Trade Unions and the Scale and Scope of Multi-Product Firms

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Abstract

This paper sets up a general equilibrium model with a continuum of industries and a small number of firms in each of these industries. Firms compete in quantities and simultaneously decide upon both the scale of output and the scope of their production line. Being interested in the role of labor market imperfections, we assume that a subset of industries is confronted with monopoly unions, while firms in the residual industries pay competitive wages. By claiming a wage premium, trade unions enforce a decline in firm scale and scope and thereby dampen industrial output. In this setting, a deregulation of the product or the labor market raises labor demand and thus wages in unionized and non-unionized industries. This induces a general decline in firm scale and scope, with the respective decline being pronounced in non-unionized industries. Aside from analyzing the consequences of national policy reforms, we also shed light on the consequences of trade for union wage-setting as well as firm scale and scope. A movement from autarky to trade between two symmetric countries stimulates labor demand and raises the competitive wage. While this induces a rise in union wage claims, the union wage premium falls and so do the prevailing differences in firm scale and scope between unionized and non-unionized industries.

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1 Introduction

In the last few years empirical studies have highlighted the omnipresence of multi-product firms. Bernard, Redding, and Schott (2010) document their dominant role in US manufacturing industries: although only 39% of firms establish two or more products\(^1\) they account for 89% of output.\(^2\) Regarding international markets, the role of multi-product firms is even more pronounced. Bernard, Jensen, Redding, and Schott (2007) showed that only 0.4% of U.S manufacturing firms export just one product and, hence, almost all exporting activity is from multi-product firms. In view of these numbers it is not surprising that economists have got increasingly interested in understanding the determinants and consequences of multi-product firms. Thereby, the focus in recent years has been on incorporating multi-product firms into models of international trade and, in contrast to an already established literature in industrial economics, analyzing these producers in a general equilibrium environment.\(^3\) Existing theoretical work emphasizes firm scope as an important adjustment margin to globalization and thus this literature significantly improves our understanding about how firms respond to international trade. By focussing on the product market side of the economy, all of the existing studies consider perfect labor markets and thus assume identical wage payments of all producers. However, this assumption seems to be restrictive for at least two reasons: first, it is an empirical fact that firms pay differing wages and, second, wages themselves are a key cost factor and thus an important determinant of firm scale and scope.

Shedding light on the role of labor market imperfection for firm scale and scope is the aim of this paper. For this purpose, we set up a general oligopolistic equilibrium (GOLE) model with multi-product firms (MPFs) along the lines of Eckel and Neary (2010). In this framework, there is a continuum of industries and a small (exogenous) number of firms competing in quantities within each of these industries. Firms can produce a range of differentiated products. They have a core competence in one of these varieties which they produce at the lowest marginal costs. By expanding the scope of their production line firms start manufacturing varieties with a larger distance to their core competence and thus higher marginal production costs. There are no fixed costs of adding a new variety to the production line and there are no feedback effects on the costs of previously produced product variants. Hence, the model of Eckel and Neary (2010) features the idea of flexible manufacturing with firm scale and scope are determined simultaneously in Cournot competition.

\(^1\)A “product” is defined at the five-digit Standard Industry Classification (SIC) level.
\(^2\)Notably, this pattern is not specific to advanced countries. For instance, Goldberg, Khandelwal, Pavcnik, and Topalova (2008) document similar figures for the developing country India.

\(^3\)Prominent examples from the industrial economics literature include Brander and Eaton (1984); Klemperer (1992); Baldwin and Ottaviano (2001); Johnson and Myatt (2003, 2006); Allanson and Montagna (2005); Grossmann (2007). These papers analyze multi-product firms in partial equilibrium settings. The role of multi-product firms in general equilibrium trade models is addressed in Arkolakis and Muendler (2007), Feenstra and Ma (2008), Nocke and Yeaple (2008), Bernard, Redding, and Schott (2009), and Eckel and Neary (2010).
While there are no direct cost linkages between the different varieties the model allows for feedback effects through consumer demand, because the different product varieties within one industry are imperfect substitutes, implying that firms, by introducing a new product variant, cannibalize the demand for their other products. As in other models of MPFs, Eckel and Neary (2010) consider labor as the only factor of production and assume a perfectly competitive labor market. This implies that all firms pay identical wages and, due to the assumption of symmetric product markets, face identical production costs. We modify the latter assumption and assume that trade unions are active in a subset of industries and unilaterally set wages there. In the rest of the economy, firms pay competitive wages (see Bastos and Kreickemeier, 2009, for a similar approach).

The asymmetry of sectors with respect to their labor market institutions is a key aspect of our analysis. It allows us to study the consequences of union wage setting on firm scale and scope and it provides novel insights on how labor market imperfections in certain industries feedback on firm organization in the rest of the economy. By setting a markup on the competitive wage, trade unions enforce a reduction in the output and employment level of the respective producers. While this effect is present in any model of a unionized oligopoly (see, for instance, Bastos and Kreickemeier, 2009), there is an additional adjustment margin in a setting with multi-product firms. By raising marginal production costs, unions reduce the incentive of firms to expand their production line and, hence, also lower firm scope. Furthermore, union wage setting lowers aggregate employment ceteris paribus and thus induces an adjustment in the competitive wage, which must fall in order to reestablish labor market clearing in a general equilibrium environment. This decline in the competitive wage raises firm scale and scope in non-unionized industries.

We use the theoretical framework in this paper to study two important policy reforms in a closed economy. First, we consider deregulation in the labor market, which we associate with a decline in the share of unionized industries. As it is common in the literature, we use the term deunionization to refer to such a reform. Deunionization is a worldwide phenomenon which has been observed in all industrialized economies over the last few decades – although, of course, to a different extent. For instance, as documented by OECD (2004) in the US union density fall from 27% to 13% over the period 1970 to 2000, while in Germany the respective decline was much less pronounced: it fall from 32% to 25% over the same period. In the model under consideration, labor demand is stimulated in those industries which become newly deunionized. This induces an increase in the competitive wage, which lowers firm scale and scope in non-unionized industries. Clearly, a higher competitive wage raises union wage claims and thus lowers firm scale and scope in unionized industries. However, since unionized wages increase less than proportional, the decline in firm scale and scope turns out to be smaller in unionized than in non-unionized industries and, hence, firms in industries with differing labor market institutions become more similar in both dimensions of
their production activity: scale and scope. Aside from deunionization we also investigate product market deregulation, which we associate with a *pari passu* increase on the number of competitors in all industries. The main effects of such a policy reform are by and large the same as those of labor market deregulation (see Blanchard and Giavazzi, 2003). In particular, both measures reduce the union wage premium and thus the scale and scope differential between firms in unionized and non-unionized industries.

