

# Organizational Belief, Managerial Vision, and International Trade

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## Abstract

In this paper, we develop a simple general-equilibrium trade model in which heterogeneous workers make an investment decision in acquiring advanced managerial skills and choose their optimal effort level based on their own individual organizational beliefs and CEO's managerial vision. In doing so, we show how trade liberalization and/or changes in managerial vision of CEO may lead to non-monotonic income changes within firms due to the interaction between workers' beliefs and CEO's managerial vision. Whether a stronger (or weaker) CEO's managerial vision benefits the firm or not depends on its extent relative to workers' overall beliefs, and may involve some winners and losers within firms.

*Keywords:* Organizational belief, Managerial vision, Organizational change, International trade.

*JEL codes:* F16, F66.

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# 1 Introduction

Why some firms engage in international trade while the others focus only on domestic market, and the impacts of trade liberalization (or more broadly, globalization) when firms differ have long been one of the main concerns of trade economists. Addressing these issues, recent firm heterogeneity literature in international trade discovered many systematic links between the characteristics of firms and their degree of internationalization. In particular, it is now widely documented that exporting firms are more productive than non-exporters and/or that more productive firms self-select into export markets (see e.g. Clerides et al., 1998; Bernard and Jensen, 1999). Consequently, on the theoretical side such selection effects of trade have largely been modeled and examined by incorporating exogenously given firm-level productivity differences (see Melitz, 2003). Another branch of modeling firm heterogeneity is to assume exogenously given worker-level ability differences and consider firms' endogenous technological choice together with employment decisions (see e.g. Yeaple, 2005; Jung and Mercenier, 2014). Some other papers model a continuum of tasks instead of a continuum of heterogeneous worker skills (see e.g. Grossman and Rossi-Hansberg, 2008; Acemoglu and Autor, 2011). Costinot and Vogel (2010) generalize this by assuming log-supermodularity between continuum of worker skills and continuum of tasks.

Though many important new insights have been gained at the aggregate level, all these approaches are, however, limited in studying intra-firm managerial mechanisms and the resulting strategic direction and performance of firms. It has been extensively discussed in the management literature that the interaction between CEO's managerial vision and employees' organizational beliefs has a considerable influence to form a corporate culture, and thus has important implications for the firm's behavior and performance: see, for instance, Schein (2004) and references therein. Though the economic literature has largely neglected these issues, some exceptions are found. By formally modeling CEO's leadership style and/or vision, Rotemberg and Sloner (1993, 2000) show that managerial preferences have an important effect on firm performance through encouraging incentives. Van den Steen (2005, 2010a,b) focuses on the sorting effect induced by managerial beliefs and shows that a firm attracts employees having

similar beliefs to that of its manager and the shared beliefs have very pervasive performance effects for the firm. Also some papers study how managerial characteristics can be determinant of firm boundaries (see e.g. Hart and Holmstrom, 2010). While the important implications of organizational belief and managerial vision on firm strategy and performance have been widely documented in the management literature during the last decades and some pioneering papers dealt with these implications in economics context, much less attention has been devoted to studying such implications in the international trade context.

In this paper, we make a first attempt in the literature (at my best knowledge) to bridge the gap. We develop a simple general-equilibrium trade model in which heterogeneous employees make an investment decision in acquiring advanced managerial skills and choose their optimal effort level based on their own individual organizational beliefs and CEO's managerial vision. Firms are free to enter the market and choose whether or not to enter the export market according to CEO's managerial vision. The key element of the model is the interaction between workers' organizational beliefs and CEO's managerial vision concerning two market strategies: localization vs. internationalization. Since similar beliefs lead to higher productivity as well as obtaining managerial skills requires learning costs, workers endogenously sort into CEOs and tasks (production vs. management). Finally, workers with high beliefs on internationalization self-select to work as managers in exporting firms, while those with high beliefs on localization self-select to work as managers in domestic firms. The middling workers having relatively indifferent beliefs on both strategies self-select to work as production workers without making any investment to obtain managerial skills. By modeling explicitly the optimal effort level decision of individual workers based on their own beliefs and CEO's managerial vision, the model therefore highlights a new source of productivity effects from trade and changes in CEO's managerial vision which could not be captured by previous models in the firm heterogeneity literature where the productivity effect comes mainly from the self-selection (reassignment) of firms (or workers) with exogenously given productivity (or ability) differences.

