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Labor-Market Frictions and Endogenous Production-Network formation

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April 2019

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Labor-Market Frictions and Endogenous Production-Network Formation

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Abstract

This paper presents a model of endogenous production-network formation in which rms face a labor-market featuring worker- rm matching frictions. The model demonstrates the role of labor mobility across sectors in determining production-network centrality. The model also shows how endogenous production-networks determine the distribution of workers' employment searches across sectors. These two effects are inseparable due to the feedback from one effect to another. That is, endogenous production-network formation leads to labor-market shifts, which lead to further changes in the production network, driving another change in the distribution of employees across sectors in a continuing evolution. Failing to account for labor-market mobility in a model of endogenous production-network formation, may considerably misstate the rate at which variables respond to trade shocks and in the case of some variables can even change the sign of the response.

1 Introduction

Firms combine inputs and workers to produce output. The rm must maintain a costly relationship with its suppliers to ensure that it is able to access the inputs it needs to reach its production goals. At the same time, the rm must also source workers from a labor-market that is not competetive. Labor-market frictions affect the way that rms form their production network. In a 2009 survey of managers conducted by the Economist Intelligence Unit, 20% of managers reported that a labor dispute had affected their supply chain over the previous year. The ef ciency of the supply chain also determines the distribution of workers searching for employment across sectors. Workers choose to search for employment in a given sector based off the expected wage in that sector. If the sector features a highly integrated supply chain then the probability of nding employment in the sector, the number of workers that look for employment in the sector, and total employment in that sector will be higher. Little is known about the interaction between labor-market frictions and production-network frictions and how they respond to economic shocks. This interaction is potentially important given that the share of labor compensation in GDP is about one half, and that rm expenditure on and sales of intermidiate inputs account for about half of rms' costs and revenues respectively.

In this paper I present a model of endogenous production-network formation in which workers and rms face labor-market matching-frictions.Recent papers by Lim [1] and Huneeus [2] have demonstrated how shocks, and more speci cally trade shocks, have changed production networks. However, these models rely on the assumption of a frictionless perfectly competitive input market, facing all rms (they refer to this as labor, but it could be any type of homogeneous input). Allowing for frictions in the sourcing of the homogeneous input will change how production networks shift in response to shocks. As the expected wages in a given sector change due to a trade shock, the endogenous labor supply available to each sector will change, systematically affecting the attractiveness of rms in each sector as potential suppliers or customers to other rms. In turn, as rms are able to match with more or fewer partner rms, their pro tability and the expected wages they pay will change, leading to yet another change in the labor supply available to each sector.

This implies that the size of the sectoral wage changes due to shocks will also be determined by the ability of firms in the sector to find trading partners with whom to build their production network.

This paper studies the following questions: What is the effect of labor-market frictions on the endogenous formation of production networks? To what extent does endogenous production-network formation affect total employment? How do workers migrate across sectors in response to shocks and to what extent does this migration drive changes in production-network formation? Finally, how do endogenous changes in the production network drive changes in expected wages, and thus the endogenous labor supply across sectors? In short, I investigate how endogenous production networks affect the endogenous labor supply available across sectors, and vice versa, in a feedback mechanism.

Prior work on endogenous production-network formation has mostly focused on the role of firm-level productivities and network centrality in determining the density of the production network (Lim [1] and Bernard and Moxnes [3]). Here I present a new mechanism for driving density differences across production networks, labor-market friction differences across sectors.This paper builds a model that points out that sectors with lower levels of labor-market frictions will be more central in the production-network. This reflects the fact that firms in sectors with lower levels of labor-market frictions are more profitable for other firms to trade with since they produce more output (making them more attractive as a potential customer) and operate at lower unit costs (making them more attractive as a potential supplier).

Prior work on the responsiveness of production networks to shocks such as Huneeus [2], Baqaee and Farhi [4], Bernard, Moxnes, and Saito [5], Gabaix [6], also have ignored the local migration of employees across sectors, focusing only on how shocks propagate throughout the economy based on firm-level productivities. While this effect is still present in my model, the addition of labor-market frictions induces two new effects. First, some workers migrate out of the sector that is relatively harmed by the shock.This harms the ability of firms in that sector to form production-network linkages. The workers that left the relatively harmed sector will now search for employment in the sector that is relatively less affected by the shock.This first effect suggests that the models above overstate the rate at which production networks respond to trade shocks, and thus the rate at which shocks propogate throughout the economy.The second effect has to do with the feedback mechanism.As workers move into the sector that relatively bene ts from the shock, rms in this sector will now nd it pro table to supply to more rms (this includes rms in the relatively harmed sector). This increases the liklihood that rms in the relatively harmed sector nd it pro table to supply to other rms, counteracting the rst effect.The net effect of labor-market frictions on the rate at which procduction networks respond to trade shocks depends on the size of these two effects.

