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Abstract

By focusing on Japanese manufacturing small and medium-sized enterprises (SMEs) that were affected by global competition in the 1990s, we examine the interplay between global competition, immigrant employment, and research and development (R&D) investment in these organizations. To do this, we use firm-level survey data including information on the influence of past globalization, current challenges, and future plans for migrant hiring and R&D investment, showing the process by which firms move toward labor-intensive production as a result of import competition. Our major finding is that manufacturing SMEs facing fierce global competition are more likely to hire immigrant workers and invest less in R&D. In this process, the current poor retention of native young workers plays a substantial role as a channel between past globalization and future immigrant employment. On the other hand, intensifying global competition is directly linked to a decrease in future R&D investment. Neither the shortage of production workers nor the high growth rate in recent years are important determinants of subsequent immigrant hiring or R&D investment.

Keywords: immigrant workers, globalization, retention, SME

JEL classification: D22, F66, J15

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1. Introduction

Increased global competition can affect a firm's employment in several ways. In the US, for example, competition in Chinese imports led to increased technical change within firms and a reduction in the share of unskilled workers (Bloom et al. 2016). Studies on offshoring have had similar findings; offshoring to low-wage countries has changed the composition of the firm's workforce by increasing the share of high-skilled, technology-related, and nonproduction workers (Mion and Zhu 2013; Becker et al. 2013; Bernard et al. 2020; Hummels et al. 2014, 2018).

Many SMEs, however, can only deal with global competition in limited ways due to their financial and human capital constraints. In fact, some SMEs cannot even afford to invest in offshore production facilities and end up continuing their domestic production. This makes such domestic SMEs consider cutting their production cost to be able to compete with cheaper foreign products. SMEs that try to achieve cost reduction have an incentive to hire immigrant workers at lower wages compared to existing workers because the reservation wage of immigrants from developing countries is, in general, lower than that of native equivalent workers in developed countries¹. It is, thus, quite likely that fierce foreign competition makes domestic SMEs choose more immigrant production workers from the available domestic workforce.

Even though some SMEs seek to switch their domestic production workers for immigrant workers, it is not self-evident that those firms will continue their labor-intensive production; they could choose another strategy and increase R&D investment to differentiate themselves from competitors by producing less labor-intensive and high-value-added products. In general, global competition boosts the attractiveness of investments in capital- or skill-intensive production technologies or less labor-intensive product mixes (Pierce and Schott 2016). Capital-intensive or R&D-intensive firms are more likely to survive and grow in the wake of import competition (Bernard et al. 2006; Homebert and Matray 2018). Facing global competition, SMEs may also attempt to shift to more capital-intensive production. In this situation, cheap immigrant labor is considered temporary until a labor-saving system of production is in place. SMEs may increase their R&D investment while saving on personnel cost by hiring immigrant production workers. It is also possible that SMEs may simply try to maintain their labor-intensive production. If this is the case, investment in labor-saving technology should be suppressed.

In this study, we examine the interplay among global competition, immigrant employment, and R&D investment by focusing on Japanese SMEs affected by global competition in the 1990s. Our main conclusion is that manufacturing SMEs exposed to global competition are more willing to consider replacing their native production workers with

¹ Zahniser et al. (2012) suggest that an annual increase in the number of migrant and seasonal farm workers would result in a decrease of 6% in US-born agricultural workers and a decrease of 3% in agricultural wages.

immigrants while being reluctant to invest in more R&D. Regression analysis shows that the probability of willingness to hire immigrants at firms facing fierce global competition increases by 6.9 percentage points, and the probability of more R&D investment in the future decreases by 15.7 percentage points.

This study also reveals how global competition affects young workers' retention, followed by the willingness to employ immigrants. This means that, for SMEs, planning to hire immigrant workers is prompted not directly by intensifying global competition but indirectly by poor retention of native employees. Poor employee retention in the manufacturing sector caused by fierce global competition is consistent with Autor et al. (2015), who discovered largely negative effects of globalization on employment. We also document in our study that firms suffering from the separation of young workers are likely to have an immigrant employment plan regardless of the extent of the firms' production worker shortage or wage growth.

Our results imply that manufacturing SMEs, faced with difficulties in retaining their employees due to fierce global competition, intend to hire cheaper immigrant production workers and reduce their R&D investment, leading to more labor-intensive production. In contrast to many previous studies that have not focused on SMEs, we find that SMEs are unable to shift to high-skilled or technology-related employment resulting from import competition.

This study makes three contributions to existing literature. First, it clarifies the interplay between global competition, immigrant employment, and R&D investment. The interplay between immigration, capital, and trade is essential to understand the way globalization affects economies (Freeman 2006). However, the impact of trade on capital is often analyzed separately from the impact of immigrants on the labor market (Bloom et al. 2016). Assuming that there is an interplay between immigrant employment and capital investment, and that they are simultaneous decisions for firms, as Freeman (2006) points out, they should be analyzed at the same level.

Second, this study focuses on how SMEs in developed countries respond to global competition. In a globalized economy, it is reasonable to suppose that some of the low-skill work that cannot be automated in developed countries may soon head for the developing world (Autor et al. 2015). However, plant size is strongly positively associated with the probability of exporting and offshoring (Bernard and Jensen 2004; Biscourp and Kramarz 2007; Bernard et al. 2020). Recent literature using firm-level data has also clearly established that there exists substantial intra-industry heterogeneity in firm size, productivity, factor use, and participation in global markets (Hummels et al. 2018). In the background, as Melitz and Trefler (2012) point out, a firm's international expansion entails some up-front fixed costs; only the best performing firms achieve the sales volume needed to justify these initial investment costs. This implies that many SMEs do not choose or cannot afford to choose to offshore or export because they cannot bear the up-front fixed costs due to human resources and capital constraints. It is quite likely that these SMEs cope with global

competition in a different way compared to larger firms that change workforce scheduling and promote offshore production. Few studies, however, have explicitly analyzed the problems SMEs face in global competition and their choice of employment composition. Even prior studies, such as Mion and Zhu (2013) and Hummels et al. (2014), which show that global competition reduces the employment of low-skilled workers and promotes a shift to technology-related workers in manufacturing, do not account for the heterogeneous effect of global competition by firm size. However, if the heterogeneity between offshore firms above a certain size and SMEs that do not expand overseas is large, it is possible that SMEs may face a different impact than the shift toward less labor-intensive production and skill upgrading of employees that was found by Artuc et al. (2010) and Autor et al. (2015) in their regional and industrial unit analyses.

