

Manpower Constraints and Corporate Policies*

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Abstract

Using a unique German panel that allows measuring manpower constraints at the firm level, we document that manpower constraints vary substantially over time and across industries. Manpower-constrained firms have 5% higher capacity utilization and 21% longer order backlog. They also plan on higher investments in physical and human capital. For identification, we exploit the fall of the Berlin Wall and the subsequent differential fluxes of specialized Eastern workers across Western German states as a shock to manpower constraints. We also design a Manpower Constraint (MPC) Index using the loadings on firm-level financials that are available in commonly used dataset worldwide.

JEL classification: J21, J31, J61, G31, G32

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I Introduction

Frictions in financial and labor markets limit firms' ability to optimize capital and labor inputs, and ultimately maximize profits. Manpower constraints—the pervasive lack of high-skill and low-skill specialized workers, irrespective of the wages firms might offer—are an important friction whose effects have been largely understudied because they are hard to detect. Any allocation of workers across firms could be an unconstrained or constrained equilibrium in the labor market.

Financial constraints, which have been the focus of substantial research in finance, face a similar detection and measurement problem but can be relaxed more easily than manpower constraints, because money—contrary to workers and skills (Moretti, 2012)—is fungible and can be redistributed across firms and space. Consistently, Jagannathan, Matsa, Meier, and Tarhan (2016) find that operational constraints rather than financial constraints determine CFOs' usage of high discount rates in capital budgeting. Manpower constraints are a form of operational constraints that might therefore represent a large obstacle to firms' activities.¹

The availability of high-skilled and low-skilled specialized workers across space is also the subject of heated policy debates. Immigration policies can restrict or enlarge the supply of specialized workers available in a country. Quotas on H-1B visa availability in the United States are a prime example of an immigration policy that shapes the supply of specialized workers. Moreover, training and education of specialized workers is partially a public good that many firms are unwilling to provide to workers, because workers can leave the firm at any time. The supply of public and private education programs, such as associate degrees, determines the skills workers build up before joining firms.

In this paper, we study manpower constraints and their relationship with corporate policies using unique data in which we observe *directly* whether firms declare they face a shortage of specialized workers with the needed skills, i.e. they cannot hire specialized workers irrespective of the (economically viable) wages they offer. The data are a proprietary semester-level panel of 2,000 German firms from 1980 to 2001, which operate

¹Gatzer, Hoang, and Ruckes (2014) provide survey evidence that lack of qualified manpower can be an impediment to “execute projects”.

in manufacturing, construction, and trade. These firms constitute a representative sample of German businesses, to which the *ifo Institut* asks a large set of questions ranging from existing corporate policies and expectations about future economic conditions and policies.

Because to the best of our knowledge this is the first paper that observes the incidence of manpower constraints, we first investigate the characteristics of manpower-constrained firms. In the median industry (*Wood Processing*), 15% of firms are manpower constrained at least once throughout our sample period. Large variation in the presence of manpower constraints exists across industries, and manpower constraints are more likely in traditional manufacturing industries and wholesale trade than in specialized and high-tech industries. For instance, 33% of the firms in *Manufacturing of beverage products* are manpower-constrained, whereas only 6% of firms in *Chemical industry* and 8% of firms in *Aviation and Aerospace* are manpower constrained. The incidence of manpower constraints also varies largely over time. In our sample, about 15% of firms were manpower constrained in 1980 and in 1990, 5% were manpower constrained in 1985, and 3% in 1996.

We then move on to our baseline analysis, which exploits cross-sectional variation in the likelihood that firms are manpower constrained at any point in time throughout our sample period. Manpower-constrained firms have 5% higher capacity utilization, 21% longer backlog of orders (measured in months), are 4% more willing to increase their capital expenditures in the following year, and are 40% more willing to grow their employment,² after partialling out semester, state, and industry fixed effects, as well as controlling directly for whether firms declare that they are subject to financial constraints. Financial constraints might be related to employment policies, and measuring them at the firm level in the same way in which we measure manpower constraints allows us to disentangle the case in which a firm does not hire additional workers because of the lack of capital instead of the lack of available workers.

All our results so far refer to conditional correlations: Unobservables correlated with the likelihood that a firm is manpower constrained might also explain the different corporate policies and performance of manpower-constrained firms compared to other firms. To tackle these endogeneity concerns, we propose a source of quasi-exogenous

²The survey asks firms about their employment policy regarding all employees, and not just specialized workers.

variation in the relaxation of German firms' manpower constraints. We consider the fall of the Berlin Wall in 1989 and the subsequent mass migrations of Eastern German workers to West Germany (Fuchs-Schündeln and Schündeln, 2005). Eastern German workers were highly specialized in traditional manufacturing tasks, which is the expertise that manpower-constrained firms in our sample are looking for. Eastern Germans migrated to areas in which relatives and friends had settled before the Berlin Wall was built. The bombings during WWII affected the supply of housing in Germany which in turn determined the settlement of such relatives and friends. Bombings during WWII therefore determined the spatial diffusion of Eastern German refugees during the 1950s, and also of Eastern Germans escaping communism after the fall of the Berlin Wall (Burchardi and Hassan, 2013). Consistent with our interpretation of the natural experiment, the share of firms that declare they are manpower constrained decreased from 14% in 1990 to 4% in 1991 and 3% in 1992, and stayed below or around 5% until the end of our sample, in 2001.

Our identification strategy is an instrumental-variable approach, which uses the variation in the yearly cumulative inflow of Eastern German immigrants across Western German states (*Bundesländer*) to instrument for the share of firms that are subject to manpower constraints in each Western state over time. We observe immigration fluxes at the state level, and hence to avoid unduly interpreting within-state firm-level observations as independent, we construct our instrument at the state level as opposed to the firm level.

The identifying assumption we need is that the extent of the influx of Eastern German workers after the fall of the Berlin Wall affected firms' policies only through the relaxation of their manpower constraints, and not through other channels. The main threat to this exclusion restriction is the fact that the fall of the Berlin Wall created a new free market to which Western firms could supply a large range of products that previously did not exist in the East. This threat is mitigated by the fact that *all* Western firms, irrespective of the state, were exposed to the opening of the new market, and our analysis exploits

variation in the influx of Eastern immigrants across states.³

A related threat to the validity of our instrument is that the differential influx of Eastern workers across Western states might have changed the size and characteristics of local markets and demand within Western states. This concern is also barely relevant in our case, because if anything a larger influx of immigrants should have increased the demand for goods of local firms and hence should have increased the prevalence of manpower constraints as well as capacity utilization, backlog of orders, willingness to invest in capital expenditures and of hiring additional workers. To the contrary, if the influx of immigrants relaxed manpower-constrained, as our identification strategy assumes, local firms should have decreased their capacity utilization and backlog of orders after the influx of Eastern German workers. To further assess the validity of our instrument, we first show that it is relevant.

In the second stage, we confirm the baseline positive effects of manpower constraints on capacity utilization, backlog of orders, willingness to invest, and willingness to grow employment. The instrumental-variable analysis confirms the endogenous OLS results.

Observing the incidence of manpower constraints is not possible in commonly used data sets for US, European, and Asian firms. At the same time, progress in the detection and measurement of manpower constraints would allow deeper investigations into the effects of this type of labor-market constraints on firm- and industry-level outcomes, productivity, and ultimately economic growth. We therefore exploit the subsample of firms for which we observe balance-sheet variables and other financials to construct a *Manpower Constraint (MPC) Index*.