Finally my analysis contributes to the literature on structural labor models that focus on how trade shocks, offshoring, and outsourcing affect labor-market outcomes (Helpman and Itskhoki [7], Helpman et al. [8], Egger and Kreickemeier [9], Autor, Dorn, and Hanson [10], Acemoglu et al. [11], Caliendo, Dvorkin, and Parro [12], and Grossman and Helpman [13]) I derive a model to look at how employees are affected by shocks through changes in rm abilities to source inputs through endogenous production-networks. Previous papers have considered how labor markets respond to shocks when they are exposed through an exogenous production-network, for example, through input-output linkages. However, these models ignore how the production networks themselves might shift and thereby change the level of exposure to these shocks. As Huneeus [2] points out, production networks must change in response to economic shocks, affecting the rate at which these shocks propagate throughout the economy. In this paper I will demonstrate how changes in endogenous production networks lead to changes in the labor market that systematically vary across sectors.

In what follows I rst present a model of endogenous production-network formation, similar to that of Lim [1]. However I also include labor-market frictions as in Helpman and Itskhoki [7]. The model not only demonstrates how endogenous production-network formation affects labor-market outcomes, but also shows how these labor-market frictions determine the production-network centrality of sectors in the economy. In the following section I present the predictions of the model and simulate the effects of the home countrty unilaterally imposing a tariff on a particular sector in the foreign country. After discussing the baseline model, I compare it to other models featuring trade and labor-market frictions. In order to demonstrate the effect of labor-market frictions on endogenous production-network formation, I compare the model presented in Section 2 to an analogous extension of Lim [1] that includes an immobile labor supply.To demonstrate the effect of endogenous production-network formation on labor-market outcomes I compare my model to an extension of [7] that includes exogenous sectoral linkages in production, similar to that of Caliendo, Dvorkin, and Parro [12] and Jones [14].

2 A Double Sided Matching Model of Production

In this section I build a model of endogenous production-network formation with labor-market frictions in which rms must pay a xed cost to match with each customer rm, and they must also pay a cost to post employment vacancies.The economy consists of multiple regions and sectors, each of which has a continuum of rms and a xed labor supply. Sectors and regions vary by the employ given the labor-market frictions. In order to hire workers, firms must post vacancies and must pay a cost per each vacancy posted. The firms cannot costlessly adjust their labor supply which induces workers and firms to engage in wage bargaining and generating wage differences within sectors and regions.

In what follows I present the model in detail by first considering the household's problem and then examining the firm's problem. I then present definitions of the equilibrium conditions of the model.

2.1.1 The Household's Problem

Within each sector-region (q,z) the representative household supplies $L_{s;r}$ units of labor to the economy by searching for employment.The household has love of variety preferences given by:

$$U_{q;z} = \left[\sum_{s;r} \alpha^{H}_{s;r} \int [x_{qz}(\omega)]^{\frac{\sigma_{H;s}-1}{\sigma_{H;s}}} dF_{\ell}(\omega) \right]^{\frac{\sigma_{H;s}}{\sigma_{H;s}-1}}$$

where $\alpha^{H}_{s;r}$ governs the degree to which households value inputs from sector-region pair $s;r$, $\sigma_{H;s} > 1$ is the elasticity of substitutions between firm specific varieties in sector s. Total demand for each firm's brand by the representative consumer in sector region $q;z$ is given by the following:/

$$x^{H}_{q;z}(\omega) = \frac{I_{q;z}}{P^{H}_{q;z}} \left(\frac{\alpha^{H}_{s;r} P^{H}_{q;z}}{\tau^{q}_{s;r} p^{H}_{q;z}(\omega)} \right)^{\sigma_{H;s}} \quad (2.1)$$

where

$$P^{H}_{q;z} = \left(\sum_{s;r} (\alpha^{H}_{s;r})^{\sigma_{H;s}} \int [\tau^{z}_{s;r} p^{H}_{q;z}(\omega)]^{1-\sigma_{H;s}} dF_{\ell}(\omega) \right)^{\frac{1}{1-\sigma_{H;s}}} \quad (2.2)$$

is the price index of the representative consumer. $I_{q;z}$ is the total income of the household in $q;z$. The parameter $\tau^{z}_{s;r}$ is an iceberg trade cost term that determines how costly it is to ship sector-s goods from region r to region z. $p^{H}_{q;z}(\omega)$ is the price charged to households in $q;z$ by firm ω.