Third, from the perspective of immigration study, we identify the determinants for firms turning into immigrant employment by comparing firms with and without plans to hire immigrants. Many of the previous studies report the effect of immigrant workers on wages and employment for native workers (Alesina and Ferrara 2005; Borjas 2003; Longhi et al. 2005; Ottaviano and Peri 2006; Dustmann et al. 2013; Suedekum et al. 2014). These studies focus on measuring the outcomes of immigrant employment and have not addressed the question of why some firms hire immigrant workers while others do not. The first probable reason is that in countries with a high immigration ratio, immigrant employment is already quite common, making it hard to identify the reason for immigrant employment. The second reason is that the decision on whether firms promote organizational diversity has mostly remained unobserved by researchers. Contrary to the approach of using data that includes firms with immigrant workers, the data used in this study is only of firms that plan to but have not yet hired immigrant workers; thus, this study is not confounded by post-employment outcomes. This implies that we successfully exclude consequences (i.e., feedback effects) of immigrant employment that allows us to identify its determinants.

Our work is most closely related to studies on the influence of global competition on employment. Autor et al. (2014) review the effect of exposure to international trade on earnings and employment of US workers. Biscourp and Kramarz (2007) argue that the association between the increasing import of goods and destruction of unskilled jobs is only found in large firms. However, only few studies provide an explicit analysis of how SMEs react when faced with global competition. In addition, workforce reorganization resulting from global competition should be caused through a change in the firms' human resource strategies. In this respect, our argument is related to that of Bernard et al. (2020), who emphasize the importance of firms' heterogeneity and reveal a channel through which offshoring affects reorganization. This literature does not show the link between global competition and future human resource strategy

on SMEs. Our study, on the other hand, seeks to find channels that influence employers' decision of hiring blue-collar migrant workers and investing in R&D by empirically analyzing manufacturing SMEs' reorganization strategies.

This study's motivation is similar to that of Almeida et al. (2012), which is a case study focusing on highly skilled workers that analyzes how organization-based matters influence the recruitment of immigrant professionals in Australia. We are not aware of any other study that has pointed out the link between global competition and immigrant employment, though scholars such as Broom et al. (2016) and Yamashita and Yamauchi (2019) have discussed the influence of import competition on R&D investment.

The next section outlines our hypothesis and provides supporting evidence. Section 3 describes data and identification strategies. Section 4 presents the regression analysis of immigrant employment plans and R&D on the index of global competition. Section 5 presents our main result, Section 6 investigates the robustness of our results, and Section 7 concludes.

2. Background and Hypotheses

Thesmar and Thoenig (2000) show, in both theory and practice, that firms' organizational choices are influenced by external conditions such as globalization. The theory proposed by Acemoglu et al. (2015) also suggests that an increase in offshoring opportunities causes a fall in the real wage of unskilled workers, skill-biased technical changes, and rising skill premiums. In empirical studies, as falling trade costs permit firms to perform some production tasks offshore, the factors that remain at home become more productive (Grossman and Rossi-Hansberg 2008). This is supported by the fact that purchasing input by cheap labor in developing countries replaces tasks previously done by expensive workers in developed countries, which results in displacement and pay reduction of existing domestic workers (Feenstra and Hanson 1997; Ebenstein et al. 2014; Hummels et al. 2014). As a result of the trade openness and overseas mobility arising from globalization, the international specialization between developed and developing countries has improved, and firms locate their production and R&D functions at the location that maximizes their productivity and profits.

However, only the most productive firms, which also tend to be the largest, can afford the cost of moving abroad (Peters 2017). Since the initial cost of offshoring is too high for some labor-intensive SMEs, few SMEs in developed countries can afford to relocate overseas. To survive in a competitive market, domestic SMEs are forced to operate by balancing between using domestic workers and offering products at lower costs.

In such cases, there are two possible strategies that domestic SMEs competing with inexpensive import products could take to maintain profitability. One strategy is that, while continuing labor-intensive production, SMEs might

switch from relatively higher-paid workers employed currently to lower-paid workers. If immigrant workers have a lower reservation wage compared to native workers—as is often the case—then SMEs have the incentive to replace their currently hired native workers with immigrant workers². It is possible that globalization may encourage SMEs in developed countries to change their labor demand and hire more immigrants as production workers³.

The other strategy is to shift to labor-saving, technology-related production. When SMEs choose to switch to technology-related production, they increase their R&D investment to produce less labor-intensive and high value-added differentiable products. Correspondingly, it becomes necessary to make the employees highly skilled (Bresnahan et al. 2002). However, if developing or recruiting highly skilled workforce takes time, SMEs may consider hiring migrant production workers as temporary workers until they shift to labor-saving production systems. In other words, firms could save on labor costs by hiring migrant workers and increasing their R&D investment. Therefore, the direction of R&D investment is ambiguous, as SMEs' R&D investment, affected by global competition, may increase and decrease.

Based on the above discussion, we derive two hypotheses on the possible ways for SMEs to deal with the global competition that they face:

- SMEs facing globalization seek lower-paid labor and plan to hire immigrant workers.
- In the face of globalization, the decision of SMEs to increase or decrease R&D is ambiguous.