The logic of our MPC index is similar to the finance literature on financial constraints such as Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock and Pierce (2010). We use a logit specification to run predictive regressions of the likelihood that firms in our sample declare they are manpower constrained onto their age, SG&A, trade accounts payable, trade accounts receivable, and inventories. Once we control for these

³This is the reason why we do not design a difference-in-differences strategy based on the relaxation of manpower constraints within firms before and after 1989. If we did so, we would be unable to disentangle the effect of the fall of the Berlin Wall on manpower constraints from the effect of the opening of a new market for Western firms.

five dimensions, we find other financials are unrelated to the likelihood of manpower constraints. We then interpret the estimated coefficients on each of these variables as the loadings one can apply to different samples of firms to obtain a measure of the extent of manpower-constraints which firms face. Based on this procedure, we compute the MPC Index as follows:

$$MPC\ Index = 0.16 \times Age + 0.23 \times \frac{SG\&A}{Assets} - 0.26 \times \frac{A/P}{Assets} + 0.39 \times \frac{A/R}{Assets} + 0.40 \times \frac{Inventories}{Assets},$$

where we define the variables in Section V. We then run a comparative analysis of manpower constraints and financial constraints (which we kept constant throughout the main analysis in the paper), and we find that, as expected, the factors that predict manpower constraints are different from those that predict financial constraints.

Overall, our results investigate the effect of manpower constraints on corporate policies in a setting which allows us to observe the incidence of manpower constraints directly, and to obtain quasi-exogenous variation in the strictness of manpower constraints based on a natural experiment. We then construct an index, the MPC index, which is based on predicting the manpower-constrained status of firms with financials that are commonly available outside our setting, and which can hopefully help future research investigating the effects of manpower constraints on other micro-level and macro-level outcomes.

Our paper is also subject to caveats. First, our results are for a representative sample of firms in Germany. Germany is a bank-dependent economy with a strong manufacturing sector. Hence, while our results might be internally valid they might not apply to different setting. We want to emphasize though, that the German economy is similar to many other economies, both in Europe but also in Asia and the US economy. Second, our sample ends in 2001 because the survey no longer elicited the occurrence of manpower constraints and hence, our results might no longer accurately reflect the determinants of manpower constraints. While it is true that the rise of the internet and of digitization has changed the way many firms operate, it did not change the industrial structure of the German economy. Third, we rely on self-reported measures of constraints but a growing literature

shows that self-reported beliefs reliably predict actual decisions, both for households but also firms, see, e.g., Coibion et al. (2020), D’Acunto et al. (2020), and Bachmann et al. (2015).

A Related literature

This paper contributes to several strands of literature. First, it belongs to the research that tries to measure the extent and severity of external constraints on corporate decision-making. The problem of measuring financial constraints has produced a large literature in finance (Fazzari et al. (1988), Kaplan and Zingales (1997), Fazzari et al. (2000), Kaplan and Zingales (2000), Whited and Wu (2006), Hadlock and Pierce (2010), and Farre-Mensa and Ljungqvist (2015)). To the best of our knowledge, no paper has tackled the problem of measuring proxies for firms’ manpower constraints, likely because providing such measures would prove even tougher than measuring financial constraints. Any labor allocation across firms could be a constrained or unconstrained optimum. Our paper contributes to this literature by providing a direct measure of manpower constraints based on firms’ survey responses.

To study the effect of financial constraints on firm-level outcomes overcoming the issue of measuring financial constraints, studies on financial frictions usually exploit quasi-exogenous variation in the relaxation of unmeasured financing constraints (e.g., see Jayaratne and Strahan (1996)). Most closely related to our paper is Chava, Danis, and Hsu (2020), who exploit the staggered introduction of Right-to-Work laws across US states on corporate investment. This literature inspires our paper, which similarly documents the baseline effects of manpower constraints on corporate policies, and uses a source of quasi-exogenous variation in the relaxation of such friction for identification. Different from earlier work, we do observe directly in the data whether firms declare they face manpower constraints, and we do not need to proxy for constraints using observable information. We also closely relate to Jagannathan, Matsa, Meier, and Tarhan (2016) who use survey evidence from the US and show that operational constraints such as lack of management or qualified workers explain why firms use high hurdle rates and forgo profitable investment projects in the hope of more profitable future projects rather than

financial frictions. We build on this work and show how the lack of qualified workers directly hampers production and investment.

Second, this paper contributes to the strand of research that studies the effects of immigration and diversity on firm-level productivity and labor market equilibria (Borjas (2014)). Recent contribution to this large literature include Peri et al. (2015), who exploit H-1B visa lotteries to estimate the effects of inflows of specialized workers on city-level outcomes. Kerr et al. (2016) and D’Acunto et al. (2020) study the selection of specialized-worker inflows and their effects on productivity and growth. Our paper uses quasi-exogenous variation in the immigration flows of specialized workers to study the effect of relaxing manpower constraints on corporate policies.

Third, the paper speaks to the literature on the effects of education policies on the quality of the workforce available to firms, both in the short and long term. Gennaioli, LaPorta, Lopez-de Silanes, and Shleifer (2012) use a unique panel data set of regional characteristics worldwide to show that higher education is related to higher development across space, and the role of the education of managers is particularly relevant to development. D’Acunto (2019) finds that the cross-sectional variation in basic education levels across European regions persisted for centuries, and that firms in regions with a more educated low-skill workforce innovate and invest more than other regions. This paper shows that the availability of specialized low-skill workers is a crucial yet neglected source of flexibility in firms’ investment and growth plans.

Fourth, we also relate to the large literature on misallocation. Hsieh and Klenow (2009) document substantial gaps in measured marginal products of capital and labor within narrowly-defined industries and argue misallocation in resources explain the measured dispersion. Similarly, Whited and Zhao (2020) show that misallocation of financial liabilities contributes to losses in measured productivity. Finally, Bloom and Van Reenen (2007) argue that heterogeneity in management practices can explain differences in measured productivity. We contribute to this literature in that we show that the inability of firms to hire qualified workers results in suboptimal corporate policies.

II Data

Our data consist of a panel of German firms we observe from 1980 to 2001. The panel is a representative sample of German firms, which is surveyed each month by the ifo Institut, Munich (DE) in the *Business Expectations Panel* (BEP). The panel includes manufacturing, trade, and construction companies. The aim of the ifo Institut is to collect firm-level perceptions and expectations regarding one-year firm-level policies as well as economy-wide variables, such as the unemployment rate and GDP growth. The ifo Institut uses this information to construct a monthly index of business sentiment in Germany called *ifo Business Climate Survey*, which is a leading macroeconomic indicator in Germany. Parts of the survey are used for the official German Business Sentiment index of the Directorate General for Economic and Financial Affairs of the European Commission. Consistent with ifo Institut’s aims, researchers have mainly used the data to address questions in Macroeconomics (e.g., see Bachmann et al. (2013)). We merge information from the BEP with data in the *Business Investment Panel*, which asks a representative sample of German firms questions about their corporate policies and investment plans every six months. Additional details and characteristics of the data we use are described by Seiler (2012).

We focus on the manufacturing sector because we aim to merge the data with additional data. The manufacturing sector sample is representative of the German manufacturing sector. A firm in the survey is either a stand-alone firm or a division of a large conglomerate. For simplicity, we refer to “firms” throughout this paper. A meta-study performed by ifo (Abberger et al., 2009) suggests that senior management or other knowledgeable people within the firm fill out the survey. Moreover, the survey respondents typically remains the same person within firm.

Although the ifo Institut has been running the survey continuously up to the present day, we do not use observations after 2001, because the survey stopped asking about manpower constraints. One drawback of the BEP is balance sheet variables are not collected for the vast majority of firms in the panel, because the aim of the ifo Institut is not the use of data for research in finance or productivity. Instead, as mentioned

above, the ifo Institut uses the survey information to construct a business sentiment index of German firms. Balance sheet variables and financials come from the *Hoppenstedt Firmendatenbank* and the *Bureau van Dijk Orbis* database and are only available for 9% of the sample. Therefore, in our baseline analysis, we do not control for financial dimensions, but we find all our results are robust to controlling for financials in the subsample of firms for which we observe them.