Beyond that, we also consider the consequences of trade liberalization for union wage setting as well as firm scale and scope. Thereby, we associate trade liberalization with a country’s movement from autarky to free trade with an identical partner economy. As in Neary (2009) and Eckel and Neary (2010) we abstract from any trade costs. In a general equilibrium setting with single-product firms (SPFs) and symmetric industries, such a trade liberalization does not exert any impact on firm scale but only affects the distribution of economic rents in the society. By raising the competitive wage, workers gain at cost of firm owners. In contrast, with MPFs, trade liberalization exerts an impact on firm activity even if all sectors are identical. The reason is that firms have an incentive to lower their scope if wages and thus production costs go up. Since more labor is now used in activities, in which firms have higher competence, trade raises firm scale and thus labor productivity. This points to a new channel through which gains from trade can materialize. By extending the Eckel and Neary (2010) framework to one with labor market imperfections, we further enrich the picture of possible firm-level adjustments to globalization. Labor unions lower their wage claims when being exposed to international competition in the product market. The associated decline in the union wage premium lowers the scope differential between firms in unionized and non-unionized industries, while firm scale may become more dissimilar as firms in non-unionized industries are also larger in the export market. This points to a crucial difference between deregulation and globalization as policy measures of liberalizing the product market, because in the former case firm scale and scope become unambiguously more similar between unionized and non-unionized industries.

By modeling multi-product firms as in Eckel and Neary (2010) our analysis contributes to the well-established literature on flexible manufacturing (Milgrom and Roberts, 1990; Eaton and Schmitt, 1994; Norman and Thisse, 1999; Eckel, 2009), which imposes two key assumptions for characterizing such firms: (i) firms possess a core competence and (ii) costs of manufacturing a certain variety increase monotonically in the distance of this variety to the firm’s core competence. The idea of flexible manufacturing distinguishes our analysis from other work on multi-product firms in trade models, as, for instance, Arkolakis and Muendler (2007), Feenstra and Ma (2008), Nocke and Yeaple (2008), Bernard, Redding, and Schott (2009). In these studies, firms do not possess a core competence, while still average production costs increase when a firm expands its production line – either due to fixed costs of introducing a new product variety (Arkolakis and Muendler, 2007;
Feenstra and Ma, 2008; Bernard, Redding, and Schott, 2009) or negative cost spillovers of a new product variety on previously produced ones (Nocke and Yeaple, 2008). Aside from differences in modeling the cost structure of multi-product firms, there is a further important aspect in which Eckel and Neary (2010) differs from other contributions to this literature. They consider oligopolistic competition in the product market and account for a cannibalization effect of adding a new variety to a firm’s production line on previously produced varieties. Such demand linkages are ruled out in other contributions on multi-product firms in general equilibrium trade models, because these other models rely on the idea of a monopolistically competitive market structure with a large number of competitors.4

These two distinctive features of the Eckel and Neary (2010) approach render their framework a particularly suitable starting point for analyzing the consequences of labor market imperfections for scale and scope of MPFs. On the one hand, the assumption of flexible manufacturing and exogenous differences in variety-specific labor coefficients allow us to focus on cost linkages between these varieties that arise due to trade union activity (as compared to negative technology spillovers in Nocke and Yeaple, 2008). To be more specific, trade unions account for changes in both firm scale and scope when setting the wage rate and, hence, they internalize the impact of higher wage claims on the firm’s production line. On the other hand, accounting for a small number of competitors in each industry relates our model to the large and well-established literature on unionized oligopoly in an open economy. This literature is particularly interested in the interaction of product and labor market imperfections and highlights the role of international trade for disciplining national unions.5

While previous studies have been primarily concerned with partial equilibrium effects of international trade, Bastos and Kreickemeier (2009) have pointed to the relevance of general equilibrium feedback effects arising from labor market clearing and endogenous adjustments in the competitive wage. Their framework is closely related to our analysis with respect to the considered labor market model and the assumption of a general oligopolistic equilibrium. However, there remains a crucial difference between the two approaches. While we account for flexible manufacturing of MPFs, Bastos and Kreickemeier (2009) assume that each firm produces a single variety, thereby ruling out any adjustments in firm scope in response to trade liberalization or a deregulation of the product or the labor market.

4For an exception see Feenstra and Ma (2008), who present a monopolistic competition model with Dixit and Stiglitz (1977) consumer preferences in which firms take into account their impact on the price index. In this case, a cannibalization effect materializes even though a large number of competitors is presumed. See Dixit and Stiglitz (1993); d’Aspremont, Ferreira, and Gérard-Varet (1996) for a critical discussion on whether the assumption of large firm number is consistent with the idea of firms foreseeing their impact on the price index.

5Prominent examples to this literature include Mezzetti and Dinopoulos (1991); Huizinga (1993); Sørensen (1993); Naylor (1998, 1999). In recent years models of unionized oligopoly have been applied to analyze the impact of unions for the location decisions of multinational firms and the incentives for international outsourcing (see, for instance, Skaksen and Sørensen, 2001; Lommerud, Meland, and Sørgard, 2003; Lommerud, Meland, and Straume, 2009).
The remainder of the paper is organized as follows. In Section 2 we introduce the main assumptions, describe the basic model structure and characterize the autarky equilibrium. Thereby, we first study a benchmark version of our model, in which we assume that all product varieties within a particular industry are perfectly differentiated goods. In this case, a cannibalization effect of expanding a firm’s production line does not materialize and firms act as monopolists in all sub-markets for their product varieties. After a brief discussion on how labor market institutions affect firm scale and scope, we study deregulation of the product and the labor market as two key policy reforms in a closed economy. In a second step, we extend the model to one with partial differentiation of consumer goods and analyze how the main insights from the benchmark model need to be adjusted when accounting for strategic interaction of firms. In Section 3 we characterize the equilibrium in open economy with free trade between two symmetric countries. There, we also discuss how a country’s movement from autarky to free trade affects union wage setting as well as firm scale and scope. In Section 4 we extend our framework to one with firm-level unions and analyze how the centralization of unions affect our results. Section 5 concludes with a brief summary of the most important results.