In the process of globalization affecting the reorganization of SMEs, their immigrant employment and R&D investment may also depend on the labor supply behavior in the labor market of developed countries. As a result of trade openness, the inflow of goods produced by cheap labor overseas lowers the price of the same types of goods in developed countries. Companies producing these goods for the domestic market will be forced to lower their production costs, leading to lower wages for currently employed workers (Autor et al. 2013). This will be followed by labor force shifts from the tradable goods industry, where wages are restrained, into the non-tradable goods industry, where wages are still maintained (Acemoglu et al. 2016). At that time, manufacturing SMEs producing tradable goods might suffer from separation of native workers and will plan to hire immigrant workers. It is thus suggested that labor

² Moriarty et al. (2012) explore Irish employers' turn toward immigrant labor rather than pursuing other strategies such as raising productivity or mobilizing alternative sources of labor.

³ As studies such as Scheve and Slaughter (2001) and Mayda (2006) have shown, workers whose skills are substitutes for immigrants' skills and who are exposed to the risk of unemployment or wage decline do not welcome an increase in the immigrant labor supply. However, even though employees are reluctant to work with immigrants, employers hire immigrant workers when they expect an increase in their profits by employing them.

supply constraints may be an impetus for manufacturing SMEs in developed countries to hire immigrant workers. More specifically, a third hypothesis can be summarized as

- Globalization is associated with immigrant employment, through a shortage of already existing production workers.

In fact, since each firm has a wide variety of characteristics, the productive benefits and possible costs associated with immigrant employment and R&D investment are likely to be heterogeneous. Such heterogeneity in net expected benefits means that not every firm will employ immigrant workers and increase R&D investment, that is, it is assumed that SMEs that plan to hire immigrants or increase R&D investment are expecting the resulting net productive benefits to be positive.

3. Data and Identification Strategies

Studies such as Bernard and Jensen (1997) and Biscourp and Kramarz (2007) show that a significant observed decline in manufacturing employment due to import competition occurs within firms. In addition, in the wake of import competition, firms shift their investment and hiring policies, leading to possible impact on workers' wages and employment. Therefore, our analysis uses detailed survey data to understand SMEs' response to globalization; past, present, and future R&D level; and human resource strategy. Moreover, use of firm-level data can be useful because it provides intra-industry variation that allows researchers to control for industry-level shocks to demand or technology (Hummels et al. 2018).

Using Japanese firm-level data from "The Survey on Manufacturing SME Management in the Global Economy," conducted by the Research Institute for Advancement of Living Standards (*Rengo Soken*) in 1997, we examine relationships between global competition, R&D investment, and immigrant employment. This data has a rich set of firm variables, including facing global competition and human resource issues, to shed light on the role of firm characteristics in immigrant employment and R&D investment decisions.

To estimate the impact of global competition on immigrant employment and R&D investment plans, panel data covering the 1990s and 2000s, such as those used by Bernard et al. (2020), are desirable. Although this data is a cross-sectional survey, it provides information on the influence of past globalization, current issues, and future plans for migrant hiring and R&D investment. In other words, since global competition and the plan of immigrant employment

is not a simultaneous occurrence, we can analyze whether mounting global competition in the past induces firms to move toward immigrant employment⁴.

However, this survey does not contain direct questions regarding whether the firm hires immigrant workers or has a plan to hire them; instead, it asks about the firm's current and future recruitment strategy. By using answers to this question, we captured information on the current and future employment of immigrant workers. The survey also asks about the types of workers currently employed and those intended to be employed in the future. The respondents chose from one of the following four options: I) regular (native) workers; II) temporary (native) workers; III) immigrant workers; and IV) not applicable.

Based on the responses to the above questions, we split the sample firms into three groups. A firm that has already employed immigrant workers was coded as an "already hiring (AH) firm." A firm that has not employed immigrant workers at the time of the survey but is willing to employ them in the future is coded as a "future hiring (FH) firm." A firm that has neither hired immigrants at the time of the survey nor plans to hire them going forward is coded as a "not hiring (NH) firm"⁵.

Differences between AH firms and NH firms include not only determinants of employment of immigrant workers but also the consequences caused by hiring them, which is called the "feedback effect." No feedback effect was observed in FH firms and NH firms because these firms had not yet employed immigrant workers. Therefore, comparing FH firms with NH firms allowed the identification of reasons why firms consider hiring immigrant workers.

Until the early 1990s, most Japanese firms consisted only of native employees, called regular (*seiki*) workers, with stable salaries and long tenures⁶. In the latter half of the 1990s, firms gradually switched part of their employees from regular workers to non-regular (*hiseiki*) workers with lower pay and limited tenure. Production workers were often targeted for conversion to non-regular positions, especially in the manufacturing sector. Most of the immigrants working on the production line were employed as non-regular workers; in fact, while many manufacturing firms hired high-school graduate natives as non-regular workers, the number of firms hiring immigrant workers gradually increased in the same period. In addition, Japan, like other developed countries, had experienced high subsequent import growth from China in the 1990s. This makes it suitable to explore the motivation of immigrant employment in firms by using Japanese data that reflect the timing of reorganization in the late 1990s.

⁴ We assume that increased international competition is exogenous for SMEs.

⁵ Of the 642 sample firms in total, 40 are AH firms, 47 are FH firms, and the remaining 555 are NH firms.

⁶ The share of immigrant workers among the labor force population was approximately 1% in the 1990s, which was one of the lowest among OECD countries.

Table 1 provides descriptive statistics for the variables used in the analysis for FH firms and NH firms. The first and second columns list the means and standard deviations for the main variables of FH firms and NH firms, respectively. The third column represents t-test results for the differences between the two types of firms, indicating that there are no significant differences for all variables. FH firms that plan to hire immigrant workers do not seem to have distinctive observable characteristics in terms of capital amount, number of employees, production workers ratio, or female ratio compared to NH firms. Appendix Table 1 documents the regional variations between FH firms and NH firms.