Given this setup, we first investigate the effects of trade liberalization due to a fall in marginal trade cost. Since the externality between workers' organizational beliefs

and CEO's managerial vision is the key element of the model, two versions of the model are explored: *i*) workers' productivity monotonically rises in both workers' organizational beliefs and CEO's managerial vision, and *ii*) CEO has an overall stronger belief than employees but his/her belief lies within the range of workers' beliefs so that the similarity of beliefs matters more. In both of the cases, trade liberalization increases the optimal effort level of exporting-firm managerial workers while decreases that of domestic-firm managerial workers, which in turn results in a rise of within-exporting-firm income inequality and a compression of it within domestic firms. On the other hand, in the former case it is the worker having the highest internationalization (localization) belief whose income increases (decreases) the most, while in the latter case it is the worker having the same belief as that of CEO whose income is affected the most (a rise in exporting firms and a fall in domestic firms, respectively).

We then investigate the impact of changes in managerial vision for both cases. Here, the two versions of the model lead to significantly different results. In the first case, a rise of managerial vision in exporting firms yields similar effects as trade liberalization, which favors in general exporters. Optimal effort level of exporting-firm managerial workers rises while that of domestic-firm managerial workers decreases, which in turn results in a rise of within-exporting-firm income inequality and a compression of it within domestic firms. A rise of managerial vision in domestic firms yields just the inverse effects. On the other hand, in the second case the income implications are more complex. When CEOs are visionary in the sense that CEOs have beliefs at least stronger than the median belief of inside managers, a further rise of managerial vision in exporting firms favors domestic firms since CEO's belief gets even far from overall beliefs of employees. This may involve some winners and losers within exporting firms since some workers with initially stronger beliefs than that of CEO now get closer to CEO's managerial vision, while some others get far from it. Also interestingly, a rise of managerial vision in exporting firms increases the income of domestic-firm managerial workers. Similarly, a fall in managerial vision in domestic firms favors domestic firms since CEO's managerial vision now gets closer to overall beliefs of employees. Thus, whether a stronger (or weaker) CEO's managerial vision benefits the firm or not depends on its extent relative to within-firm workers' overall beliefs,

and may involve some winners and losers within the same firm.

The rest of the paper is organized as follows. In Section 2, we present the basic setup of the model where workers' productivity monotonically rises in both workers' organizational beliefs and CEO's managerial vision. In Section 3 and 4, we study the effects of trade liberalization and changes in managerial vision in this case. In Section 5, we extend the basic model to incorporate more explicitly externalities from the similar CEO's managerial vision and workers' organizational beliefs, and investigate the effects of trade liberalization and changes in managerial vision in this case. Section 6 supplements our theoretical discussions by exploring numerically a parameterized version of the model. Section 7 concludes with some concluding remarks.

## 2 Setup of the model

We consider two symmetric countries. Each country is populated by a unit mass continuum of workers (households), indexed by  $z$ . The distribution is given by  $G(z)$  with density  $g(z)$  on support  $[0, 1]$ . For simplicity of analysis, we assume a uniform distribution. All workers are endowed with one unit of raw input  $R$ . Each worker either provides  $R$  or can make investments to gain managerial skills,  $M$ . There are two types of managerial skills to be obtained for two types of strategies,  $s \in \{D, E\}$ : localization (domestic) strategy-specific  $M_D$  or internationalization (exporting) strategy-specific  $M_E$ .