2 MPFs and imperfect labor markets: The closed economy

We introduce the basic model structure by looking at the closed economy. There is a continuum of industries, with an oligopolistic market structure and a small (discrete) number $n$ of firms in each of these industries. The industries are identical in all respects except of the prevailing labor market institutions. While firms in a subset of industries are exposed to union wage-setting, firms in the other industries pay the economy-wide competitive wage.

2.1 Preferences and consumer demand

We follow the approach of Eckel and Neary (2010) and assume that there exists a representative consumer, whose preferences are represented by a two-tier utility function. The upper tier is an additive function of sub-utilities each corresponding to a certain industry $z$, with $z$ varying over interval $[0, 1]$. 

$$U[u\{z\}] = \int_{0}^{1} u\{z\} \, dz.$$  \hspace{1cm} (1)
Each sub-utility is a quadratic function of consumption levels $x(i, z)$, $i \in [1, N(z)]$, where $N(z)$ is the measure of differentiated goods produced in industry $z$. To be more specific, we assume

$$u \{z\} = a \int_0^{N(z)} x(i, z)di - \frac{1}{2} b \left[ (1 - \rho) \int_0^{N(z)} x(i, z)^2di + \rho \left( \int_0^{N(z)} x(i, z)di \right)^2 \right], \quad (2)$$

with $a, b$ denoting non-negative preference parameters with the usual interpretation and $\rho$ being an inverse measure of product differentiation, which is assumed to lie strictly between 0 and 1.\(^6\)

Aggregate demand in this setting is determined by maximizing utility of the representative consumer subject to her budget constraint

$$\int_0^1 \int_0^{N(z)} p(i, z)x(i, z)dzidz \leq I, \quad (3)$$

where $p(i, z)$ denotes prices for variety $i$ in industry $z$ and $I$ is aggregate income of the economy. This gives

$$p(i, z) = \frac{1}{\lambda} \left\{ a - b[(1 - \rho)x(i, z) + \rho Y(z)] \right\}, \quad (4)$$

where $\lambda$ is the representative consumer’s marginal utility of income, which for convenience is set equal to one. Due to this normalization all nominal variables are measured relative to the representative consumer’s marginal utility of income. However, since $\lambda$ is not the price of a consumption good, the respective values have to be interpreted with care (see Neary, 2009, for further details). Setting $\lambda = 1$, inverse demand for variety $i$ in industry $z$ is given by

$$p(i, z) = a - b[(1 - \rho)x(i, z) + \rho Y(z)], \quad (5)$$

where $Y(z) = \int_0^{N(z)} x(i, z)$ equals total sectoral output in the case of product market clearing.

From Eq. (5) we can infer insights upon the role played by preference parameter $\rho$ in our setting. As mentioned above, $\rho$ is a measure of product differentiation and lies in interval $[0, 1]$. If $\rho = 1$ products are homogeneous (perfect substitutes), so that demand for each variety depends only on

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\(^6\)The preferences in Eqs. (1) and (2) combine the continuum-quadratic approach to symmetric horizontal product differentiation of Ottaviano, Tabuchi, and Thisse (2002) with the preference specification in Neary (2009). By formulating the respective preferences of the representative consumer, we have presumed that the following two conditions are fulfilled for any individual consumer: participation in the market for any good $i$ and non-satiation in the consumption of these goods. Clearly, both of these conditions depend on endogenous variables. However, under the additional assumption of identical consumer preferences, we know from previous work that these conditions are fulfilled if a lump-sum tax-transfer system redistributes a sufficient level of income from rich to poor agents. Being not interested in income distribution, we can thus safely assume that the two conditions are fulfilled throughout our analysis.
total industry consumption: \( p(i, z) = a - bY(z) \). In the other limiting case with \( \rho = 0 \), goods are perfectly differentiated in the perception of consumers, so that demand for each variety is independent of the consumption of all other varieties and the model reduces to the monopoly case: \( p(i, z) = a - bx(i, z) \). This refers to the benchmark scenario analyzed in Subsection 2.4.

### 2.2 Technology and production

For simplicity, we abstract from fixed costs and assume that marginal production costs are constant in the output level. However, costs are varying across varieties. They are lowest for a firm’s core competence product, which uses the firm’s most efficient technology. In addition to producing its core competence variety, the firm can add new products to its product line via flexible manufacturing, with the latter describing a firm’s “ability to produce additional varieties with only a minimum of adaptation” (Eckel and Neary, 2010, p.192). The costs of adaptation are modeled by higher labor requirements for producing a unit of output of a firm’s non-core competence product, and the respective adaptation costs are assumed to be monotonically increasing in the distance between a specific product to the firm’s core competence variety. However, adding a new variety to the production line does not alter the costs of producing other varieties.

To put it formally, we denote marginal production costs of firm \( j \) in industry \( z \) for producing variety \( i \) by \( c_j(i, z) = \gamma_j(i)w_j(z) \), with \( \gamma_j(i) \) denoting the labor input coefficient for variety \( i \), \( w_j(z) \) being the wage rate in industry \( z \). We associate firm \( j \)'s core competence with variety \( i = 0 \). Then, the idea of flexible manufacturing is captured by assumption \( \partial c_j(i, z)/\partial i = \partial \gamma_j(i)/\partial i \times w_j(z) > 0 \). While the main mechanisms of our analysis do not hinge on a specific functional form of \( \gamma_j(i) \), we impose the additional assumption \( \gamma_j(i) = e^i \) in order to obtain explicit solutions for the variables of interest.\(^7\) Finally, assuming that production lines are firm-specific (i.e. that each firm has its own core competence), the technology assumptions considered here are the same as in Eckel and Neary (2010). However, there remains an important difference between the two approaches. While Eckel and Neary (2010) consider identical wages for all sectors and thereby impose the additional assumption of symmetric industries, we allow for sectoral differences in the prevailing labor market institutions and thus end up with industry-specific wage rates. Hence, in contrast to Eckel and Neary (2010) marginal production costs in our model comprise both a product-specific component, \( \gamma_j(i) \), and a sector-specific one, \( w_j(z) \).