[Table 1]

It is worth noting that FH firms expect immigrant workers to fill the roles of lower-skilled production workers. Immigrants are not expected to be hired as highly skilled technical workers in the sample firms⁷. In this way, a human resources strategy wherein native workers are responsible for management tasks and immigrant workers fully engage in production to complement mutual skills and increase productivity is consistent with theoretical studies on the ethnic diversity of employees, such as that provided by Lazear (1999a, 1999b).

4. Effect of Globalization on Future Immigrant Employment and R&D Investment

Does global competition induce SMEs to hire domestic immigrant workers or increase R&D investment? Since manufacturing employment is strongly affected by rising import competition (Autor et al. 2013; Acemoglu et al. 2016), we first focus on the relationship between global competition and the willingness to hire immigrants in manufacturing SMEs. In parallel, we also analyze whether global competition affects firms' future R&D strategies.

The employment of immigrants in the production process is an indicator of whether a firm is still sticking to labor-intensive production. R&D investment is an indicator of whether a firm is aiming for high value-added, labor-saving, and capital-intensive production. First, if firms are inclined toward labor-intensive production in response to global competition, they may consider hiring immigrants and spending less on R&D. Thus, the relationship with global competition is expected to be positive for immigrant employment and the opposite for R&D investment. However, if immigrant employment is temporary, both future immigrant employment and R&D investment are expected to be positively related to global competition. Finally, when global competition results in a reduction in the number of

⁷ This might be because sample firms are manufacturing SMEs. Large manufacturing firms and service sector firms, for example in the IT industry, have a high demand for skilled immigrant workers in Japan.

production workers and a shift of employees to higher skills and labor-saving production, we expect a negative correlation for immigrant employment and a positive correlation for R&D investment with global competition.

Table 2 presents initial estimates of the relation between global competition and immigrant employment planning through a logit model. Using the full sample, we fit models of the following form:

$$Y_{imc} = \delta globalization_{imc} + X_{imc}\beta + \mu_m + \varphi_c + \varepsilon_{imc} \quad (1)$$

where, in columns (1)–(4), Y_{imc} is the binary variable for whether firm i is a FH firm, namely, whether it has an immigrant employment plan. In columns (5)–(8), Y_{imc} is the binary variable for whether firm i will increase their future R&D investment. The base specifications reported in columns (1) and (5) include X_{imc} , a vector of firm-level control variables containing (log) capital stock, firm age, (log) number of employees, and an indicator variable for union. Our specification includes industry effect to account for industry-specific productivity. The model also contains city fixed effects to capture common characteristics within an area where a firm is located. The binary variable on globalization represents whether the firm is faced with intensifying competition with firms abroad. Here, individual SMEs are assumed to have no effect on the degree of global competition.

Estimates of equation (1) are presented in Table 2. To make the interpretation of the coefficients easier, we show the marginal effects of the explanatory variables. The result in column (1) provides a positive and statistically significant relationship between globalization and future immigrant employment. The estimated coefficient of 0.069 means that firms facing fierce global competition increase the probability of willingness to hire immigrants by 6.9 percentage points, all else being equal. This is because the coefficient is the average marginal partial effect that is computed for a hypothetical firm whose values of the regressors, other than global competition dummy, equal the sample mean.

[Table 2]

Column (5) displays the relationship between global competition and future R&D investment in our base sample, also shown in Table 2. The coefficient of -0.157 indicates that the probability that a firm facing fierce global competition will invest more in R&D in the future than it does today is reduced by approximately 15.7 percentage points.

In the analysis above, we treat global competition as exogenous with respect to the willingness to hire immigrants and invest in R&D. However, the validity of the results would be threatened if other factors that are correlated with

the global competition affect immigrant employment or R&D investment⁸. Considering the fact that firms have developed different preferences based on their productivity (Melitz 2003), there is a concern in our analysis that each firm's productivity affects its willingness to hire immigrants and invest in R&D. This is an omitted variable problem. To address it, we additionally control for heterogeneity of firm productivity. Fortunately, we can use the information on production workers' initial monthly salary, both current and as of five years ago, as proxy indicators for rarely observed firm productivity. Controlling these variables enables us to satisfy the conditional mean independence assumption. Under the assumption that the productivity variables (initial salary and its growth rate) can be correlated with the error term, after conditioning on these variables, the mean of the error term does not depend on immigrant employment or the R&D investment variable.

Columns (2)–(4) list the relationship between global competition and immigrant employment plan after controlling the log of initial monthly salary of production workers and its growth rate over the last five years. In the same way, columns (6)–(8) list the corresponding relations between globalization and R&D investment. In columns (2) and (6), we repeat the base analysis about immigrant employment, adding initial monthly salary five years ago, and in columns (3) and (7), we include salary growth to control firm productivity. Columns (4) and (8) include both initial monthly salary five years ago and salary growth. In columns (2)–(4), we still find a positive and statistically significant relationship between global competition and immigrant employment plan. In addition, these effects are larger than those of the base models. In columns (6)–(8), the corresponding effects of the globalization on future R&D are negative and significant, and in line with the base model, though these values are larger than those of the base model. We find that none of these overturns our results; the estimates change remarkably little when we include controls for the firm's productivity and growth.

These results demonstrate that manufacturing SMEs facing fierce global competition are more likely to plan to start hiring immigrant workers, and at the same time, invest less in R&D. These results are consistent with the hypotheses raised in Section 2 and suggest that global competition is likely to induce SMEs to be more labor-intensive in production, rather than labor-saving and productivity-enhancing.

5. Retention of Young Workers: the Channel between Globalization and SME's Future Strategies

5.1 Globalization and the Current Situation

⁸ Simultaneity is likely not to be an issue in this study. Although we use cross-sectional data, we use three variables at different points in time: past globalization, current issues, and future strategies.

In this section, we argue that there is a retention problem of young native workers between past globalization and future immigrant employment. First, we confirm whether past global competition has an influence on current workers' retention and R&D investments in SMEs, followed by a discussion on the link between retention of young employees and *future* immigrant employment.