The unique question in the BEP we use in our analysis asks whether firms think they face manpower constraints. In the official English translation of the BEP questionnaire, question 3.2.29 is titled “*constraints: lack of manpower.*” The translated question reads as follows:

“Our domestic production activities are currently constrained by the lack of skilled labour.”

In our analysis, we define a dummy variable that equals 1 if a firm in the panel responds “Yes” to the question above, and equals 0 otherwise.

We measure financial constraints as follows:

“Our domestic investment activities were, respectively will be, positively/ negatively influenced this year by the financing situation.”

Firms can answer strong inducement, slight inducement, no influence, slight negative influence, and strong negative influence. In our analysis, we define a dummy variable that equals 1 if a firm in the panel responds “Strong negative influence” to the question above, and equals 0 otherwise.

We also use the following question to measure capacity utilization:

“The utilisation of our production equipment for producing our main product (customary full utilization = 100) currently amounts to”

Survey participants can answer 30, 40, 50, 60, 70, 75, 80, 85, 90, 95, 100, and more than 100 in which case they are prompted to answer a specific number.

To measure order backlog we use the answer to the following question:

“At the moment our backlog of orders for shipments of our main product corresponds to a production period of . . . months.”

Survey participants can answer 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and more than 10 in which case they are prompted to answer a specific number.

To measure investment and hiring plans, we use the answers to:

“As compared to the current year we probably will invest . . . next year.”

Answer options are more, about the same, less.

“With respect to the economic development - so after elimination of purely seasonal fluctuations - the number of employees involved in the production of the main product during the next 3 months will”

Answer options are increase, remain about the same, decrease.

Figure 1 describes the variation of manpower constraints across manufacturing subsectors. In the figure, we measure the fraction of firms within an industry that at least once declared being manpower constrained at any point in time covered by the survey. Substantial heterogeneity in the incidence of manpower constraints exists across manufacturing subsectors. In the median industry, that is, *Wood Processing*, 15% of firms declare they are manpower constrained at least once over the sample period. The share of manpower constraints is highest in the *Manufacture of beverages* (33%) and lowest in the *Chemical industry* (6%).⁴ Interestingly, manpower constraints are more common in traditional industries, such as *Wholesale, Printing and copying*, and *Mechanical engineering* than in high-tech industries, such as *Shipbuilding and Aerospace*. Low-skill specialized workers, as opposed to high-skill specialized workers, seem to drive the presence of manpower constraints. This fact is consistent with the results in Labor Economics and Economic Geography that low-skilled workers are substantially less likely to move across space than high-skilled workers, and the results in Education Economics that building up basic and specialized skills in the broader population takes decades.

⁴The share reaches 100% in the *Mining support service activity* sector, but because we only observe two firms in this sector, we do not use them in the analysis. All results are virtually unchanged when we use these additional two firms in the analysis.

Figure 2 describes the variation of manpower constraints over time. In the figure, we define as manpower-constrained a firm-year observation that declares that they are manpower constrained. The incidence of manpower constraints varies dramatically over time. In our sample period, the fraction of firms that declare that they are manpower constrained peaks in 1980 and in 1990, when it equals 14% in the overall population of firms. The fraction reaches its local minimum point in 1983, when it equals 2%. The fraction of manpower-constrained firms in the German economy stays around 5% in the second half of the 1980s, as well as in the late 1990s/early 2000s.

III Baseline Analysis

After having described the characteristics of manpower constraints across industries and over time, we move on to analyze how facing manpower constraints correlates with the set of corporate policies we observe in our data.

Our baseline analysis exploits the panel structure of the data to estimate the correlation between a firm's manpower-constrained status at each point in time and its contemporaneous and prospective policies. Variation in manpower-constrained status at the firm level over time is crucial to reduce the concern that systematic time-invariant differences across firms above and beyond their manpower-constrained status drive our results. For instance, better-managed and efficient firms—dimensions that we cannot measure directly in the data—might be manpower constrained because they face higher demand than unconstrained firms.

In terms of corporate policies we observe in our data, we first consider policies contemporaneous to the detection of firms' manpower-constrained status. Specifically, we look at capacity utilization and at the backlog of orders that firms have not yet fulfilled, which is measured in months. Firms in our sample might declare that they are manpower constrained because they are less efficient and productive than other firms, and hence high-skill and low-skill specialized workers would obtain higher salaries and bonuses in other firms. In this case, manpower-constrained firms would face lower demand than other firms, and hence should have a shorter backlog of unfulfilled orders and lower

capacity utilization. At the same time, manpower-constrained firms might be facing higher demand than they can fulfill, because they are more efficient or produce better products than competitors. In this case, manpower-constrained firms should produce at or above normal capacity and should have a longer backlog of orders than other firms.

For the prospective corporate policies, we consider firms' plans to grow in terms of both capital expenditures and employment base. If lower efficiency determines manpower constraints, constrained firms should not be willing to invest or grow more in the short term, because they would anyway be unable to use additional resources efficiently. If higher efficiency determines manpower constraints, instead, firms are constrained in their growth and hence should be willing to invest more in capital expenditure and in employment in the short term.

A Univariate Analysis based on Raw Data

Before moving to our multivariate analysis, we look at the raw data in Figure 3. This figure focuses on capacity utilization as an example of the four policies described above. We plot the density of capacity utilization separately for firms that declare they are manpower constrained (solid curve) and firms that are unconstrained (dashed curve). The vertical lines are set at the mean of the capacity utilization distribution for each group.

The average capacity utilization of manpower-constrained firms is 95%, whereas the average for unconstrained firms is 82%.⁵ The figure also shows that the whole density of capacity utilization for constrained firms lies to the right of that for unconstrained firms. An alternative way to see that manpower-constrained firms are more likely to produce at full capacity than other firms consists of comparing the share of firms that hit the 100% boundary in the manpower-constrained and unconstrained distributions. The share of manpower-constrained firms is higher and the manpower-constrained curve lies above the unconstrained curve for all values above 90%. The raw data in Figure 3 show that, before partialling out any industry-, time-, or location-characteristic of firms, manpower-constrained firms have higher capacity utilization than unconstrained firms.

⁵Note that firms can operate above 100% of regular capacity if they run extra shifts overnight and on weekends.

The fact that manpower-constrained firms have higher capacity utilization than unconstrained firms also acts as a validation of our measure of manpower constraints. Because the measure is based on corporate executives' answers to a survey in which they have no incentives to tell the truth one might worry that our measure captures noise or false claims. Instead, many firms whose corporate executives declare that they are manpower constrained do work at or above full capacity.

B Multivariate Analysis

Our baseline multivariate specification is as follows:

$$\begin{aligned} \text{Corporate Policy}_{i,t,k,s} = & \alpha + \beta \text{Manpower Constrained}_{i,t,k,s} \\ & + \gamma \text{Financially Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s}, \end{aligned} \tag{1}$$

where $\text{Corporate Policy}_{i,t,k,s}$ is one of the two contemporaneous policies or two prospective policies describe above for firm i in semester t in sector k and state s ; $\text{Manpower Constrained}_{i,t,k,s}$ is a dummy that equals 1 if firm i declares they are manpower constrained in semester t ; $\text{Financially Constrained}_{i,t,k,s}$ is a dummy that equals 1 if firm i declares they are financially constrained in semester t ; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects.

For capacity utilization and backlog of orders, the dependent variable is continuous, and we estimate equation (1) by ordinary-least-squares. We cluster standard errors at the firm level to account for the autocorrelation of firm-level variables in our panel structure. For the prospective willingness to invest in capital and labor, the dependent variable equals 1 if the firm declares they want to invest and hire, and 0 otherwise. We therefore estimate equation (1) in a probit specification and we report marginal effects estimated at the mean value of the independent variables. Standard errors clustered at the firm level are estimated with the delta method.