Considering the technology assumptions above and denoting by \( \delta_j(z) \) the product range, profits

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\(^7\)Given this additional assumption, the output across the multiple products within MPFs is highly skewed in the distance to a firm’s core competence. This is consistent with the empirical findings in Goldberg, Khandelwal, Pavcnik, and Topalova (2008) and Bernard, Redding, and Schott (2010).
of firm \( j \) in industry \( z \) are given by

\[
\Pi_j(z) = \int_0^{\delta_j(z)} \left[ p_j(i, z) - c_j(i, z) \right] y_j(i, z) di, \tag{6}
\]

where \( y_j(i, z) \) denotes output of variety \( i \). Considering the market clearing condition \( x_j(i, z) = y_j(i, z) \) and maximizing \( j \)'s profits in (6) with respect to \( y_j(i, z) \) gives

\[
y_j(i, z) = \frac{a - c_j(i, z) - b\rho(X_j(z) + Y(z))}{2b(1 - \rho)}. \tag{7}
\]

The negative impact of industry-wide output \( Y(z) \) on firm \( j \)'s best response in the output of variety \( i \) captures the fact that under Cournot competition (and linear demand) output levels are strategic substitutes. Furthermore, the additional negative impact of this firm's own total output \( X_j(z) = \int_0^{\delta(z)} y_j(i, z) di \) reflects the cannibalization effect, i.e. multi-product firms internalize that increasing output of a certain variety lowers prices for this as well as all other varieties. Both of these effects do exist if and only if \( \rho > 0 \) (see above).

Furthermore, maximizing profits (6) with respect to \( \delta_j(z) \) yields firm \( j \)'s optimal product range

\[
\delta_j(z) = \ln \left[ \frac{a - b\rho(X_j(z) + Y(z))}{w_j(z)} \right]. \tag{8}
\]

Comparing Eqs. (7) and (8), we see that firms add new varieties until the marginal costs of the last variety \( \delta \) equals the marginal revenue of this variety at zero output. Using the latter insight in Eq. (7), we can derive a second expression for optimal output of variety \( i \), by expressing the respective output level of this variety in terms of the difference between its own marginal cost and that of the marginal variety:

\[
y_j(i, z) = \frac{w_j(z) [\delta_j(z) - \rho]}{2b(1 - \rho)}. \tag{7'}
\]

### 2.3 Trade unions and the labor market

Regarding factor endowments, we assume that the country under consideration is populated by \( L \) workers, each of them supplying one unit of labor. Workers are mobile across sectors, with sectors differing in the prevailing labor market institutions. To be more specific, we apply the labor market model of Bastos and Kreickemeyer (2009) and assume that a subset of industries is unionized, while in the rest of the economy, the labor market is perfectly competitive. Without loss of generality, we order industries such that unions are active in all sectors with \( z \leq \tilde{z} \) and, hence, there is no involuntary unemployment in this model as long as \( \tilde{z} < 1 \). In this case, workers who do not find a
job in unionized industries will move to non-unionized industries, and the competitive wage will fall until all workers can find employment there.\(^8\) We consider a monopoly union model, in which unions are organized at the sector level and set wages that are binding for all workers of the respective industry, while, at the same time, they leave the right-to-manage employment to firms. Unions are utilitarian and have an objective function of the form\(^9\) \(\Omega(z) = [w(z) - w^c]nl(z)\), where \(w^c\) is the economy-wide competitive wage, \(n\) is the number of competitors in each industry and \(w(z), l(z)\) are union wage claims and firm-level labor demand in unionized industry \(z\).

Differences in the labor market institutions generate an asymmetry between the subgroup of unionized and the subgroup of non-unionized industries. However, there prevails no asymmetry within the two subgroups of industries. Due to this feature of our model, we can introduce superscripts \(u\) and \(c\) to refer to unionized and non-unionized industries, respectively, and suppress sector index \(z\) from now on. Then, substituting \(l(z) = \int_0^{\delta(z)} \gamma(i, z)y(i, z)di\) and \(y(i, z)\) from \((7')\) into union objective \(\Omega\) and applying the new notation, we obtain

\[
\Omega = \frac{n}{4b(1-\rho)}[w^u - w^c]w^u[e^{\delta^u} - 1]^2.
\]  

\(^{(9)}\)

Comparing the objective function in \((9)\) with the respective objective function in Bastos and Kreickemeier (2009) provides insights how the problem for the trade union changes if firms produce a set of different products and the production line is endogenous relative to a model with SPFs and exogenous firm scope. With firms having the right-to-manage employment, they simultaneously adjust firm scale and scope to changes in union wage claims in our setting, and they do so in a non-trivial way because of the oligopolistic structure in the product market. It is the adjustment in firm scope, which differentiates our analysis from Bastos and Kreickemeier (2009) and it is this aspect which is in the center of our interest. However, it is also this additional adjustment margin which renders a formal analysis of the general equilibrium outcome difficult. We therefore reduce complexity of our model, by first considering a benchmark version with \(\rho = 0\). This rules out strategic interaction of firms in the product market and, hence, renders the analysis of the two possible adjustment margins of firm size (scale and scope) to changes in union wage claims simpler. A detailed discussion of this benchmark model is at the agenda of the next subsection, while the more sophisticated model variant with \(\rho > 0\) is accounted for in Subsection 2.5.

\(^8\)This distinguishes our analysis from Egger and Etzel (2009), who assume that all sectors are unionized, so that involuntary unemployment arises as an equilibrium phenomenon.

\(^9\)Since all firms within a particular industry are symmetric and unions are organized at the industry level, we suppress firm indices from now on in order to simplify notation.
2.4 A benchmark model of MPFs with perfectly differentiated goods

To keep things as simple as possible, we start our analysis of the general equilibrium outcome in the closed economy with the benchmark case of $\rho = 0$. This implies that goods are perfectly differentiated and, hence, firms behave as monopolists for each of their product varieties. Then, Eqs. (7) and (8) simplify to

$$y(i, z) = \frac{a - c(i, z)}{2b}, \quad \delta(z) = \ln \left[ \frac{a}{w(z)} \right],$$

respectively, and the union objective can be rewritten as

$$\Omega = \frac{n}{4b(1 - \rho)} [w^u - w^c]w^u \left[ \frac{a}{w^u} - 1 \right]^2.$$

Maximizing union objective (11) with respect to $w^u$ gives the union wage claim as an implicit function of the competitive wage, $w^c$:

$$w^u = \frac{1}{2} \left[ \frac{a}{\omega} + w^c \right],$$

where $\omega \equiv w^u/w^c$ is the union wage premium. It is easily shown that $\omega > 1$ and, according to Eq. (10), that firms in unionized industries are smaller in both scale and scope than firms in non-unionized ones (see Eq. (10)). However, this result has to be interpreted with care – in particular, when contrasting it with real-world evidence – because we have focused on labor market institutions as the only source of asymmetry in our model, thereby abstracting from other reasons of cross-sectoral differences in firm characteristics, as, for instance, exogenous differences in labor productivity or firm organization.