To assess the impact of past global competition on the current problems faced by firms, we consider two measures as indices of workforce management and R&D investment behavior from the survey: (1) whether a firm suffers from difficulty in retaining young native workers; and (2) whether a firm invests in R&D more than it did in the past.

As discussed in Section 2, globalization makes the manufacturing sector less attractive for workers because increased competition from globalization lowers the price of manufacturing products, and firms can no longer pay the same level of wages as before. Competition with products from developing countries might be followed by avoidance of working in the manufacturing sector and thereby, a decrease in the retention of exiting workers in manufacturing firms⁹. As a result, some SMEs are likely to move toward the employment of migrant production workers. Additionally, the SMEs affected by global competition may have already adjusted their R&D investment levels to the present before considering future R&D investment strategies.

To examine these relations, we regress global competition on the following two binary variables: separation of young workers and increased R&D investment, compared to five years ago (Table 3). We include the same control variables and fixed effects as the last section:

$$C_{imc} = \delta globalization_{imc} + X_{imc}\beta + \mu_m + \varphi_c + \varepsilon_{imc}. \quad (2)$$

[Table 3]

where C_{imc} is the binary variable of the current difficulty in workers' retention or R&D investment more than in the past. Panel A of Table 3 examines the relationship between the separation of young workers and global competition, while Panel B estimates the effect of globalization on the current R&D investment. The coefficients on the separation of young workers are around 0.15, which means a statistically significant increase in the separation of young workers, while the coefficient on current R&D investment is statistically indistinguishable from zero. This result implies that

⁹ Autor et al. (2014) argues that individuals who worked in manufacturing industries that experienced high subsequent import growth spend less time in their initial manufacturing industries and more time working outside of manufacturing.

firms facing global competition are associated with suffering from poor employee retention, while current R&D investments are not related to the impact of globalization in the past.

5.2 Effect of Current Concern on Future Immigrant Employment

In the last section, we have found that separation of young workers is positively associated with fierce global competition and have looked at the relationship between past global competition and the current problem of young workers' retention. There is a possibility that the poor retention of existing native workers in SMEs is one of the results of globalization.

Does the problem of poor retention then lead to future immigrant employment? In Table 4, to examine the relationship between young workers' separation and future immigrant employment, we present regression of equation (3), including all the same controls and fixed effects as the prior analysis.

$$Y_{imc} = \gamma C_{imc} + X_{imc}\beta + \mu_m + \varphi_c + \varepsilon_{imc}. \quad (3)$$

[Table 4]

The results of Panel A of Table 4 report all the positive significant relationships between immigrant employment planning and the difficulty in retaining young workers at the 1% level. Column (1) displays our base sample. The corresponding estimates with productivity indices, columns (2)–(4), are consistent with but larger than the base estimate reported in column (1). Columns (5)–(8) present the effect of separation with young workers on immigrant employment planning by adding an indicator for global competition. In these specifications, the coefficients of global competition become nonsignificant.

The results in Panel A of Table 3 and 4 show that the relationship between recent global competition and the future immigrant employment works through the young worker turnover within SMEs. In other words, the effect of separation of young workers plays an important role as a channel between past globalization and future immigrant employment. In sum, the effect of globalization is indirectly attributed to firms' willingness to hire immigrant workers. These results provide evidence in support of the prediction of the hypotheses discussed in Section 2. For manufacturing SMEs, immigrant employment planning seems to be associated with forward-looking firms that are suffering from the retention of native production workers and anxious about possible labor shortage in the future.

On the other hand, looking at Panel B of Table 4, the effect of young worker turnover on future R&D investment is totally insignificant in contrast to the effect on immigrant employment plans. In columns (1)–(4), there seems to be little evidence that separation of young workers increases the possibility that firms will invest more in future R&D. Adding a global competition dummy in columns (5)–(8) gives the global competition dummy a negative and statistically significant value, even though the coefficients of separation of young workers remain insignificant. The global competition dummy in column (5) indicates that, in our sample, the probability that an SME facing global competition will invest more in R&D in the future than it does today decreases by approximately 16.4 percentage points. Finally, in columns (6)–(8), we repeat our basic regressions with variables of firm productivity, obtaining results that are remarkably close to our baseline. The results of future R&D investment show that intensifying global competition is directly linked to a decrease in future R&D investment.

6. Robustness

In the previous section, we found that what matters to SMEs' future immigrant employment plans is presumably the poor retention of young workers that they are facing at the time. Here we substantiate the result of Table 4 further by controlling for interactions.

In columns (1) and (2) of Table 5, as a reference, we begin by reproducing the models in which the effects of global competition and the separation of young workers are estimated separately, though the coefficients of the independent variables are not marginal effects. Column (3) examines whether there are interactions between global competition and the separation of young workers. The coefficient of global competition remains insignificant. Moreover, the coefficient of the interaction term is statistically indistinguishable from zero, though it is large and positive. We interpret these results as further evidence that the positive correlation between globalization and immigrant employment planning is driven by poor retention of existing young workers. However, the probability that a firm suffering from poor retention plans to hire immigrants is not significantly different (statistically) between firms facing global competition and those not facing it. That is, even though firms may not realize the severity of global competition, the difficulty in retaining young workers is strongly and significantly associated with firms' immigrant employment plans.

[Table 5]

As mentioned above, global competition used in the previous analysis is based on each firm's subjective perception of intensified global competition. If unobserved factors affect this perception of each firm, it could make the global

competition measure we used in the analysis so far endogenous. To deal with this issue, we attempt to estimate import penetration ratio (IPR) by industry as an instrumental variable (IV) of each firm's perception of global competition, assuming that it is caused by growing IPR of its own industry¹⁰. Following Hombert and Matray (2018), the variable IPR for the broad industry classes is defined as the amount of import in the industry in 1996 divided by the industry employment in 1994¹¹. IV estimation maintains the result that poor retention leads to immigrant employment. After the Durbin-Wu-Hausman test for endogeneity is implemented, however, we do not reject the null hypothesis that the variable of global competition is exogenous. Then, the variable of global competition should be treated as exogeneous, and there is no need to instrument.