Table 1 reports the results for estimating equation (1) when the outcome variables are two policies contemporaneous to the presence of manpower constraints – order backlog (columns (1)-(3)) and capacity utilization (columns (4)-(6)). The dependent variables

are standardized. Order backlog is the backlog of orders unfulfilled by the company measured in months. Columns (1)-(3) show that manpower-constrained firms have a 0.25-standard-deviations-higher backlog of orders, which is about 21% of the mean backlog of manpower-constrained firms in our sample. The estimates are similar whether or not we include the full set of fixed effects. In columns (4)-(6), manpower-constrained firms' capacity utilization is 0.26-standard-deviations higher than for unconstrained firms. This amounts to 5% of the mean value of capacity utilization of manpower-constrained firms in our sample. The magnitude and statistical significance of the estimates are again similar whether or not we absorb systematic shocks that affect all firms equally each semester, systematic time-invariant characteristics across industries and across states.

Results for contemporaneous corporate policies are consistent with the notion that manpower-constrained firms are more efficient, or face a higher demand, than other firms, and hence the lack of specialized workers makes them operate above capacity by over-utilizing their existing resources.

Table 2 also estimates equation (1), but the outcome variables are prospective policies, that is, firms' reported willingness to invest in capital expenditures and to hire new workers in the future. The estimated associations between manpower-constrained status and prospective policy outcomes are in line with our interpretation of the contemporaneous policy outcomes. In columns (1)-(3), manpower-constrained firms are 40% more likely to declare that they want to hire more employees during the following three months and the association is stable across specifications that restrict the variation we exploit differently. In columns (4)-(6), manpower-constrained firms are 4% more likely to declare they want to grow more by investing more in the following year.

Overall, our baseline results suggest that manpower-constrained firms operate at higher capacity than other firms, face larger amounts of unfulfilled demand as suggested by their order backlogs, and want to invest more in capital expenditures and employment in the short term.

IV Instrumental-Variable Strategy

Our correlational analysis cannot rule out that unobservable firm-level characteristics that vary within states and within industries over time might determine both firms' manpower-constrained status and their contemporaneous and prospective corporate policies. For instance, the managers of manpower-constrained firms might be more efficient than other managers. Efficient managers would produce better products at better conditions, absorbing all available specialized workers in their local economy, attracting higher demand, and hence operating at higher capacity than other firms. Reverse causality might also explain our baseline findings. Firms that face higher demand might work at higher capacity and for this reason become manpower constrained once they absorb all the specialized workers available in the local economy.

Tackling these identification concerns requires a source of exogenous variation in the extent to which the limited availability of specialized workers constrains firms' production and investment activities. This variation should be orthogonal to other demand- and supply-side shocks firms face. To obtain a source of quasi-exogenous variation, we exploit a natural experiment that resembles a quasi-random differential influx of specialized workers into Western German states. The natural experiment is the fall of the Berlin Wall in 1989. Fuchs-Schündeln and Schündeln (2005) and Burchardi and Hassan (2013) use the fall of the Berlin Wall and the subsequent reunification of Western and Eastern Germany as a natural experiment to study households' precautionary saving motives and the economic impact of social ties.

Although the *Deutsche Demokratische Republik* (DDR)—the previous East Germany—had shown signs of economic and social crisis for a few years, the timing of the fall of the Berlin Wall and its consequences were largely unexpected by Germans on either side of the Wall. For instance, whereas the US media suggested that the passionate “Tear Down This Wall!” speech in which US President Ronald Reagan called for the fall of the Berlin Wall in 1987 was a milestone that helped the actual fall of the Wall, that speech went largely ignored by the German media and politicians on both sides of the Wall, including the West. Moreover, Ms. Angela Merkel, German Chancellor since 2005,

provided another vivid suggestion that the fall of the Berlin Wall was a largely unexpected event when she revealed in 2009 that she was taking a sauna and having beers in East Berlin when the border was opened on the Eastern side. Even claims that US cultural influences in 1989 directly affected the fall of the Wall seem unrealistic. For instance, many believe that the Scorpions song “Wind of Change” was crucial to the revolts of East German youngsters conducive to the fall of the Wall. But “Wind of Change” was recorded in Los Angeles in 1990 and released as a single album in 1991, that is, well after the Wall had already fallen.

The fall of the Berlin Wall is relevant to our study because it determined mass migrations of Eastern German workers into Western Germany. Eastern German workers were highly specialized in manufacturing jobs, which is the expertise firms in our sample need most. For our identification strategy, the crucial feature of this shock is that Eastern Germans moved into areas in which relatives and friends had settled after WWII, i.e. about 40 years before the fall of the Wall (Burchardi and Hassan, 2013). Back then, East German refugees were only allowed to settle in areas of West Germany in which the supply of housing was not largely destroyed during WWII. Bombings during WWII therefore determined the spatial diffusion of Eastern German refugees during the 1950s, as well as the spatial distribution of Eastern German migrants after the fall of the Berlin Wall.

Consistent with this interpretation of the natural experiment, in our sample the share of firms that declared they were manpower constrained decreased from 14% in 1990 to 4% in 1991 and 3% in 1992, and stayed below or around 5% until the end of our sample in 2001.

We use this setting to design an instrumental-variable strategy, which uses the variation in the yearly cumulative fluxes of Eastern German migrants across Western German states to instrument for the share of firms that were subject to manpower constraints in each Western state over time. We observe immigration fluxes at the state level, and hence, to avoid unduly interpreting within-state firm-level observations as independent, we construct our instrument at the state level as opposed to the firm level.

The IV strategy consists of the following equations:

$$\begin{aligned} \text{Share Manpower} - \text{constrained}_{i,k,t,s} &= \alpha + \beta \text{Cum Inflow Immigrants}_{t,s} \\ &+ \gamma \text{Fin Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s}, \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Corporate Policy}_{i,t,k,s} &= \alpha + \beta \widehat{\text{Share Manpower} - \text{constrained}}_{i,k,t,s} \\ &+ \gamma \text{Fin Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s}. \end{aligned} \quad (3)$$

Equation (2) is the first stage, in which we predict the share of manpower-constrained firms in state s and semester t for firm i operating in industry k . Equation (3) is the second stage, in which we predict the corporate policies of the same set of firms using the share of manpower-constrained firms instrumented in the first stage.

The identifying assumption (exclusion restriction) is that the extent of the influx of Eastern German workers after the fall of the Berlin Wall affected firms' policies only through the relaxation of their manpower constraints and not through other channels. The next subsection discusses a set of economic arguments to gauge the plausibility of this assumption.

A Assessing the Validity of the Instrument

The main threat to the exclusion restriction underlying our strategy is the fact that the fall of the Berlin Wall created a new free market to which Western firms could supply a large range of products that previously did not exist in the East. The formal political and monetary reunification of Germany followed. This threat is not as concerning to our identification strategy, because *all* Western states were exposed to the opening of the new market and to the new monetary union at the same time and to the same extent, whereas our strategy exploits only variation in the influx of Eastern German immigrants across states.

Another potential concern is that the increase in the size of the local population due to the influx of Eastern German workers changed the size and characteristics of local markets and local demand across Western states. In particular, firms in states that

faced a higher influx of Eastern Germans because they housed more WWII refugees 40 years earlier might have faced a positive shock to the local demand of their products. This concern is barely relevant in our setting because, if anything, higher local demand would have increased firms' manpower constraints as well as capacity utilization and their backlog of orders. To the contrary, if the influx of immigrants relaxed manpower constraint (as our identification strategy assumes) local firms should have decreased their capacity utilization and backlog of orders.