For a better understanding of the role played by flexible manufacturing, it is meaningful to compare Eq. (12) to the union wage claim in an otherwise equivalent model with SPFs. Imposing the additional assumption that labor productivity in the SPF model is equal to one, as for the core competence variety in our setting, we obtain $w^u = a/2 + w^c/2$ (see Bastos and Kreickemeier, 2009). In view of $\omega > 1$, it is then immediate that union wage claims are lower if firm scope is endogenous. The reason for the latter is that in a model with flexible manufacturing firms respond to higher union wage claims with both a reduction in scale and a narrowing of their production line. However, regarding adjustments in the production line, firms stop manufacturing those products with the highest labor input coefficient first, implying that, all other things equal, the employment reduction in response to a higher union wage claim is more pronounced in a model with flexible manufacturing than in an otherwise identical model with exogenous firm scope.
This completes our discussion of the partial equilibrium outcome in the closed economy. Thereby, partial equilibrium means that we have treated the competitive wage as a constant so far. In a next step, we now consider the general equilibrium outcome. For this purpose, we apply the labor market clearing condition, \( L = \int_0^1 \int_0^{\delta(z)} ny(i, z)e^i dz \), in order to determine the competitive wage. Straightforward calculations give

\[
L = \frac{n}{4b} \left[ \frac{\tilde{z}}{w^u} (a - w^u)^2 + \frac{1 - \tilde{z}}{w^c} (a - w^c)^2 \right],
\]

with the left-hand side of this equation representing exogenous labor supply and the right-hand side representing economy-wide labor demand. From inspection of (13), we see that even in the benchmark model the equilibrium competitive wage is only given implicitly. However, as shown in the appendix the respective equilibrium characterized by Eq. (13) is unique and fulfills the criterion of Walrasian stability.

Together, Eqs. (10), (12) and (13) determine equilibrium firm size and scope in the closed economy, and we can use the respective equations for studying firm-level consequences of policy reforms that aim at deregulating the product and labor market. With union wage setting generating labor market imperfections, we can associate labor market deregulation with a decline in the share of unionized industries, \( \tilde{z} \), and thus a fall in union density and coverage. Partially differentiating the right-hand side of Eq. (13) with respect to \( \tilde{z} \), we see that deunionization raises economy-wide labor demand, ceteris paribus, as firms in non-unionized sectors are larger. The excess demand for labor leads to an increase in both the competitive and the union wage, which brings the labor market back to an equilibrium. From Eq. (12) we can furthermore deduce that the increase in wage rates is biased towards the competitive wage, which implies that the union wage premium, \( \omega \), shrinks. These wage adjustments lead to a decline in total firm scale in all industries, with the respective decline being more pronounced in non-unionized ones, due to the stronger wage increase there, i.e. \( \Xi \equiv X^c - X^u \) falls if \( \tilde{z} \) decreases. While this effect is also present in a model with SPFs, in our setting the respective wage effects trigger an additional and so far unexplored adjustment in firm scope. With general wage increase, firm scope declines in unionized as well as non-unionized industries. Again, this effect is more pronounced in non-unionized industries, due to a fall in the union wage premium, i.e. \( \Delta \equiv \delta^c - \delta^u \) shrinks if \( \tilde{z} \) decreases. We can therefore conclude that deunionization renders firms in non-unionized and unionized industries more similar in both dimensions of firms size: scale and scope.

We can now compare the consequences of deunionization with those of a policy reform that aims at liberalizing the product market. The simplest way of modeling product market deregulation is to increase the number of competitors, \( n \). Thereby, we assume that \( n \) increases symmetrically
in all industries and thus abstract from the differing incentives of firms to enter unionized and non-unionized industries. Since firms act as monopolists, the respective increase in the number of producers does not directly impact the competitive environment in the product market, but rather it generates feedback effects on incumbent producers only due to changes in the economy-wide competitive wage. From (13) we see that an increase in the number of competitors raises labor demand and thus leads to an increase in both the competitive and the union wage. Again, it can be deduced from (12) that the respective increase in the union wage claim is less pronounced than the respective increase in \(w_c\), so that the union wage premium, \(\omega\), decreases. These wage effects are qualitatively the same as those of a deunionization reform and, hence, it is immediate from Eq. (10) that adjustments in firm scale and scope in response to product market deregulation are qualitatively the same as the respective adjustments in response to labor market deregulation.

However, there remains an important difference between the two policy measures with respect to their consequences for industry-level variables. While in the case of deunionization output between unionized and non-unionized industries becomes more similar at both the firm and the sector level, a decline of the output differential materializes only at the firm level if product market deregulation is considered. On the contrary, the differential industry-wide output, \(\Psi \equiv Y_c - Y_u\), increases in \(n\), because new entrants in non-unionized industries are larger than new entrants in unionized ones and this effect dominates the decline in the firm-level scale differential \(\Xi\). A further difference between the two policy measures arises with respect to their impact on the total mass of varieties produced in a particular industry. Except for newly deunionized industries this falls in the case of labor market deregulation because all firms in sectors with a given labor market regime reduce their scope. However, the mass of available varieties increases in the case of product market deregulation because the entry of new firms with new varieties dominates the decline in firm scope.

These comparative-static insights complete our discussion of the benchmark model in the closed economy. In a next step, we analyze to what extent our insights from above need to be adjusted when accounting for a more general setting with partial differentiation of consumer goods and oligopolistic competition in the product market. A detailed discussion of this issue is at the agenda of the next subsection.