Each firm can sell to all regions and sectors in the economy. This implies the total demand that rm faces from households in the economy is given by:

$$x^{H}(\ ) = \sum_{q;z} x^{H}_{q;z}(\ ) \quad (2.3)$$

The cost of hiring one more worker in sector region $s;r$ is denoted by $b_{s;r}$ and $P(\ )$ is the cost the rm must pay to increase its CES aggregator of intermediates $x(\ )$ by one unit.

The rm combines intermediates across sectors using the following CES aggregator:

$$x(\ ) = \left[\sum_{s^0} {}_{s;s^0} [x_{s^0}(\ )]^{\frac{s \ \ 1}{s}} \right]^{\frac{s}{s \ \ 1}}$$

determine the extensive margin of trade within the model. I assume that the fixed cost of firm-to-firm matching is paid in terms of labor within the model.

Given the matching function, the firm combines intermediate varieties within each sector according to the following CES-aggregator:

$$x_{s'}(\ ) = \left(\sum_{r'} \int m(\ ;\ ')[x(\ ;\ ')]^{\frac{_{s;s'}-1}{_{s;s'}}} dF_{`}(\ '|s') \right)^{\frac{_{s;s'}}{_{s;s'}-1}}$$

where $x(\ ;\ ')$ is the total sector s' variety demanded by the firm and $_{s;s'}$ is the elasticity of substitution that governs how sector s firms substitute between sector s' varieties. Given this structure, the conditional demand for variety $'$ by firm is given by:

$$x(\ ;\ ') = [\ ^{r}_{r',s'} p(\ ;\ ')]^{-_{s;s'}} x_{s'}(\ ) P_{s'}(\ )^{_{s;s'}} \tag{2.8}$$

where the firm's unit cost of increasing it's sector s' CES aggregator, $P_{s'}(\ )$, is defined as:

$$P_{s'}(\ ) = \left(\sum_{r'} \int m(\ ;\ ')[\ ^{r}_{r',s'} p(\ ;\ ')]^{1-_{s;s'}} dF_{`}(\ '|s') \right)^{\frac{1}{1-_{s;s'}}} \tag{2.9}$$

where $^{r}_{r',s'}$ is the cost of shipping sector s' goods from region r' to region r and $p(\ ;\ ')$ is the price charged by firm $'$ when selling to firm .

Firm Pricing and Firm-to-Firm Matching Given that the price elasticity of demand for a firm's variety only varies across sectors, within each sector pair, a firm does not find it optimal to price discriminate. Firms will find it optimal to price discriminate across sectors, but not within a given sector they are selling to. This implies the standard CES markup over unit cost for each firm:

$$p(\ ;\ ') = \ _{s;s'}\ (\ ') \tag{2.10}$$

where $_{s;s^0}$ $_{s;s^0}$ $=($ $_{s;s^0}$ $1) > 1$, is the markup over the unit cost of production that is charged by all sector s^0 rms when selling to sector s. Firm ^{0} similarly charges a markup over unit costs when selling to the representative household employed in q,z that is given by:

$$p^H_{q;z}(\ ) = \ _{H;s} \ (\ ) \quad (2.11)$$

where $_{H;s}$ $_{H;s} = ($ $_{H;s}$ $1)$.