As we argued above, the influx of Eastern German immigrants after the fall of the Wall followed the patterns of migrations of Eastern migrants that relocated to Western states after WWII, before the construction of the Wall. Building on Burchardi and Hassan (2013), because the availability of non-bombed housing stock determined post-WWII migration patterns, we argue that the spatial diffusion of immigrant fluxes was quasi-exogenous. At the same time, one might be concerned that West German firms that were founded after WWII might have faced different local market conditions based on the number of immigrants in the areas in which they operated. Firms might have also selected into areas with more or less post-WWII migrants based on unobservable characteristics that also affected their tendency to become manpower constrained and their corporate policies in the long run. To address this concern, we repeat our IV analysis on the subsample of firms in our sample that were founded before WWII and survived throughout the war. This subsample includes about half of the firms in our sample.⁶ Our results are similar if we focus on this subsample of firms.

B First- and Second-stage Results

Before presenting the results of our IV analysis, we note that in the IV specification we use variation in manpower constraints at the state level rather than the firm level, which is the level of variation we used in the baseline analysis. Using state-by-time level variation is imposed by the identification design. For this reason, in Table 3 we replicate the baseline OLS panel multivariate analysis when using the share of manpower constrained firms at

⁶Note that German corporations have high survival rates and high average ages. For instance, the oldest firm in our sample was founded in 1258 AD.

the state level as the main covariate of interest. The specification in Table 3 represents the endogenous regression implied by our IV specification. We can see that qualitatively all our baseline results go through when using variation in the share of manpower-constrained firms at the state level.

Table 4 reports the results for estimating equation (2) and equation (3) by two-stage least squares for the contemporaneous corporate policies (columns (1)-(4)), and by two-stage probit estimation for the prospective corporate policies (columns (5)-(8)). The sample period is all the years between 1990 and 2001. As for the first stage, the results show our instrument is relevant, because across all outcomes the first-stage F-statistics are above 150 in each specification.

As for the second stage, the IV results largely confirm our baseline multivariate analysis across corporate policies. Manpower-constrained firms operate at higher capacity utilization, have longer backlogs of orders, and are more willing than unconstrained firms to invest in capital expenditures and in employment in the short run. The magnitude of the effects cannot be directly compared with the baseline multivariate analysis, because in the baseline analysis the main independent variable is a dummy that equals 1 if the firms is manpower-constrained, whereas in the IV analysis the main independent variable—the share of manpower-constrained firms in each Western German state instrumented with the cumulative influx of Eastern German immigrants after the fall of the Berlin Wall—is continuous.

Our sample covers the period 1980-2001. The fluxes of Eastern Germany immigrants were substantial in the first few years after the fall of the Wall, but lower in the subsequent years. We therefore repeat our IV analysis limiting the sample between 1990 and 1994, so that we capture only the few years in which Eastern German migration was at its peak, and our migration fluxes are not driven by dimensions possibly different from the fall of the Berlin Wall. We show the results for this estimation in Table 5, and we confirm our IV results in this subsample across all corporate actions and policies.

V Manpower-Constraint Index

Our analysis so far focused on the effects of manpower constraints on the corporate policies of German firms between 1980 and 2001. This setting is unique in that it allows us to observe directly which firms are manpower constrained as well as to obtain quasi-exogenous variation in the likelihood firms are manpower-constrained across Western German states in an internally-consistent identification strategy.

To the best of our knowledge, this is the first paper that observes directly whether firms declare they face manpower constraints. We are also unaware of other survey- or administrative-based evidence that includes this information in the US, other European countries, or Asia. At the same time, progress in the detection and measurement of manpower constraints would allow deeper investigations into the effects of this type of labor-market constraints on firm- and industry-level outcomes, productivity, and ultimately economic growth.

To allow scholars to proxy for the incidence of manpower constraints in settings different from the one we study, we exploit the subsample of firms in our sample for which we observe balance-sheet financial variables to construct a *MPC Index* in the spirit of financial constraints indexes.

Similar to the construction of the Kaplan and Zingales (1997) index, to build the MPC Index, we run predictive logistic regressions of a dummy that equals 1 if the firms declares it is manpower constrained on a set of financials that are available in the databases scholars in Finance and Accounting commonly use, such as Compustat and Amadeus. We estimate the marginal effects of each financial characteristic on the likelihood of being manpower constrained and propose these marginal effects as loads other scholars can use to proxy for the likelihood firms face manpower constraints.

Specifically, we estimate the following specification with a logit regression:

$$\begin{aligned} Pr(MPC == 1)_{i,t,k,s} = & \Phi\left(\alpha \times Age_{i,t,k,s} + \beta \times \frac{SG\&A}{Assets_{i,t,k,s}} + \gamma \times \frac{A/P}{Assets_{i,t,k,s}} \right. \\ & \left. + \delta \times \frac{A/R}{Assets_{i,t,k,s}} + \zeta \times \frac{Inventories}{Assets}\right)_{i,t,k,s}, \end{aligned} \quad (4)$$

where Age is the firm's age at time t , $\frac{SG\&A}{Assets}$ is SG&A expenses scaled by total assets, $\frac{A/P}{Assets}$ and $\frac{A/R}{Assets}$ are the firm's accounts payable and accounts receivable scaled by total assets, and $\frac{Inventories}{Assets}$ is the amount of inventory scaled by total assets. We focus on these five firm-level financial characteristics because we find that after controlling for these five dimensions no other financials we observe in our sample are associated significantly with firms' manpower-constrained status.

We then interpret the estimated coefficients on each of these variables as the loadings one can apply to different samples of firms in order to obtain a measure of the extent of manpower constraints firms face. Based on this procedure, the following expression is the MPC Index, where we report the loadings associated with each financial variable. Stars indicate the significance level of the test-statistic for the null hypothesis that the marginal effect from equation (4) equals zero:

$$\begin{aligned}
 MPC\ Index = & 0.16^{**} \times Age + 0.23^{***} \times \frac{SG\&A}{Assets} - 0.26^{**} \times \frac{A/P}{Assets} \\
 & + 0.39^{***} \times \frac{A/R}{Assets} + 0.40^{***} \times \frac{Inventories}{Assets}.
 \end{aligned} \tag{5}$$

Financial constraints have been heavily studied over the last two decades. Financial constraints and manpower constraints should not be highly correlated, because dimensions like the supply of finance that firms can access, the amount of collateral they can pledge, and the uncertainty of firms' investment projects should determine the likelihood of whether firms face financial constraints. Instead, under our interpretation, manpower constraints depend on the supply of specialized workers in the economy, which individual firms can barely control.

To assess this conjecture and determine whether financial constraints and manpower constraints capture different concepts, we exploit the logit setup in equation (4) to obtain a similar index for financial constraints. Our aim is to compare the loadings of financial constraints on the financials that explain manpower constraints with the loadings for

manpower constraints. Below are the loadings for financial constraints:

$$\begin{aligned}
 \text{Financial Constraints} = & 0.10 \times \text{Age} - 0.13 \times \frac{\text{SG\&A}}{\text{Assets}} + 0.11 \times \frac{\text{A/P}}{\text{Assets}} \\
 & - 0.05 \times \frac{\text{A/R}}{\text{Assets}} + 0.23^* \times \frac{\text{Inventories}}{\text{Assets}}.
 \end{aligned} \tag{6}$$

As expected from the fact that financial constraints are a different economic object than manpower constraints, all the loadings in equation (6) are not different from zero statistically, and the signs of three of the five loadings are different from the ones we estimated for manpower constraints in expression (5).

VI Conclusions

Using a panel of German firms from 1980 to 2001, in which we uniquely observe direct measures of firms' manpower constraints—the lack of high-skill or low-skill specialized workers, whatever wage firms might offer—we describe the characteristics of manpower-constrained firms as well as the effects of manpower constraints on a set of contemporaneous and prospective corporate policies.