2.5 A sophisticated model of MPFs with partially differentiated goods

In this subsection we extend the previous model to one with \(\rho > 0\). This gives rise to partial differentiation of consumer goods and oligopolistic competition in the product market. Then output of a single variety and the size of the production line are given by the more general specifications in (7') and (8), respectively, and, hence, both of these variables depend on total firm scale as well as sector-wide output and thus the nature of strategic interaction in the product market. With firms
being symmetric within each industry, we can make use of $nX(z) = Y(z)$. Furthermore, noting that $X(z) = \int_0^{\delta(z)} y(i, z) di$ and substituting $y(i, z)$ from (7'), we can rewrite total firm output as

$$X(z) = \frac{w(z)}{2b(1 - \rho)} [e^{\delta(z)}(\delta(z) - 1) + 1]. \quad (14)$$

Substituting the latter into Eq. (8) then gives firm scale as an implicit function of the prevailing wage rate:

$$e^{\delta(z)} = \frac{a/w(z) - \phi}{1 + \phi \delta(z) - \phi}$$

where $\phi \equiv \rho(n + 1)/[2(1 - \rho)]$ is a constant. To be more specific, Eq. (15) establishes a negative relationship between wage costs and firm scope, which is in line with our finding from the benchmark model variant that firms in unionized industries are leaner, i.e. they have a shorter production line, because unions claim a premium on the economy-wide competitive wage.\footnote{Applying the implicit function theorem to (15) gives}

$$\frac{d\delta(z)}{dw(z)} = -\frac{a/w(z)}{w(z)e^{\delta(z)}[1 + \phi \delta(z)]} < 0,$$

which proves the respective result in the text.

\footnote{From $X(z) = \int_0^{\delta(z)} y(i, z) di$, it follows that a decline in $\delta(z)$ lowers firm scale ceteris paribus and thus $X(z)$ can only increase in response to an increase in $w(z)$ if output $y(i, z)$ goes up for any non-marginal variety. However, in view of Eq. (7), we can deduce that an increase in $y(i, z)$ is only possible if $X(z) + Y(z) = (n + 1)X(z)$ shrinks, which is in contradiction to an increase in firm scale.}

While the impact of a wage increase on firm scope is immediate, the respective impact on firm scale turns out to be less clear. A higher sectoral wage rate lowers demand for each variety, ceteris paribus, with negative consequences for firm scale. This effect is present in any model with an oligopolistic market structure and in our setting with flexible manufacturing it is reinforced by the shortening of a firm’s production line. However, there is a counteracting effect of lowering firm scope, because shortening the production line reduces competition for those varieties that remain in the firm’s production line after the decline in $\delta$. It can be shown that this counteracting effect cannot dominate, so that firm scale falls along with firm scope when the sectoral wage rate increases.\footnote{From $X(z) = \int_0^{\delta(z)} y(i, z) di$, it follows that a decline in $\delta(z)$ lowers firm scale ceteris paribus and thus $X(z)$ can only increase in response to an increase in $w(z)$ if output $y(i, z)$ goes up for any non-marginal variety. However, in view of Eq. (7), we can deduce that an increase in $y(i, z)$ is only possible if $X(z) + Y(z) = (n + 1)X(z)$ shrinks, which is in contradiction to an increase in firm scale.}

These implications of higher wages are taken into account by trade unions, which in the more sophisticated model variant with partially differentiated goods maximize an objective function of the form

$$\Omega = \frac{n}{4b(1 - \rho)} [w^u - w^c] w^u \left[ \frac{a/w^u - \phi}{1 + \phi \delta^u - \phi} - 1 \right]^2,$$

according to (9) and (15). Totally differentiating the latter with respect to $w^u$ and setting the
resulting expression equal to zero allows us to derive the union wage claim under autarky as implicit function of the competitive wage $w^c$:  

$$w^u = \frac{1}{2} w^c + \frac{a}{[1 + \phi \delta^u][e^{\delta^u} - 1]} \left[1 - \frac{w^c}{w^u}\right].$$  

(17)

Eqs. (15) and (17) establish a system of two implicit equations, which together determine the equilibrium levels of $w^u$ and $\delta^u$. For $\rho = 0$ we have $\phi = 0$ and (15) and (17) reduce to the respective expressions in (10) and (12). As outlined in Subsection 2.4 this refers to a benchmark scenario in which firms act as monopolists for all of their products. With $\rho > 0$ the market structure is oligopolistic and, hence there is strategic interaction between the different producers in both firm scale and scope. In this case, the number of competitors becomes a key determinant of the union wage premium. The latter follows from the insight that $\phi$ is a function of $n$ if $\rho > 0$.

This is in sharp contrast to a setting with SPFs where the union wage premium does not depend on the number of competitors as long as unions are organized at the sector level (see Bastos and Kreickemeier, 2009, and the cited literature there), and it also differentiates the scenario with $\rho > 0$ from the benchmark scenario with $\rho = 0$. In a setting with SPFs sector-level unions are just interested in the trade off between a higher income of individual members and the costs in terms of lower sectoral employment, when raising their wage claim. However, this trade off is independent of the number of competitors. In a setting with MPFs and flexible manufacturing, unions account for the fact that there are now two dimensions in which firms can adjust employment in response to higher union wage claims and the relative attractiveness of these two channels depends on the competitive environment in the product market. To be more specific, unions anticipate that firms cut their product line and shut down production of those varieties with the highest labor costs when increasing their wage claims. While this exerts an additional negative impact on labor demand, which induces fall in the union wage premium relative to a model with SPFs (see Subsection 2.4), the respective effect is weakened if the decline in product scope lowers the cannibalization effect on products which are closer to the firm’s core competence. Due to this second effect unions actually claim a higher wage premium in a setting with MPFs and partial differentiation of consumer goods ($\rho > 0$) than in an otherwise identical setting with MPFs and perfect differentiation of consumer goods ($\rho = 0$). This implies that differences in the scope of unionized and non-unionized firms are magnified relative to the benchmark in Subsection 2.4.

With these insights at hand, we can now determine how an increase of $\rho$ from zero to some positive level affects firm scale in unionized industries relative to firm scale in non-unionized sectors. For this purpose, we can first note from above that a higher union wage rate induces, all other things equal, a fall in the scale of unionized firms – even when accounting for the triggered decline in firm
scope. This effect is reinforced by a surge in product market competition in response to an increase in \(\rho\).

Finally an increase in \(\rho\) exerts a direct negative effect on both \(\delta^u\) and \(\delta^c\), in addition to the one arising from an increase in the wage rate, and the respective fall in firm scope tends to lower firm scale in unionized as well as non-unionized industries, ceteris paribus. In general, the latter effect can be stronger in non-unionized industries and thus may counteract the former two effects. Since determining the relative size of these effects analytically turns out to be difficult, we have analyzed the total effect of an increase in \(\rho\) on firm scale differential \(\Xi\) in a set of numerical simulation exercises (with details being available upon request). The results from these exercises indicate that the differential in firm scale between non-unionized and unionized industries increases along with the differential in firm scope and, hence, we can conclude that partial differentiation of consumer goods amplifies the implications of labor market institutions for firm performance.

