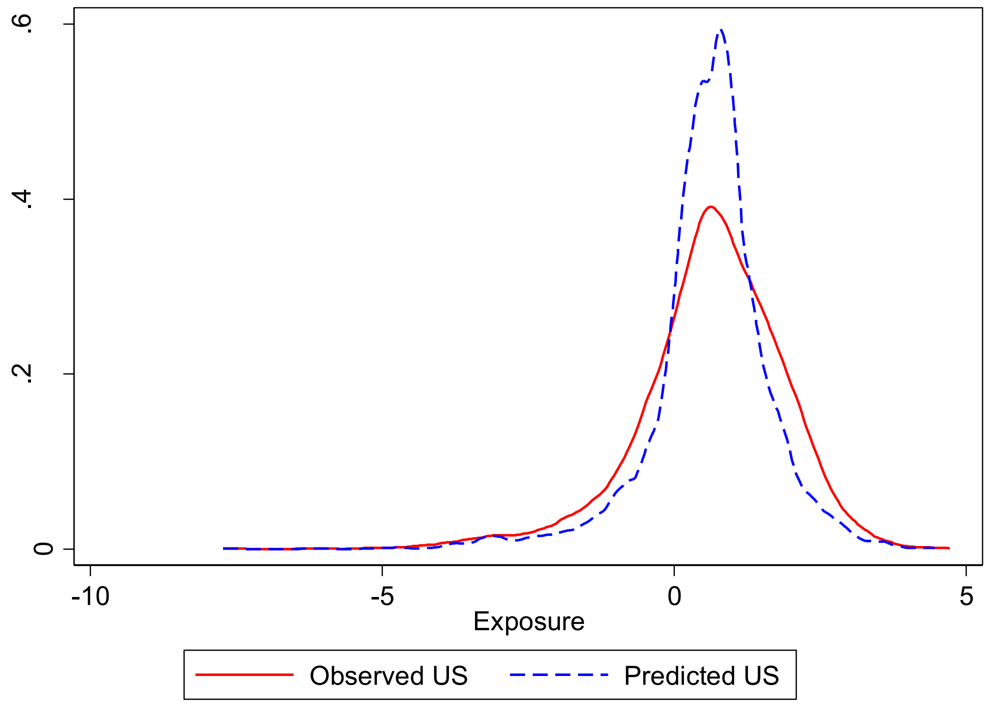

FIGURE 3. PRODUCT LEVEL EXPOSURE DISTRIBUTION

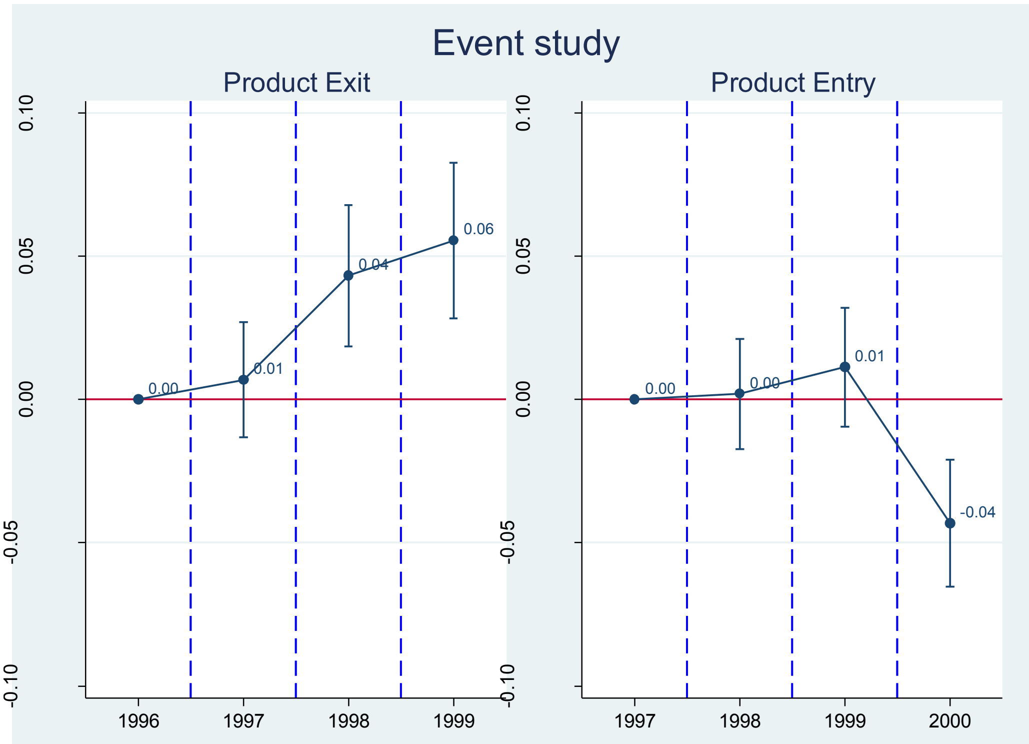

FIGURE 4. TREATMENT EFFECT OVER TIME

TABLE 1. DATA DESCRIPTION: PLANTS AND PRODUCTS

Year	Plants	Products	Products per Plant	ISIC 6 digits	ISIC 5 digits
1996	4541	1742	2.61	546	246
1997	4310	1697	2.54	555	248
1998	3939	1656	2.38	542	247
1999	3659	1641	2.23	543	244
2000	3611	1741	2.07	553	245

TABLE 2. AVERAGE PRODUCT DESTRUCTION AND CREATION RATES BY YEAR

Year	Drop	Add	Drop	Add
	Total Sample		Survivors(t,t+1)	
1996	0.18	.	0.09	.
1997	0.20	0.16	0.08	0.10
1998	0.26	0.11	0.13	0.06
1999	0.21	0.17	0.10	0.11
2000	.	0.17	.	0.10
Average	0.21	0.15	0.10	0.09

TABLE 3. AVERAGE PRODUCT DESTRUCTION AND CREATION RATES BY SECTOR

Sector	Drop	Add	Drop	Add
	Total Sample		Survivors (t,t+1)	
Food and Beverage	0.16	0.12	0.05	0.06
Textile	0.22	0.13	0.08	0.08
Wood	0.29	0.22	0.15	0.16
Pulp and Paper	0.20	0.16	0.10	0.08
Chemicals	0.20	0.15	0.12	0.10
Non-metallic	0.22	0.15	0.07	0.07
Metallic	0.22	0.27	0.16	0.21
Machinery	0.22	0.16	0.12	0.10
Other Industries	0.19	0.14	0.08	0.08
Average	0.21	0.15	0.10	0.09

TABLE 4. BASIC MODEL

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add	(5) Drop	(6) Add	(7) Drop	(8) Add
Q3EXP x MW	0.501***	-0.332***			0.490***	-0.336***		
	[0.100]	[0.063]			[0.099]	[0.063]		
50-99					-0.060**	-0.023	-0.060**	-0.023
					[0.023]	[0.016]	[0.023]	[0.016]
100-199					-0.101***	-0.068***	-0.101***	-0.069***
					[0.035]	[0.024]	[0.035]	[0.024]
200+					-0.101**	-0.114***	-0.101**	-0.114***
					[0.047]	[0.032]	[0.048]	[0.032]