For further robustness checks, in column (4), we replace the dummy for global competition used in column (3) with the variable of IPR. The coefficient on IPR and its interaction term with young workers' separation in column (4) are both positive and significant at the 5% level. This implies that SMEs in import-intensive industries are more likely to suffer from low retention of young workers and to increase the probability of planning to hire immigrants. This result is also in line with previous works such as that of Parrotta et al. (2014) and Reskin et al. (1999) that examine the significant positive labor diversity for firms in more trade-open industries.

We now turn to the effect on R&D. The regressions in columns (7)–(8) investigate the sensitivity of the results in the previous section (about decreased future R&D investment) to changes in the regression specification. Column (7) modifies the baseline results of columns (5)–(6) by adding the interaction between workers' separation and global competition. The interaction term is not jointly statistically significant, while global competition continues to have a negatively significant effect at the 1% level. The estimate implies that SMEs struggling to retain younger workers are not particularly inclined to increase future R&D investment after severe global competition. On the other hand, when we replace the variable of global competition with IPR, the indicator of industry-level global competition environment, neither the IPR indicator nor the interaction terms in column (8) are statistically significant. This suggests that increasing future R&D investment seems to depend more on the firm's own perception of the severity of global competition than on whether industry import competition is actually severe or not.

We are also interested in whether global competition and young workers' separation have a larger effect on labor-intensive firms; to capture this, we include interactions between global competition (or separation of young workers)

¹⁰ IPR is assumed to have the exogenous variation of import share as predictors for global competition because variations in import share is mainly driven by large companies such as multinational corporations (MNC) that export, on which individual SME has little impact.

¹¹ Data on imports and employment in the industry come from RIETI JIP database: <https://www.rieti.go.jp/jp/database/JIP2018/index.html>. We use 1996 industry-level imports rather than the contemporaneous ones because current imports are likely to be endogenous.

and the production workers ratio (PWR). Furthermore, we are also interested in understanding whether firms that currently lack production workers or have experienced rapid growth in recent years are more likely to hire immigrants or invest in R&D in the face of global competition. It is quite likely, for example, that firms without sufficient native production workers may look for immigrant workers to make up for deficiency in native production workers, whereas firms with sufficient workers may replace native production workers with equivalent immigrants to raise money for R&D. These analyses can be rephrased as to whether immigrant employment and R&D investment plans differ between different categories of firms. The analysis here also serves as a robustness check of the results so far.

In Table 6, we add PWR, the dummy for the current shortage of native production workers (SPW), and the initial wage growth rate for five years (IWG) with these interactions¹². The estimates in columns (1)–(3) for the immigrant employment plan show that the coefficients of young workers' separation have significantly positive effects on firms' immigrant employment plans. On the contrary, none of the interaction terms are significant. Controlling for firm heterogeneity has little effect on our main results. Firms suffering from the separation of young workers are likely to have an immigrant employment plan regardless of the extent of the firm's production worker shortage or wage growth.

[Table 6]

Looking at the results of regressions for future R&D investment in columns (4)–(6), the coefficient of global competition is statistically negative and significant after controlling the additional confounders, which is similar to the results of Table 4. None of the intersection terms are significant. Firms with labor-intensive production, shortage of production workers, and high wage growth rates are less likely to consider increased future R&D investment.

Overall, controlling for some confounders does not change the estimated coefficients of global competition and the young workers' separation in an important way. These results suggest that the current shortage of production workers and the high-growth wages in recent years are not important determinants of subsequent immigrant hiring and R&D investment.

7. Concluding Remarks

The exposure of the manufacturing sector to globalization has increased rapidly in developed countries, especially since the 1990s. SMEs have found limited ways to deal with competition stemming from such globalization due to their financial and human capital constraints. This is in contrast to large firms that can flexibly address changes in the

¹² Since we found in the prior analysis that omitted variable bias resulting from not controlling productivity, is less serious, we do not control any indicator for productivity to maintain the sample size.

competitive environment. Despite this, only few studies have examined the impact of globalization with a focus on SMEs. There is particularly little agreement about what determines workforce and investment planning for SMEs struggling with global competitiveness in developed countries. In this study we analyze the interplay among global competition, immigrant employment, and R&D investment. Our work also seeks to find channels that influence employers' decision of hiring migrant workers and investing in R&D.

There is a high correlation between fierce past global competition and current separation of young workers, and poor retention of native young workers and future immigrant workforce planning. There is a possibility that poor retention of existing native workers in SMEs is one of the results of globalization. We also document that intensifying global competition is directly linked to a decrease in future R&D investment. Overall, global competition is likely to induce SMEs to utilize more labor-intensive production rather than labor-saving and productivity-enhancing forms of production.

It is useful to emphasize that SMEs' response to global competition is likely to differ from that of larger firms. Our results suggest that global competition encourages SMEs to hire immigrant production workers while discouraging future R&D investment; therefore, SMEs' production might become more labor-intensive than before. If many SMEs stick to labor-intensive production, there is a concern that the productivity gap with larger firms that are saving labor and adopting a higher-skilled workforce could widen further. The growing productivity gap in industries and firms might be explained as a contributing factor to the growing income inequality within developed countries since the 1990s.

There are many questions that our analysis does not address. It would be necessary to demonstrate additionally whether the findings for Japan, as presented in this study, are applicable to other countries. A comparative analysis may reveal that the labor-intensive tendency of SMEs is unique to Japan. In that case, the SME's labor-intensive orientation could be interpreted as a factor of stagnation of the Japanese economy since the 1990s. Besides, our one-shot cross-sectional survey data, with no time series information or exogenous events, is insufficient to examine the clear causality between global competition and immigrant employment. An in-depth analysis of the effect of global competition on immigrant employment and R&D investment using detailed panel data is important for future studies.