In a next step of our analysis, we look at the general equilibrium outcome in the closed economy. For this purpose, we substitute \(y(i, z)\) from Eq. (7') into the labor market clearing condition \(L = \int_0^1 \int_0^{\delta(z)} ny(i, z)e^i didz\). Together with Eqs. (14), (15) – for unionized and non-unionized industries – and (17) this gives a system of six equations, which jointly determine the autarky level of the six endogenous variables \(w^c, w^u, \delta^c, \delta^u, X^c\) and \(X^u\). Due to the complexity of the model, we do not get explicit solutions for these variables and we have to rely on insights from numerical simulation exercises in order to understand how the insights from the partial equilibrium analysis need to be adjusted when taking into account the endogeneity of the competitive wage rate. As we know from above that union wage claims are higher with partial differentiation of consumer goods than in our benchmark model with \(\rho = 0\), it is clear that, all other things equal, labor demand in unionized industries is lower in this subsection than in the previous one. As a consequence, the competitive wage needs to fall in order to reestablish a labor market equilibrium and, hence, \(w^c\) must be smaller if \(\rho > 0\) than in the benchmark case of \(\rho = 0\).

However, it follows from Eqs. (15) and (17) that a lower competitive wage raises wage premium \(\omega\) and thus contributes to the partial equilibrium magnification of the union wage premium if \(\rho\) rises from zero to some positive value. Furthermore, a decline in \(w^c\) (and the associated fall in \(w^u\)) raises the incentives of firms to extend their production line in both unionized and non-unionized industries. While this effect counteracts the negative partial equilibrium effect it does not dominate in our numerical experiments, implying that firm scope is smaller with partial differentiation of consumer goods than in the benchmark scenario with perfect differentiation of these goods. While firm scope falls in both unionized and non-unionized industries, we find that the respective effect is more pronounced in non-unionized sectors, so that the differential in firm scope, \(\Delta\), shrinks if

12 Clearly, this pro-competitive effect impacts firm scale in both unionized and non-unionized industries. However, with firms in non-unionized industries being larger than firms in unionized ones, it is immediate that a higher \(\rho\) ceteris paribus raises the differential in firm scale between non-unionized and unionized industries.
\( \rho \) increases from zero to some positive value. Intuitively, the decline in scope implies that firms concentrate on the production of those varieties which are closer to their core competence. Since these varieties are produced with a more efficient technology, the requirement of labor market clearing implies that all firms raise their production level. The respective increase in firm scale is more pronounced in competitive industries, where, in view of an increase in \( \omega \), labor costs shrink more than proportionally. This confirms our partial equilibrium insight that the firm scale differential \( \Xi \) is also magnified if \( \rho \) increases from zero to some positive value.

We complete the discussion of the closed economy by repeating the comparative static exercises for changes in \( n \) and \( \tilde{z} \) from the benchmark model in the more sophisticated model variant with \( \rho > 0 \). Thereby, we again rely on a simulation exercise and start our discussion with a brief summary of the effects of labor market deregulation. As in the benchmark model, a decline in \( \tilde{z} \) stimulates labor demand in the newly deunionized industries and thus induces an increase in both \( w^c \) and \( w^u \). The higher wage costs lower firm scope in all industries. However, since \( w^c \) increases relative to \( w^u \), \( \omega \) declines and the reduction in firm scope turns out to be more pronounced in non-unionized industries. As a consequence, \( \Delta \) shrinks. Similarly, firm scale also shrinks in all sectors (except of the newly deunionized ones) and so does the differential in firm scale, \( \Xi \). Similar firm-level effects are exerted by a marginal increase in the number of competitors. Furthermore, as in the benchmark model with \( \rho = 0 \), a larger firm number amplifies the differential of industry-wide output \( \Psi \) and it raises the total mass of varieties produced in each industry because the entry of new firms with their own production line dominates the fall in firm scope of incumbent producers. In summary, we can conclude that the comparative static effects of changes in \( \tilde{z} \) and \( n \) are qualitatively the same in the benchmark model with \( \rho = 0 \) and the more sophisticated model with \( \rho > 0 \).

3 MPFs and labor market imperfection in an open economy

While the previous section was concerned with characterizing the general equilibrium outcome in the closed economy and discussing comparative static effects of labor market and product market deregulation, we now analyze the open economy equilibrium and compare our findings with the autarky scenario. Thereby, we consider trade between two fully symmetric countries and abstract from the existence of trade costs. Product markets are segmented and labor is not allowed to move across borders. We start our analysis of the open economy by first looking at the benchmark model with \( \rho = 0 \) and discuss the more sophisticated model with \( \rho > 0 \) and strategic interaction in the product market afterwards.

If \( \rho = 0 \), opening up for trade does not change a country’s competitive environment and leaves the partial equilibrium outcome unaffected. However, there are general equilibrium effects, because
firms start to serve foreign consumers in the open economy and thus expand production and labor demand at the extensive margin. Hence, to reestablish the labor market equilibrium, the competitive wage must increase and unions respond to this increase in $w^c$ by raising their wage claims. However, following the reasoning from the closed economy, we know that $w^u$ increases less than proportionally, so that the union wage premium shrinks. The rise in factor costs causes a shortening of the production line of all competitors and firm scope falls in unionized as well as non-unionized industries. However, the decrease in firm scope is more pronounced in non-unionized industries, due to a more than proportional increase in factor costs there. Thus, the differential in firm scope, $\Delta$, shrinks when a country opens up for trade. While the decline in firm scope means a reduction in the mass of varieties produced by domestic firms, it does not imply a reduction in the overall amount of varieties available to consumers. Due to access to new varieties from foreign producers, there is a counteracting effect on the total mass of available varieties which dominates the negative effect from a reduction in firm scope of incumbent producers.