We find that manpower-constrained firms operate at higher capacity utilization, have a longer backlog of orders, and are more willing to invest in capital expenditures and in employment in the short term. We confirm these results in an instrumental-variable strategy that exploits the quasi-exogenous fluxes of Eastern German specialized workers across Western German states after the fall of the Berlin Wall in 1989.

We then follow the literature on measuring financial constraints and propose a Manpower Constraint Index, which proxies for the likelihood that a firm is manpower constrained and is readily applicable for firms in commonly-used data sets that include balance sheet financial variables, such as Compustat and Amadeus.

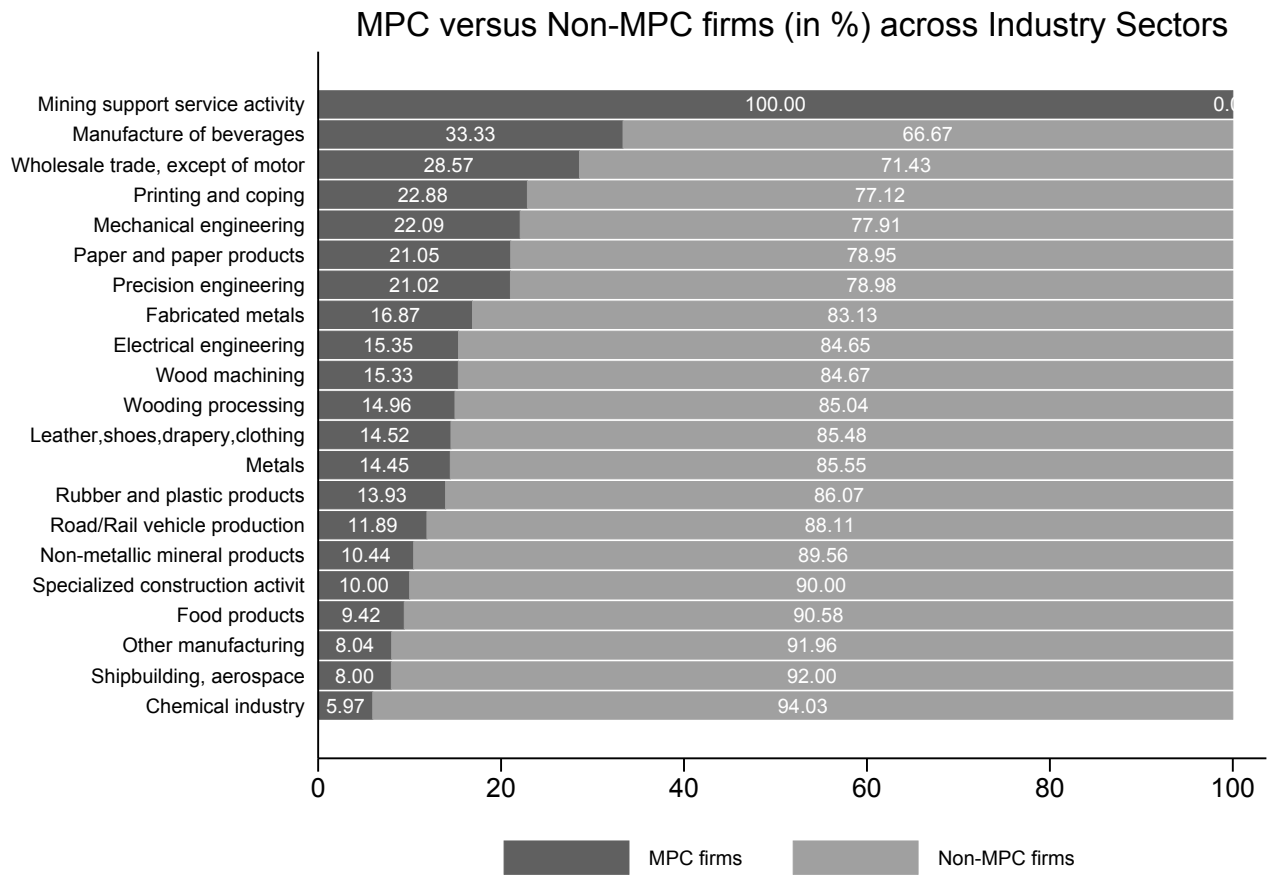
The results in this paper are a first step towards understanding the nature and role of manpower constraints, the characteristics of manpower-constrained firms, and the effects of manpower constraints on corporate policies. Future research in Finance and Accounting should delve deeper into this important and yet neglected friction to firm-level operations.

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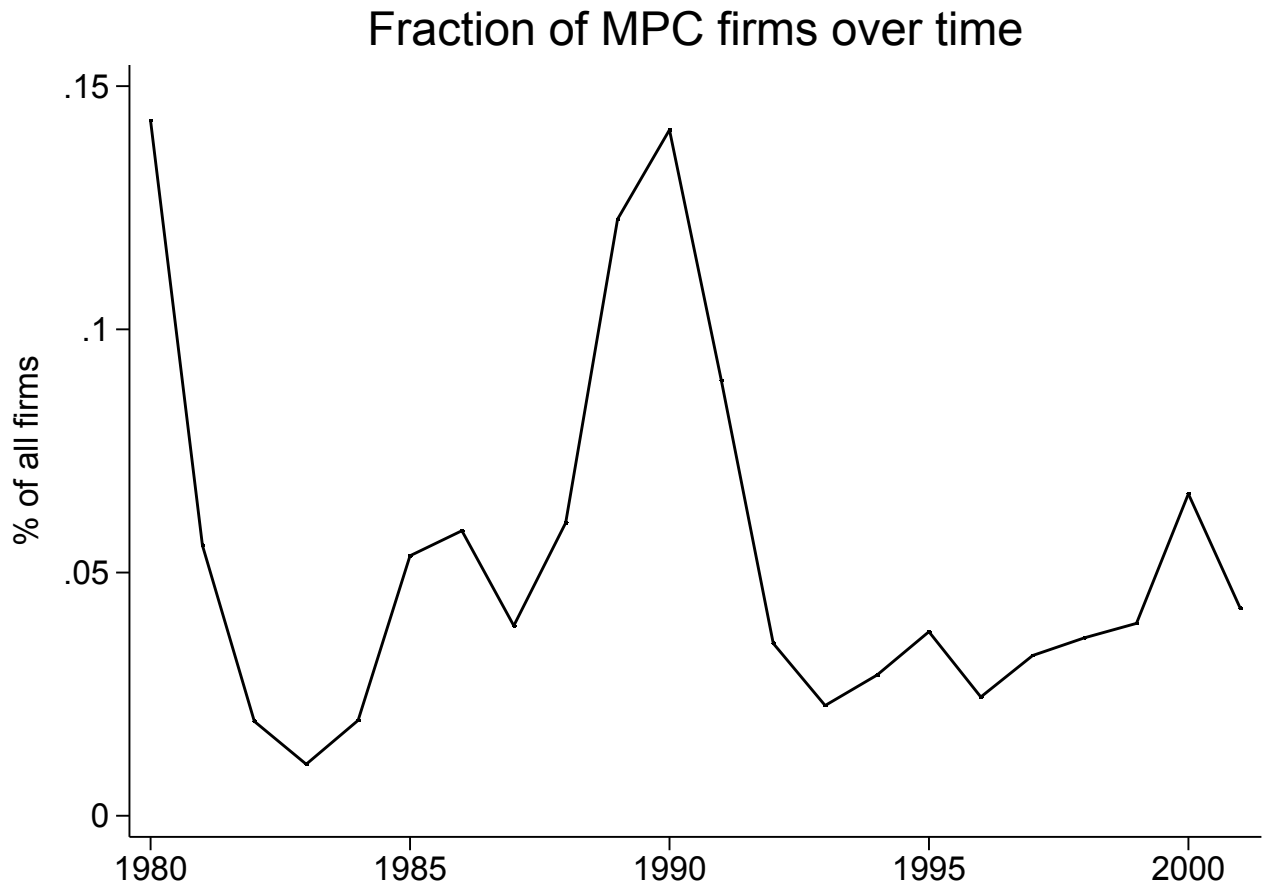
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Figure 1: Manpower-constrained Firms by Industry