Given the rm's optimal pricing rule, we can now calculate the pro t the rm would earn from selling to households in any given sector region.

$$^H_{q;z}(\ ) = \frac{1}{1+}(\ _{H;s} \ 1)[\ _{H;s}] \ ^{H;s} [\ ^q_{s;r} \ (\ )]^{1 \ \ H;s} \ I_{q;z}[\ ^H_{s;r}] \ ^{H;s} [P^H_{q;z}] \ ^{H;s \ \ 1} \quad (2.12)$$

Ag)g]TJ markup o

match with customer rms, the selling rm must pay $b_{s;r} f_{s;r}$ in matching costs. Given these assumptions, rm ^{0} will nd it pro table to sell to rm with probability:

$$m(; \ ^0) = F \frac{(; \ ^0)}{b_{s^0;r^0} f_{s^0;r^0}} \tag{2.15}$$

Following with Lim [1] I assume that takes on a Weibull distribution. Therefore the total labor employed by a rm to facilitate matching with all other rms can be calcualted as:

$$FC(\ ) = f_{s;r} \sum_{r^0;s^0} \int E$$

thought of as a communication cost between the customer and supplier. Real-world examples of this fixed cost include time spent communicating with or finding customers, customization of the

Where $_{s;r}$ is the cost of posting each employment vacancy.

Finally, the labor market must clear. That is the number of labor-market matches in a given sector region must equal total employment by firms in the same sector region:

$$H_{s;r} = \int L(\ )dF(\ | s; r) \tag{2.25}$$

2.3 Competitive Equilibrium

Solving the model requires the inclusion of two more sets of equations. First, the goods market must clear. Second the income of households in each sector region must be calculated.

There exists a goods market clearing condition for each variety. Firms sell their output to households and any other firm in any sector region that they agree to match with by paying their fixed cost of matching. Thus the total output of the firm must equal their total sales:

$$X(\ ) = x^H(\ ) + \sum_{s^0 r^0} \int m(\ ^0;\ )x(\ ^0;\ )dF(\ ^0) \tag{2.26}$$

This equation (equation 2.1) and the unit cost equation (equation 2.5) classify every firm's problem as each firm specific variable in the problem can be written in terms of the two variables these equations define, given the other sector region specific variables.

The total income of households in each sector region is calculated by aggregating over the total payments to workers by firms.Since the workers receive a share of profits equal to $= (1 + \ )$ this implies that total income in each sector region must be equal to a share of total sector region

This implies that the total income of workers in sector region $s;r$ is given by:

$$I_{s;r} = \frac{\quad}{1 + \quad} \int (\ ) \quad FC(\ ) dF_{\ell}(\ \ell | s; r) \tag{2.28}$$

Having closed the model we can now de ne a competitive equilibrium of the model:

De nition 2.1. Given a set of parameters and a rm-level distribution of labor augmenting productivities, a competitive equilibrium consists of a set of variables that maps from the binary Cartesian power of the set of all rms,

$$f\, x(\ ; \ ^0); p(\ ; \ ^0); \ (\ ; \ ^0); m(\ ; \ ^0) g_{8\ ;\ \ 0}$$

, a set of variables that maps from the Cartesian product of the set of all rms and the set of sector regions, $f\, x^H_{q;z}(\ ); p^H_{q;z}(\ ); \ ^H_{q;z}(\ ) g_{8\ ;q;z}$, a set of variables that maps from the Cartesian product of the set of all rms and the set of all sectors, $f\, P_{s^0}(\ ); x_{s^0}(\ ) g_{8\ ;s^0}$, a set of variables that maps from the set of all rms,

$$f\, x^H(\ ); X(\ ); \ell(\ ); x(\ ); \ (\ ); P(\ ); \ _H(\ ); FC(\ ); L(\ ); V(\ ); \ (\ ) g_8$$

and a set of variables that maps from the set of all sectors and regions,

$$f\, L_{s;r}; H_{s;r}; V_{s;r}; I_{s;r}; b_{s;r}; P^H_{s;r}\, g_{8s;r}$$

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Parameter	Description	Assumed Value
	Household Bargaining Power	0.5
`	Employment Share of Production	0.5
H	Household's Elasticity of Substitution Across Varieties	5.0
`	Firm's Elasticity of Substitution Between Inputs and Workers	4.0
s	Firm's Elasticity of Substitution Across Sectors	6.0
ss	Firm's Elasticity of Substitution Across Varieties, within a sector	8.0
m	Firm–Worker Matching Function Scale Parameter	1.0
	Weight of Vacancies in Firm-Worker Matching Function	0.5
	Mean of Firm Labor Augmenting Productivities	0.0
	Variance of Firm Labor Augmenting Productivities	1.0
	Scale Parameter of Distribution of Stochastic Firm to Firm Match Cost	1.0
k	Shape Parameter of Distribution of Stochastic Firm to Firm Match Cost	0.25