With respect to firm scale, we can note that the increase in factor costs lowers the output of firms for the domestic market. However, in the open economy firms additionally serve foreign consumers and thus expand production at the extensive margin. Due to the requirement of labor market clearing it must be the second effect that dominates. To be more specific, by concentrating on varieties with higher labor productivity firms can expand production with the same amount of labor input and, hence, firm scale unambiguously increases in all industries when a country opens up for trade. Regarding the impact of trade on firm scale differential, $\Xi$, it is again worthwhile to distinguish between the effects in the domestic and the export market. With the factor price increase being more pronounced in non-unionized industries, it is immediate that the decline in domestic output is more pronounced in these industries. All other things equal, this induces a fall in $\Xi$. However, with market-specific output being larger in non-unionized sectors, the output expansion at the extensive margin is also more pronounced in these industries. This raises $\Xi$ ceteris paribus. It is this second effect that dominates in our model, so that the effect of trade on the differential in firm scale turns out to be positive. This result is well in line with the findings in Bastos and Kreickemeier (2009), but it differentiates trade liberalization from the two policy reforms analyzed in the closed economy. Since firm scale increases in either industry and the number of competitors stays constant, it is immediate that total industry output increases when a country opens up for trade. Furthermore, the differential in industry-wide output, $\Psi$, is also larger in the open than in the closed economy as the increase in firm scale is more pronounced in non-unionized than in unionized industries.

From the above analysis we can conclude that in the benchmark scenario with $\rho = 0$, a country’s movement from autarky to trade exerts an impact on the variables of interest which is similar to
the implications of product market deregulation in a closed economy, with the key difference that
the former magnifies the difference in firm scale and total industry output between non-unionized
and unionized industries while the latter one reduces the respective difference. With $\rho > 0$ there
are additional differences between these two policy measures. Most importantly, the opening up
for trade with a symmetric partner country not only intensifies competition in the product market
but also exposes the sector-level trade unions to competition with foreign unions. As emphasized
in the literature on unionized oligopoly with single-product firms the latter provides an incentive
for unions to reduce their wage claims and thus lowers $\omega$ in a partial equilibrium environment (see,
for instance, Huizinga, 1993; Sørensen, 1993). Such a union-disciplining effect does not materialize
if policy makers deregulate the product market in a closed economy. In a general equilibrium
environment the respective wage dampening effect in unionized industries is counteracted by an
increase in the competitive wage rate. As outlined by Bastos and Kreickemeier (2009), it is in
general not clear which of the two effects dominates and the union wage rate may actually increase
or decrease in response to globalization. To be more specific, they find that the partial equilibrium
effect dominates if union coverage $\tilde{z}$ is small, while the general equilibrium effect is stronger if the
share of unionized industries is large.

The finding of Bastos and Kreickemeier (2009) regarding the role of union density for wage setting
in an open economy is a natural starting point for investigating how unionized labor markets affect
the consequences of trade for MPFs in our setting. Since a formal discussion of this issue is not
feasible, we have conducted a set of simulation exercises, with the chosen parameter values and the
main results of these exercises being summarized in Table 1. The first row of this table captures
a scenario with a small share of unionized industries: $\tilde{z} = 0.1$. In this case, a country’s movement
from autarky to trade triggers a relatively small increase in the economy-wide competitive wage,
which is dominated by the pro-competitive effect in unionized industries. As a consequence, $w^u$
falls significantly after the abolition of trade barriers. This is in sharp contrast to our benchmark
model, where a pro-competitive effect in the product market does not exist, so that union wage
claims unambiguously increase in response to trade liberalization. The reduction in factor costs
of unionized industries renders an expansion of the production line attractive and leads to an
increase in the domestic output level, $D^u$. Things are different in non-unionized industries, where
an increase in the factor costs leads to a shortening of the production line and a cutback in domestic

13 In a setting with SPFs, increasing the number of competitors does not affect the wage claim of a sector-level
union. In our setting with MPFs, increasing the number of competitors exerts a partial equilibrium effect on union
wage claims. However, from our insights regarding the impact of an increase in $\rho$ the respective effect can expected
to be positive.

14 Noting that lowering the union wage premium amplifies the surge in labor demand when an economy opens up
for trade, it is immediate that the positive impact on the competitive wage is particularly pronounced in countries
with high union density.
output. Furthermore, firm scale increases in both unionized and non-unionized industries, with the respective effect being stronger in unionized sectors. Hence, the differential in both firm scale and scope unambiguously declines when a country opens up for trade, similar to the benchmark model with $\rho = 0$.

The second simulation exercise refers to an intermediate level of the share of unionized industries: $\tilde{z} = 0.4$. In this case, the partial equilibrium effect still dominates the general equilibrium effect in determining the impact of trade on union wage setting, so that $w^u$ falls when a country opens up for trade. However, the respective decline in union wage claims is now rather small and it does not dominate the negative impact of higher product market competition on firm scope and domestic output, so that both $\delta^u$ and $D^u$ fall when a country becomes exposed to international trade. The later effects are similar to those in non-unionized industries, where the respective changes are more pronounced. Clearly the negative domestic output effect is counteracted by an increase at the extensive margin of production as firms get access to the export market. In unionized industries, this positive exporting effect dominates the decline in domestic production, so that $X^u$ is larger in the open than in the closed economy. Things are different in non-unionized industries, where the decline in domestic production dominates the output expansion in the export market, so that firm scale shrinks in these sectors. Again, the impact of trade on the differential in firm scale and scope remains qualitatively the same as in our benchmark model. In a final experiment we have accounted for a large share of unionized sectors: $\tilde{z} = 0.7$. In this case, the general equilibrium effect of trade liberalization on union wage claims dominates the partial equilibrium one and $w^u$ increases in response to a country’s movement from autarky to trade. In all other respects, the findings from this third simulation experiment are qualitatively the same as those in the scenario with an intermediate level of $\tilde{z}$.

From the simulation results in Table 1 we can conclude that the degree of unionization exerts a non-trivial impact on trade effects in a general equilibrium environment. To be more specific,
the respective figures indicate that firm-level adjustments to globalization depend crucially on the prevailing labor market institutions. In particular, there is a presumption from our analysis that firms in non-unionized and unionized industries are affected by trade liberalization in a qualitatively different way. For instance, in countries with low union density, like the US, firms in all industries may raise the scale, while firm scope can only be expected to increase in unionized sectors. In countries with intermediate or high levels of union density, as, for instance, Germany or Scandinavian countries, firms in all industries will shorten their production line when a country opens up for trade. Furthermore, in these countries producers in unionized sectors will raise firm scale, while producers in non-unionized industries experience a decline in total output. In summary, we may thus conclude that the firm-level trade effects in a setting with labor market imperfections are less clearcut than in a setting with a perfectly competitive labor market. In particular, the adjustments in firm scale and scope turn out to be much more complicated than one may have expected from the analysis in Eckel and Neary (2010), where trade liberalization raises firm scale and reduces firm scope of all producers.

4 Extension: Firm- vs. sector-level unions

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5 Concluding remarks

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References


Appendix

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