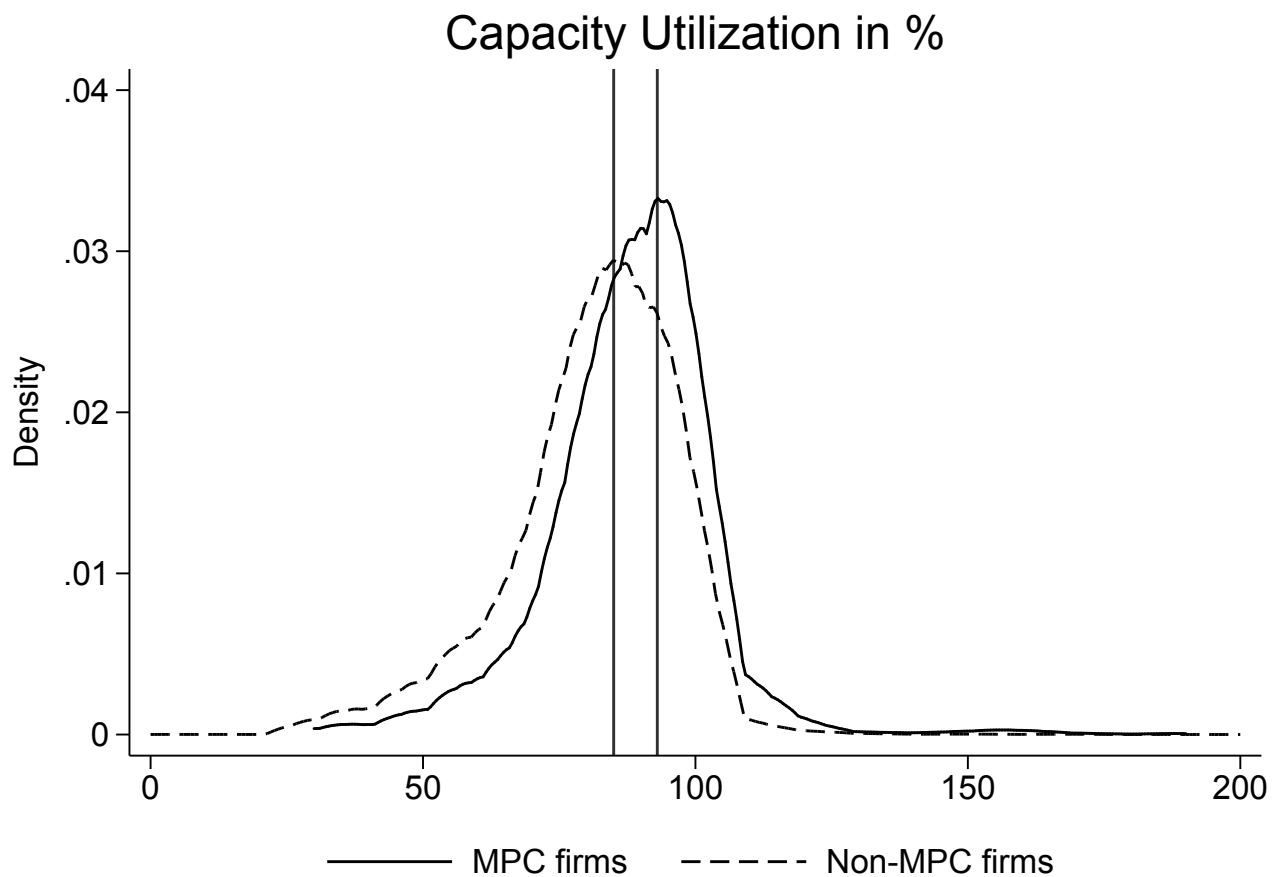
This figure describes the fraction of firms in our sample that ever declare being manpower-constrained and the share of unconstrained firms in each industry. Our sample is the Business Expectations Panel (BEP) run by the ifo Institut in Munich (DE) since 1980. We look at the period 1980-2001, during which the BEP asked corporate executives if they agreed with the following sentence: "Our domestic production activities are currently constrained by the lack of skilled labour".

Figure 2: Manpower-constrained Firms by Year



This figure describes the fraction of firms in our sample that declare being manpower-constrained for each year between 1980 and 2001. Our sample is the Business Expectations Panel (BEP) run by the ifo Institut in Munich (DE) since 1980. We look at the period 1980-2001, during which the BEP asked corporate executives if they agreed with the following sentence: "Our domestic production activities are currently constrained by the lack of skilled labour".

Figure 3: Manpower Constraints and Capacity Utilization: Raw Data



This figure plots the densities of capacity utilization in percentage points for two groups of firms in our sample, that is, manpower-constrained firms (solid line) and unconstrained firms (dashed line). Our sample is the Business Expectations Panel (BEP) run by the ifo Institut in Munich (DE) since 1980. We look at the period 1980-2001, during which the BEP asked corporate executives if they agreed with the following sentence: "Our domestic production activities are currently constrained by the lack of specialized labor".

Table 1: Manpower Constraints and Order Backlog and Capacity Utilization (Contemporaneous Corporate Policies)

This table reports the results for estimating the following linear equation:

$$\text{Corporate Policy}_{i,t,k,s} = \alpha + \beta \text{Manpower Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s},$$

$$+ \gamma \text{Financially Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s},$$

where $\text{Corporate Policy}_{i,t,k,s}$ is either the order backlog or capacity utilization for firm i in semester t in sector k and state s ; $\text{Manpower Constrained}_{i,t,k,s}$ is a dummy that equals 1 if firm i declares they are manpower constrained in semester t ; $\text{Financially Constrained}_{i,t,k,s}$ is a dummy that equals 1 if firm i declares they are financially constrained in semester t ; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects. The sample period is the first semester of 1980 until the second semester of 2001. Manpower constraints and financial constraints are self-reported in the *ifo Business Expectations Panel*. Standard errors are clustered at the firm level.

	Order Backlog			Capacity Utilization		
	(1)	(2)	(3)	(4)	(5)	(6)
Manpower Constraints	0.35*** (8.89)	0.25*** (7.06)	0.25*** (7.01)	0.30*** (6.20)	0.26*** (5.72)	0.26*** (5.69)
Fin Constraints	-0.07 (-1.32)	-0.08 (-1.69)	-0.08 (-1.76)	-0.44*** (-9.04)	-0.45*** (-9.84)	-0.45*** (-9.87)
West	0.10* (2.29)	0.11** (2.67)		0.22*** (5.64)	0.19*** (4.67)	
Const	-0.06 (-1.16)	0.86*** (-17.66)	0.74** (-3.19)	-0.02 (-0.33)	-0.01 (-0.20)	-0.25 (-0.77)
Sector FE		X	X		X	X
State FE			X			X
Semester FE	X	X	X	X	X	X
Nobs	66,060	65,958	65,958	68,511	68,409	68,409
Adjusted R ²	0.02	0.21	0.21	0.07	0.10	0.10

t-stats in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Manpower Constraints and Hiring and Investment Intentions (Prospective Corporate Policies)

This table reports the results for estimating the following probit regression:

$$\text{Corporate Policy}_{i,t,k,s} = \alpha + \beta \text{Manpower Constrained}_{i,t,k,s} + \gamma \text{Financially Constrained}_{i,t,k,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s},$$

where *Corporate Policy*_{*i,t,k,s*} is a dummy variable which equals 1 if a firm reports it wants to hire or investment for firm *i* in semester *t* in sector *k* and state *s*; *Manpower Constrained*_{*i,t,k,s*} is a dummy that equals 1 if firm *i* declares they are manpower constrained in semester *t*; *Financially Constrained*_{*i,t,k,s*} is a dummy that equals 1 if firm *i* declares they are financially constrained in semester *t*; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects. The sample period is the first semester of 1980 until the second semester of 2001. Manpower constraints and financial constraints are self-reported in the *ifo Business Expectations Panel*. The table directly reports marginal effects. Standard errors are clustered at the firm level.