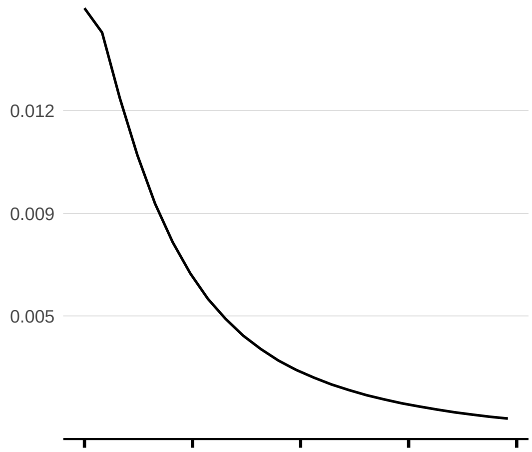
Table 1: Parameters for Simulation

production-network formation in response to changes in trade costs.I then highlight the role that endogenous rm to rm matching plays in how aggregate outcomes change.

3.1 Baseline Model Simulation

I simulate the effect of a tariff in model assuming the parameter values given in table 1.I assume that the rm speci c labor augmenting productivities; are distributed Log-Normal, the mean and variance of their distribution are presented in table 1. In addition to the parameters listed in table 1, I allow to vary across sectors and regions. This parameter will not only drive changes in the cost of hiring workers and thus employment in response to changes in trade costs, but it will also govern how rm speci c production networks will change in response to the imposition of a tariff.

In what follows I assume that there are 2 countries (Home and Foreign), and that Home unilaterally imposes a tariff on imports from one speci c sector in Foreign. This tariff applies to sales to households and rms in Home.



(a) Foreign sector to which the tariff is applied

(b) Non-import competing sectors in Home, within regions

Figure 3.1: Within sector-region average rm-level mass of customers

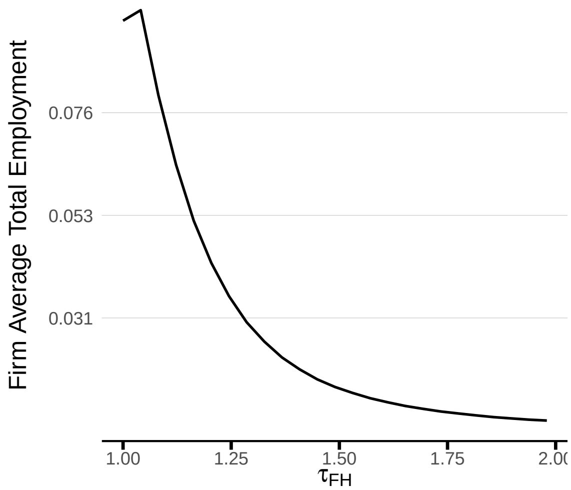
Figure 3.1 presents the average mass of customer rms, across all rms within a given sector-region pair as a share of the total mass of rms in the economy, from the model outlined in section §2.The numbers on the y-axis represented in gure 3.1 are small, however they represent the weighted average across the set of rms within each region. Due to the assumption of the Log Normal distribution of labor augmenting productivities, there are many small rms who are unable to match with any customer rms whatsoever. gure 3.2 presents the results from ??gure presenting the mass of customers for only the largest rm in each region.Note that in free trade the most productive rm in the import competing sector with the lowest cost of posting employment vacancies sales to around 9 percent of all rms in the economy.

Figure 3.2: Import competing sector in Home across regions, values represent the most productive rm in each sector-region pair.