Y/L					-0.031***	-0.021***	-0.031***	-0.021***
					[0.011]	[0.007]	[0.011]	[0.007]
EXP x MW			0.222***	-0.075**			0.217***	-0.079**
			[0.059]	[0.037]			[0.059]	[0.037]
Observations	36,511	33,230	36,511	33,230	36,511	33,230	36,511	33,230
R-squared	0.478	0.462	0.478	0.461	0.480	0.463	0.479	0.462

Notes: Exp is the log of the unskill/skill wage bill ratio at the product level using product level data from single product firms. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 5. SURVIVING PLANTS

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.311***	-0.275***		
	[0.074]	[0.054]		
EXP x MW			0.109**	-0.078**
			[0.045]	[0.031]
Observations	30,713	28,327	30,713	28,327
R-squared	0.479	0.474	0.479	0.473

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 6. SINGLE PRODUCT PLANTS

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3US x MW	0.492	-0.199		
	[0.308]	[0.191]		
US x MW			0.145	-0.091
			[0.141]	[0.076]
Observations	6,642	5,945	6,642	5,945
R-squared	0.516	0.576	0.516	0.576

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 7. MULTI PRODUCT PLANTS

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.485***	-0.399***		
	[0.107]	[0.069]		
EXP x MW			0.221***	-0.063
			[0.064]	[0.042]
Observations	29,841	27,259	29,841	27,259
R-squared	0.482	0.462	0.482	0.461

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 8. PRODUCT DROP AND ADD IN INTERNATIONAL MARKETS

VARIABLES	(1) Drop X	(2) Add X	(3) Drop X	(4) Add X
Q3EXP x MW	-0.004	0.054		
	[0.068]	[0.039]		
EXP x MW			-0.031	0.016
			[0.038]	[0.028]
Observations	36,511	33,230	36,511	33,230
R-squared	0.347	0.363	0.347	0.363