	Want to Hire More			Want to Invest More		
	(1)	(2)	(3)	(4)	(5)	(6)
Manpower constraints	0.40*** (13.41)	0.40*** (12.98)	0.40*** (13.03)	0.04** (2.67)	0.03* (2.10)	0.03* (2.08)
Financial constraints	-0.01* (-2.12)	-0.01* (-2.21)	-0.01* (-2.23)	-0.03 (-0.78)	-0.03 (-0.75)	-0.02 (-0.70)
West	-0.01* (-2.38)	-0.01* (-2.30)		0.09*** (3.94)	0.09*** (4.00)	
Sector FE		X	X		X	X
State FE			X			X
Semester FE	X	X	X	X	X	X
Nobs	74,695	74,421	74,421	61,819	61,819	61,819

t-stats in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Manpower Constraints and Corporate Policies: State-level Variation

This table reports the results for estimating the following linear/probit regression:

$$\text{Corporate Policy}_{i,s} = \alpha + \beta \text{Manpower Constrained}_{i,t,k,s} + \gamma \text{Financially Constrained}_{t,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s},$$

where Corporate Policy_{*i,t,k,s*} is the order backlog in months in columns (1)-(2), capacity utilization in columns (3)-(4), a dummy variable which either equals 1 if a firm reports it wants to either hire (columns (5)-(6)) or investment (columns (7)-(8)) in the next 12 months compared to the current 12 months; Manpower Constrained_{*t,s*} is the share of firms in state *s* declaring they are manpower constrained in semester *t*; Financially Constrained_{*t,s*} is the share of firms in state *s* declaring they are financially constrained in semester *t*; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects. The sample period is the first semester of 1980 until the second semester of 2001. Manpower constraints and financial constraints are self-reported in the *ifo Business Expectations Panel*. Columns (5)-(8) directly report marginal effects. Standard errors are clustered at the firm level.

	Order Backlog		Capacity Utilization		Want to Hire More		Want to Invest More	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relative MPC	0.005*** (13.64)	0.0047*** (13.45)	0.0081*** (23.07)	0.0081*** (23.27)	0.0071*** (11.87)	0.0072*** (12.18)	0.0057** (2.96)	0.0059** (3.07)
Fin Constraints	-0.05 (-0.12)	-0.27 (-0.56)	-0.23 (-0.57)	-0.35 (-0.83)				
Const	-0.2 (-0.99)	0.08 (0.35)	-0.28 (-0.76)	-0.42 (-1.10)				
State FE		X		X		X		X
Sector FE	X	X	X	X	X	X	X	X
Nobs	19,359	19,335	20,159	20,135	21,241	21,146	15,752	15,752
Adj R2	0.0164	0.2459	0.0393	0.0761				

t-stats in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Manpower Constraints and Corporate Policies: Instrumental-VARIABLE Results

This table reports the results for estimating the following linear/probit regression:

$$\text{Corporate Policy}_{i,t,s} = \alpha + \beta \text{Manpower Constrained}_{i,t,k,s} + \gamma \text{Financially Constrained}_{i,t,s} + \eta_t + \eta_k + \eta_s + \epsilon_{i,t,k,s},$$

where Corporate Policy_{i,t,k,s} is the order backlog in months in columns (1)-(2), capacity utilization in columns (3)-(4), a dummy variable which either equals 1 if a firm reports it wants to either hire (columns (5)-(6)) or investment (columns (7)-(8)) in the next 12 months compared to the current 12 months; Manpower Constrained_{i,t,s} is the share of firms in state *s* declaring they are manpower constrained in semester *t* instrumented by the cumulative inflow of people from East Germany after the Fall of the Berlin Wall; Financially Constrained_{i,t,s} is the share of firms in state *s* declaring they are financially constrained in semester *t*; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects. The sample period is the first semester of 1980 until the second semester of 2001. Manpower constraints and financial constraints are self-reported in the *ifo Business Expectations Panel*. Columns (5)-(8) directly report marginal effects. Standard errors are clustered at the firm level.

	Order Backlog		Capacity Utilization		Want Hire More		Want Investment More	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relative MPC	0.0094*** (6.45)	0.0064*** (4.70)	0.0077*** (5.44)	0.0077*** (5.47)	0.034*** (16.25)	0.035*** (16.71)	0.0028 (1.77)	0.0031 (1.96)
Fin Constraints	-0.05 (-0.11)	-0.27 (-0.56)	-0.23 (-0.57)	-0.35 (-0.83)				
Const	-0.2 (-1.00)	0.078 (0.34)	-0.28 (-0.76)	-0.42 (-1.10)	-2.26*** (-6.90)	-1.41*** (-3.62)	-0.79*** (-9.60)	-0.83*** (-9.07)
State FE		X		X		X		X
Sector FE	X	X	X	X	X	X	X	X
Nobs	19,359	19,335	20,159	20,135	21,241	21,146	15,752	15,752
Adj R2	0.0094	0.2448	0.0392	0.0761				
F-Stat	3,380	3,253	4,303	4,250				

t-stats in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Manpower Constraints and Corporate Policies: Instrumental-Variable Results around German Reunification (1990-1994)

This table reports the results for estimating the following linear/probit regression:

$$\text{Corporate Policy}_{t,s} = \alpha + \beta \text{Manpower Constrained}_{t,k,s} + \gamma \text{Financially Constrained}_{t,s} + \eta_t + \eta_k + \eta_s + \epsilon_{t,k,s},$$

where Corporate Policy_{t,k,s} is the order backlog in months in columns (1)-(2), capacity utilization in columns (3)-(4), a dummy variable which either equals 1 if a firm reports it wants to either hire (columns (5)-(6)) or investment (columns (7)-(8)) in the next 12 months compared to the current 12 months; Manpower Constrained_{t,s} is the share of firms in state *s* declaring they are manpower constrained in semester *t* instrumented by the cumulative inflow of people from East Germany after the Fall of the Berlin Wall; Financially Constrained_{t,s} is the share of firms in state *s* declaring they are financially constrained in semester *t*; and η_t , η_k , and η_s are full sets of semester-year, industry, and state fixed-effects. The sample period is the first semester of 1990 until the second semester of 1994. Manpower constraints and financial constraints are self-reported in the *ifo Business Expectations Panel*. Columns (5)-(8) directly report marginal effects. Standard errors are clustered at the firm level.

	Order Backlog		Capacity Utilization		Want Hire More		Want Investment More	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relative MPC	0.0060*** (12.25)	0.0060*** (14.10)	0.010*** (24.04)	0.010*** (24.60)	0.017*** (13.10)	0.018*** (13.26)	0.0054*** (6.77)	0.0054*** (6.77)
Fin Constraints	-0.88 (-1.79)	-0.81 (-1.89)	-1.64*** (-3.73)	-1.74*** (-4.02)				
Const	0.11 (0.88)	0.64* (2.01)	-0.09 (-0.82)	-0.08 (-0.25)	-2.15*** (-5.43)	-0.38 (-0.75)	-0.83*** (-6.33)	-0.79*** (-5.46)
State FE		X		X		X		X
Sector FE	X	X	X	X	X	X	X	X
Nobs	6,680	6,672	7,285	7,277	7,545	7,295	5,442	5,442
Adj R2	0.0274	0.2562	0.0753	0.1121				
F-Stat	6,6327	6,6076	71,427	71,067				

t-stats in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$