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Table 1 — Descriptive Statistics

| | FH firms | NH firms | t-test P-Value |
|----------------------------------|-------------------|-------------------|-------------------|
| Capital stock (ten thousand yen) | 4840 (4659.15) | 6487 (12473.3) | 0.369 |
| Firm age (years) | 34.02 (15.54) | 37.07 (14.30) | 0.169 |
| Number of employees | 88.55 (78.63) | 81.02 (104.55) | 0.649 |
| Capital-labor ratio | 92.03 (127.51) | 96.91 (131.38) | 0.817 |
| Non regular workers ratio (%) | 11.29 (13.39) | 11.39 (15.04) | 0.97 |
| Female workers ratio (%) | 24.54 (36.13) | 21.17 (17.51) | 0.363 |
| Production workers ratio (%) | 55.83 (39.49) | 51.21 (30.37) | 0.435 |
| Union (%) | 57.78 (49.95) | 57.56 (49.47) | 0.981 |
| Number of observations | 47 | 555 | |

Notes: Standard deviations are in parentheses. An FH firm is defined as a firm that has not employed immigrant workers at the time of the survey but is willing to employ them in the future. An NH firm is defined as a firm that has neither hired immigrants at the time of the survey nor plans to hire them going forward.

Table 2 — Marginal Effects of Global Competition on Future Strategy

| | Dep. variable: Immigrant employment | | | | Dep. Variable: Increased R&D investment | | | |
|--|-------------------------------------|----------------------|----------------------|----------------------|---|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Global competition | 0.0688** (0.0343) | 0.108** (0.0540) | 0.108** (0.0548) | 0.108** (0.0548) | -0.157** (0.0642) | -0.191*** (0.0702) | -0.196*** (0.0700) | -0.196*** (0.0701) |
| Log of capital stock | -0.00912 (0.0170) | -0.0273 (0.0258) | -0.0284 (0.0261) | -0.0284 (0.0261) | -0.0499* (0.0281) | -0.0395 (0.0332) | -0.0390 (0.0332) | -0.0391 (0.0333) |
| Firm age | 0.00180* (0.000985) | 0.00232 (0.00179) | 0.00240 (0.00183) | 0.00240 (0.00183) | 0.000323 (0.00172) | 0.000852 (0.00213) | 0.000845 (0.00217) | 0.000848 (0.00217) |
| Log of number of employees | 0.0273 (0.0187) | 0.0611* (0.0357) | 0.0624* (0.0361) | 0.0624* (0.0362) | 0.0608* (0.0334) | 0.0268 (0.0414) | 0.0241 (0.0416) | 0.0242 (0.0416) |
| Union dummy | 0.00612 (0.0194) | -0.0145 (0.0315) | -0.0133 (0.0319) | -0.0132 (0.0323) | 0.00244 (0.0329) | 0.00915 (0.0377) | 0.00113 (0.0375) | 0.000799 (0.0379) |
| City FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Log of initial monthly salary (five years ago) | | ✓ | | ✓ | | ✓ | | ✓ |
| Growth rate of initial monthly salary | | | ✓ | ✓ | | | ✓ | ✓ |
| Number of observations | 417 | 213 | 208 | 208 | 477 | 336 | 331 | 331 |

Notes: All regressions are logit models. Standard errors are in parentheses. The dependent variable in columns (1)–(4) is the binary variable for whether the firm is an FH firm. The dependent variable in columns (5)–(8) is the binary variable for whether the firm will increase their future R&D investment. “Global competition” is the binary variable on whether a firm is faced with intensifying competition with firms abroad. *** p<0.01, ** p<0.05, * p<0.1.

Table 3 — Marginal Effects of Globalization on Current Concerns

| | (1) | (2) | (3) | (4) |
|------------------------|--|---------------------|---------------------|---------------------|
| Panel A | Dep. Variable: Separation of young workers | | | |
| Global competition | 0.124** (0.0555) | 0.161** (0.0657) | 0.157** (0.0662) | 0.155** (0.0661) |
| Number of observations | 519 | 350 | 344 | 344 |
| Panel B | Dep. Variable: Increased R&D investment | | | |
| Global competition | 0.00512 (0.0625) | -0.0173 (0.0729) | -0.0232 (0.0745) | -0.0215 (0.0737) |
| Number of observations | 463 | 330 | 324 | 324 |

Notes: All regressions are logit models. Standard errors are in parentheses. The dependent variable in Panel A is the binary variable for separation of young workers. The dependent variable in Panel B is the binary variable for increased R&D investment compared to that five years ago. “Global competition” is the binary variable on whether a firm is faced with intensifying competition with firms abroad. All specifications include log of capital stock, firm age, log of number of employees, union dummy, city fixed effects and industry fixed effects, log of initial month salary (five years ago) in columns (2) and (4), growth rate of initial monthly salary in columns (3) and (4) as controls. *** p<0.01, ** p<0.05, * p<0.1.

Table 4 — Marginal Effects of Workers' Retention and Global Competition

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|--|----------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Panel A | | | | | | | | |
| Separation of young workers | 0.108*** (0.0288) | 0.154*** (0.0438) | 0.154*** (0.0441) | 0.154*** (0.0441) | 0.103*** (0.0283) | 0.143*** (0.0428) | 0.143*** (0.0430) | 0.143*** (0.0430) |
| | | | | | | | | |
| Global competition | | | | | 0.0453 (0.0307) | 0.0658 (0.0477) | 0.0663 (0.0485) | 0.0662 (0.0485) |
| Number of observations | 417 | 213 | 208 | 208 | 417 | 213 | 208 | 208 |
| Panel B | | | | | | | | |
| Separation of young workers | 0.0432 (0.0483) | 0.0179 (0.0585) | 0.0174 (0.0587) | 0.0173 (0.0588) | 0.0559 (0.0484) | 0.0378 (0.0587) | 0.0376 (0.0587) | 0.0376 (0.0588) |
| | | | | | | | | |
| Global competition | | | | | -0.164*** (0.0635) | -0.197*** (0.0700) | -0.202*** (0.0698) | -0.202*** (0.0698) |
| Number of observations | 477 | 336 | 331 | 331 | 477 | 336 | 331 | 331 |
| City FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Log of initial monthly salary (five years ago) | | ✓ | | ✓ | | ✓ | | ✓ |
| Growth rate of initial monthly salary | | | ✓ | ✓ | | | ✓ | ✓ |