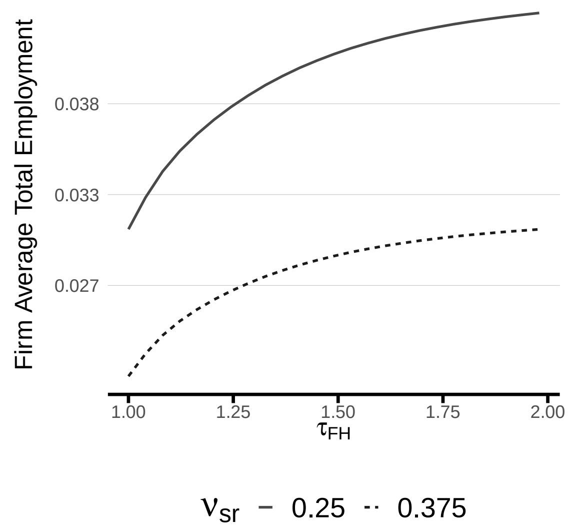
A few results pop out immediately from gure 3.1. First, sector-region pairs with a higher cost of posting employment vacancies feature a lower rm-level average mass of customer rms.This result is due to two mechanisms. The rst the fact that in sector-region pairs with a higher cost of posting employment vacancies the probability of a worker choosing to search in one of these sectors and matching with an employer is lower, due to the fact that rms will post less vacancies since it is more expensive. Since less workers search for employment in these high job-vacancy-posting-cost sectors, due to the low probability rms will in general hire less workers and thus be able to produce less. When rms produce less, they are less attractive as customers to other rms limiting their access to inputs and causing their unit cost to rise.When unit costs rise the rm will nd it less pro table to sell to other rms due to higher unit costs of production, making it much more likely that the rm doesn't sell to rms.The second mechanism is due to the assumption that workers must pay their xed cost of matching in terms of labor, implying for each match with a customer- rm that the selling- rm undertakes they must hire an additional unit of labor, implying the rm must post employment vacancies. This limits the relative number of rm-to- rm-matches that rms in high vacancy-cost sector-regions can have.

The second result from gure 3.1 is that the shape of the response to an increase in the trade costs is highly non–linear. For Foreign rms, the tariff causes the mass of customer rms to decay quickly as trade costs move away from free trade. This is due to the decrease in potential pro ts from selling to rms in Home. Home rms rst see an increase in their mass of customer rms as trade costs move away from free trade. This is because as the tariff increases, Home workers are more likely to search for employment in the import competing sector, lowering the rm's unit cost through lower employee-hiring costs, as shown in gure ??.This means that at rst, rms in the import competing sector are able to match with more customer rms due to their lower unit costs.But as trade costs continue to rise the loss of Foreign suppliers takes over, leading to higher unit costs and a decrease in the mass of customers for rms in the import competing sector industry.Firms in non-import competing sectors follow a similar, but less pronounced, pattern. This is due to the fact that as workers search more in the import competing sector, the cost of hiring workers in the non-import competing sectors increases. However, these rms bene t from the import competing sector's initial growth through the production network.As the gains from the tariff in the import competing sector are eliminated, so to are the lesser gains in the non-import competing sector.

Finally rms in sector-regions with lower costs of posting employment vacancies are more sensitive to changes in the tariff. This is due to the fact that these rms are more integrated with foreign rms, due to their attractiveness as suppliers and customers to other rms.The contrast in responses to trade shocks between sector-regions with different costs of posting employment vacancies is the most pronounced within regions among “non-import competing” sectors, as in gure 3.1b.As trade costs increase, within all regions, each sector sells less due to their increased unit costs (from a lack of access to foreign suppliers).Since low rms are more integrated into the international economy their relative total sales decrease and their relative unit costs increase in response to an increase in the tariff rate.These effects counter act one-another in the labor demand equation. Initially as the tariff increase takes the economy away from free trade the rms demand more workers since unit costs increase by more than sales fall. This effect is more pronounced among high rms due to their greater integration in the production network.