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 9. HETEROGENEOUS IMPACT ON EXPORTED PRODUCTS IN BASE YEAR

VARIABLES	(1) Drop	(2) Drop	(3) Drop	(4) Drop
Q3EXP x MW	0.420***		0.299***	
	[0.105]		[0.077]	
Exported Product x MW	-0.535***	-0.399**	-0.329***	-0.296***
	[0.169]	[0.162]	[0.108]	[0.096]
Q3EXP x Exporter Product X MW	0.519*		0.016	
	[0.271]		[0.170]	
EXP x MW		0.200***		0.119**
		[0.066]		[0.048]
EXP x Exporter Product X MW		0.070		-0.079
		[0.121]		[0.080]
Observations	36,511	36,511	30,713	30,713
R-squared	0.478	0.478	0.480	0.480

Notes: The estimation considers heterogeneous impacts on drop of products exported in 1996.Whole sample (columns 1-2), Survivors (columns 3-4). Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 10. INTERACTIONS WITH SECTORIAL GDP GROWTH

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.409***	-0.327***		
	[0.102]	[0.063]		
Q3EXP x dGDP Sector	-0.283***	-0.129*		
	[0.095]	[0.075]		
EXP x MW			0.215***	-0.069*
			[0.061]	[0.038]
EXP x dGDP Sector			-0.017	-0.093**
			[0.057]	[0.043]
Observations	36,511	33,230	36,511	33,230
R-squared	0.478	0.462	0.478	0.461

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 11. INTERACTIONS WITH PRODUCT SCOPE

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.487***	-0.287***		
	[0.109]	[0.060]		
Distance to scope xMW	0.063**	-0.078***	0.064**	-0.079***
	[0.026]	[0.010]	[0.026]	[0.010]
EXP x MW			0.229***	-0.091**
			[0.066]	[0.037]
Observations	28,217	24,453	28,217	24,453
R-squared	0.480	0.465	0.480	0.464

Notes: Distance to scope is the log difference in absolute value between the product code and the plant average product code. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 12. IMPACT ON CORE PRODUCTS

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.351***	-0.223***		
	[0.066]	[0.038]		
EXP x MW			0.099***	-0.066***
			[0.038]	[0.022]
Observations	36,511	33,230	36,511	33,230
R-squared	0.442	0.452	0.441	0.452

Notes: A core product is a product with sales representing at least 75% of the plant total sales. Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 13. ASSIGNING EXP VALUES RANDOMLY ACROSS PRODUCTS

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.022	0.051		
	[0.088]	[0.054]		
EXP x MW			-0.058	0.030
			[0.044]	[0.026]
Observations	33,272	30,550	33,272	30,550
R-squared	0.473	0.467	0.473	0.467

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 14. EXPOSURE VARIABLE DEFINED AS BITE OF MINIMUM WAGE FROM CASEN 1996

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add	(5) Drop	(6) Add	(7) Drop	(8) Add
Bite 1.2 x MW	0.700***	-0.209*			0.636***	-0.278***		
	[0.201]	[0.111]			[0.133]	[0.080]		
Bite x MW			0.431**	-0.060			0.362***	-0.143**
			[0.175]	[0.100]			[0.106]	[0.071]
Observations	39,539	36,142	39,539	36,142	33,344	30,838	33,344	30,838
R-squared	0.450	0.433	0.449	0.433	0.428	0.431	0.427	0.431

Notes: Bite is the fraction of workers earning up to 1.2 and 1minimum wages at the ISIC2-3digit level in logs, respectively. Whole sample (columns 1-4), Survivors (columns 5-8). Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 15. PRODUCT DESTRUCTION AND CREATION BY 6-DIGIT ISIC LEVEL

VARIABLES	(1) Drop	(2) Add	(3) Drop	(4) Add
Q3EXP x MW	0.245**	-0.153**		
	[0.102]	[0.065]		
EXP x MW			0.115**	-0.020
			[0.057]	[0.038]
Observations	29,058	26,765	29,058	26,765
R-squared	0.452	0.438	0.452	0.438

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include plant-product and industry-year fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

TABLE 16. TREATMENT EFFECT OVER TIME

VARIABLES	(1) Drop	(2) Add
Q3EXP x 1997	0.007	
	[0.010]	
Q3EXP x 1998	0.043***	0.002
	[0.013]	[0.010]
Q3EXP x 1999	0.055***	0.011
	[0.014]	[0.011]
Q3EXP x 2000		-0.043***
		[0.011]
Observations	36,533	33,249
R-squared	0.443	0.431

Notes: Robust standard errors clustered at the plant-product level in brackets. All regressions include time effects, plant-product and industry fixed effects.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.