Notes: All regressions are logit model. Standard errors are in parentheses. The dependent variable in Panel A is the binary variable for whether the firm is an FH firm. The dependent variable in Panel B is the binary variable for whether the firm will increase their future R&D investment. All specifications include log of capital stock, firm age, log of number of employees, union dummy (full results not reported to save space). *** p<0.01, ** p<0.05, * p<0.1.

Table 5 — Robustness Checks: Effect on Interactions and IPR

| | Dep. variable: Immigrant employment | | | | Dep. Variable: Future increased R&D investment | | | |
|--|-------------------------------------|--------------------|---------------------|---------------------|--|---------------------|----------------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Separation of young workers | 1.432*** (0.394) | | 1.172*** (0.428) | 0.361 (0.725) | 0.181 (0.203) | | 0.119 (0.224) | -0.130 (0.414) |
| Global Competition | | 0.870** (0.440) | -0.403 (1.053) | | | -0.665** (0.279) | -1.024*** (0.385) | |
| Import penetration ratio (IPR) | | | | 9.358** (4.364) | | | | 0.276 (0.177) |
| Separation # global competition | | | 1.435 (1.192) | | | | 0.736 (0.563) | |
| Separation # IPR | | | | 0.0712* (0.0417) | | | | 0.0174 (0.0205) |
| City FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Log of initial monthly salary (five years ago) | | | | | | | | |
| Growth rate of initial monthly salary | | | | | | | | |
| Observations | 417 | 417 | 417 | 417 | 477 | 477 | 477 | 477 |

Notes: All regressions are logit models. Standard errors are in parentheses. The dependent variable in columns (1)–(4) is the binary variable for whether the firm is an FH firm. The dependent variable in columns (5)–(8) is the binary variable for whether the firm will increase their future R&D investment. The variable of the import penetration ratio (IPR) for the broader industry is defined as the amount of import in the industry in 1996 divided by the number of industry employment in 1994. All specifications include log of capital stock, firm age, log of number of employees, union dummy (full results not reported to save space). *** p<0.01, ** p<0.05, * p<0.1.

Table 7 — Robustness Checks: Controlling for Firm's Heterogeneity

| | Dep.variable: Immigrant employment | | Dep. Variable: Future increased R&D | | |
|--|------------------------------------|---------------------|-------------------------------------|---------------------|-------------------|
| | (1) | (2) | (4) | (5) | |
| Separation of young workers | 3.400** (1.356) | 1.873*** (0.624) | 1.360** (0.694) | 0.291 (0.239) | 0.154 (0.236) |
| Global Competition | 0.568 (0.566) | 0.529 (0.535) | 0.677 (0.509) | -1.181** (0.523) | -0.588 (0.394) |
| Production workers ratio (PWR) | 3.310 (2.038) | | | -0.0545 (0.473) | |
| Shortage of production workers (SPW) | | 0.330 (0.727) | | 0.355 (0.250) | |
| Initial wage growth (IWG) | | | -1.480 (5.156) | | 1.156 (1.865) |
| Separation # PWR | -2.533 (2.106) | | | | |
| Separation # SPW | | -0.724 (0.922) | | | |
| Separation # IWG | | | 1.471 (5.640) | | |
| Global competition # PWR | | | | 0.615 (0.695) | |
| Global competition # SPW | | | | -0.190 (0.629) | |
| Global competition # IWG | | | | | 4.014 (4.675) |
| City FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry FE | ✓ | ✓ | ✓ | ✓ | ✓ |
| Log of initial monthly salary (five years ago) | | | | | |
| Growth rate of initial monthly salary | | | | | |
| Observations | 234 | 264 | 208 | 356 | 374 |

Notes: All regressions are logit models. Standard errors are in parentheses. The dependent variable in columns (1)–(3) is the binary variable for whether the firm is an FH firm. The dependent variable in columns (4)–(6) is the binary variable for whether the firm will increase their future R&D investment. The measure of production workers ratio (PWR) is the percentage of production workers in a firm. The variable of shortage of production workers (SPW) is the binary variable for the current shortage of native production workers. The measure of the initial wage growth rate (IWG) is defined as the ratio of initial wage change from 5 years ago to the present. All specifications include log of capital stock, firm age, log of number of employees, union dummy (full results not reported to save space). *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 1 - Immigrant Employment Plan by Regions

| | Hokkaido | Tohoku | Kanto | Tokai | Hokuriku | Kinki | Chugoku | Shikoku | Kyushu | Total |
|----------|----------|--------|-------|-------|----------|-------|---------|---------|--------|-------|
| FH firms | 0 | 1 | 16 | 12 | 2 | 7 | 5 | 1 | 1 | 45 |
| (%) | 0 | 2.22 | 35.56 | 26.67 | 4.44 | 15.56 | 11.11 | 2.22 | 2.22 | 100 |
| NH firms | 9 | 26 | 166 | 130 | 38 | 93 | 60 | 5 | 19 | 546 |
| (%) | 1.65 | 4.76 | 30.4 | 23.81 | 6.96 | 17.03 | 10.99 | 0.92 | 3.48 | 100 |
| Total | 9 | 27 | 182 | 142 | 40 | 100 | 65 | 6 | 20 | 591 |
| (%) | 1.52 | 4.57 | 30.8 | 24.03 | 6.77 | 16.92 | 11 | 1.02 | 3.38 | 100 |