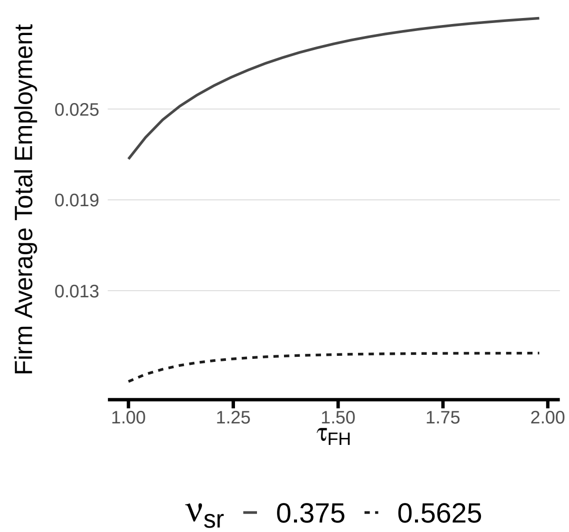


(a) Foreign sector to which the tariff is applied



(b) Import competing sector in Home, across regions

(c) Non-import competing sectors in Home, across regions



(d) Non-import competing sectors in Home, within regions

Figure 3.3: Within sector-region average rm-level total employment

The effect of rm-to- rm matching on sector-region aggregate labor-market variables occurs through two channels, labor demand for production and labor demand for paying the xed cost of matching between rms with the former dominating the latter. The amount of xed cost paid in terms of labor by each rm in a sector region, resembles the rm's mass of customers presented in gure 3.1 and is negligible in magnitude.The effect of rm-to- rm production on labor demand is two-fold.First, since labor demand is increasing in total sales, the inclusion of endogenous production networks lowers the amount of labor demanded by each rm due to the fact that rms are not able to sell to all other rms.Secondly, the inclusion of endogenous production-networks makes labor demand less responsive to the change in the tariff. This is because the inclusion of endogenous production network mutes the effect the tariff relative to a model where rms can freely trade without paying a matching cost.

4 Comparison to Different Models

In this section I compare the model to several other models of international trade to emphasize the crucial interaction between mobile labor supply and endogenous production-network formation. First in order to demonstrate how labor-market-mobility affects production networks, I present the results of a model with endogenous rm to rm matching that does not include labor-market mobility across sectors (analogous to Lim [1] and Huneeus [2]). Presenting these models next to my own highlites the importance of labor-market frictions in determining the production network. I then present two models with labor-market frictions that do not feature endogenous production networks. The rst of the two has no connections across rms (analogous to that of Helpman and Itskhoki [7]). The second allows rms to be connected to all other rms in the economy through an exogenous production network such that there are linkages that are identical across sector pairs (as in Jones [14] or Caliendo, Dvorkin, and Parro [12]).Contrasting against these models stresses the role that endogenous production networks play in labor-supply shifts and other labor-market variables.

4.1 Comparison to Other Models of Endogenous Production-Network Formation

In the rst comparison I emphasize the effect of the reallocation of labor supply across sectors on endogenous production networks by comparing the model to one in which each sector is endowed with an immobile labor supply. The model is not identical to that presented by Lim [1] and Huneeus [2], however it features the same labor-market setting as the model presented above without the conditions given in equation (2.21) and equation (2.22). The amount of labor supply available to each sector is simply given by $L_{s;r} = L_{s;r}$, where $L_{s;r}$ is a simple constant that is equal across sectors and regions. This assumption shuts down the migration of labor across sectors, allowing the comparison of this first counterfactual model to the one presented in section §2 to be interpreted as the effect of labor migration on endogenous production networks.

4.2 Comparison to a Model with Exogenous Input-Output Linkages Across Sectors

In the second comparison I emphasize the importance of endogenous production-network formation in determining labor-market outcomes, by comparing the model to one that features an exogenous production-network as in Jones [14] or Caliendo, Dvorkin, and Parro [12]. Once again, the comparison model is not identical to either of the ones mentioned, however the spirit of the model is similar. All firms within a given sector pair are linked via the input-suitability parameter $_{s}$. More specifically this second counterfactual model assumes that $m(\,;\,^{0}) = 1 \;\; 8\,; \;\; ^{0}$, so that $_{s}$ governs the size of linkages across sectors. This assumption preserves all labor-market features laid out in section §2 and maintains the assumption that all firms are connected. The key difference between this counterfactual model and the baseline model is the assumption that the production-network does not change in response to the tariff as it does in the baseline model.

Figure 4.1 presents the total employment by firms across non-import competing sectors in Home. The baseline model is more responsive to the tariff than the counterfactual model of exogenous input-output linkages. This is due to the fact that in the input-output model the amount of inputs available to each drastically falls in response to the tariff, whereas in the endogenous production-network model even in free trade only some firms are exposed to the Foreign market

Figure 4.1: Labor Demand in Non-Import Competing Sectors in Home

and implementing the tariff only affects some rms. As the tariff continues to increase, the labor demand in IO model attens out while labor demand in the endogenous matching model continues to increase. This is due to the changing relationships between other domestic rms. As the import competing sector bene ts from the tariff, this spills over into the non-import competing sector through more connections being formed in the endogenous model . This effect is absent in the input-output model since the network between all rms at home are left unaffected.

5 Conclusion

This paper highlights the fact that models of endogenous production-network formation are inseparable from models of labor-market frictions that feature labor mobility across sectors by presenting a model of endogenous production-network formation and labor-market frictions.Comparing the model to one without labor-market frictions reveals the importance of inter-sectoral labor-market mobility in determining how endogenous production-networks change in response to tariffs. Looking at the model next to one with an exogenous anfog

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