### 2.1 Organizational belief and managerial vision

One key element of the model is the uncertainty about the market demand of the two types of  $M_s$ ,  $s \in \{D, E\}$ . All workers have their own subjective belief about the likelihood of each strategy dominance in the market (and/or in the organization they work for). Workers' beliefs differ, but are common knowledge. We align workers according to their belief from high  $D$ -strategy belief to high  $E$ -strategy belief: a worker  $z$  believes that with probability  $z$  the dominant overall market (and/or organization he/she works for) strategy is  $E$ , while believes with probability  $(1 - z)$   $D$  is dominant; a worker with  $z = 1/2$  has the same belief in both states, and is thus indifferent to

both strategies.<sup>1</sup>

We now consider managerial vision of CEOs (or entrepreneurs). A vision is defined as a strong belief of CEO about the right course of action for the firm. A CEO is visionary when his/her belief is at least stronger than the median (reference) belief of his/her managerial team. There are two types of CEOs with different managerial visions  $v_s$ ,  $s \in \{D, E\}$ : a CEO with  $v = v_s$  has a strong belief to pursue  $s$ -strategy,  $s \in \{D, E\}$ . The output of a  $M$ -worker with organizational belief  $z$  depends on his/her own effort level  $e_z$  for both strategies and the CEO's managerial vision:<sup>2</sup>

$$q_z^s = \varphi_z^s e_z^s, \quad s \in \{D, E\}, \quad (1)$$

where  $\varphi_z^s$  is a function of  $z$  and  $v_s$ , a productivity factor that converts individual effort into respective output of  $M_D$  or  $M_E$ . We assume positive externalities between a worker's organizational belief  $z$  and CEO's managerial vision  $v$  in a sense that the closer between  $z$  and  $v$  is, the more productive the worker is.<sup>3</sup> In order to highlight the main mechanisms through which workers' organizational beliefs and CEO's managerial vision interact, in this section we begin by considering a simpler version of the model in which  $\varphi_z^s$  is linear in  $z$  and  $v_s$ ,  $s \in \{D, E\}$ . Specifically, we assume that:

$$\varphi_z^D = 1 + v_D(1 - z), \quad \text{and} \quad \varphi_z^E = 1 + v_E z. \quad (2)$$

Eq. (2) implicitly implies that CEO's managerial vision is stronger enough than any worker's belief in each managerial team, so that  $\varphi_z^D$  and  $\varphi_z^E$  monotonically increase in  $(1 - z)$  and  $z$ , respectively, and that even stronger managerial vision only affects positively workers' productivity. This will be relaxed later.

Learning managerial skills requires each strategy-specific individual investments  $c_s$ ,  $s \in \{D, E\}$ , measured in terms of individual's forgone output. We assume that

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<sup>1</sup>This mirror-characteristic linear belief schedule is adopted for simplification reason. Any more general functional forms, however, can of course be adopted.

<sup>2</sup>Various interpretations might be applicable to the  $M$ -workers. One natural interpretation would be middle managers who carry out the strategic directives of CEO at the operational level and supervise the production  $R$ -workers. In the paper we refer to them as managerial workers or simply managers in contrast to CEO and production workers.

<sup>3</sup>It is widely documented that similar beliefs between manager and employees (shared beliefs) have considerable influences for corporate culture and to enhance firm performance: see e.g. Van den Steen (2010a,b) and references therein.

$c_D < c_E$ . Workers derive utility from net income, and disutility from exerting effort. The utility function is given by:

$$u_z^s = w_s (q_z^s - c_s) - \gamma (e_z^s)^2, \quad s \in \{D, E\}, \quad (3)$$

where  $w_s$  is respective measured-in-efficiency-units wage rate for  $s \in \{D, E\}$ , and  $\gamma > 0$  is a parameter that governs disutility from exerting effort. A utility-maximizing worker  $z$  determines his/her optimal level of effort for a given wage rate. From Eqs. (1), (2) and (3), optimal effort level of a worker  $z$  is given by:

$$e_z^{Opt} = \begin{cases} \frac{w_D[1+v_D(1-z)]}{2\gamma} & \text{if } s = D \\ \frac{w_E[1+v_E z]}{2\gamma} & \text{if } s = E. \end{cases} \quad (4)$$

Given this individual optimal level of effort and from Eqs. (1) and (2), the output of a worker  $z$  is then given by:

$$q_z^{Opt} = \begin{cases} \frac{w_D[1+v_D(1-z)]^2}{2\gamma} & \text{if } s = D \\ \frac{w_E[1+v_E z]^2}{2\gamma} & \text{if } s = E. \end{cases} \quad (5)$$

Note from above that  $e_z^{Opt}$  and  $q_z^{Opt}$  increase in respective wage rate and managerial vision, while decrease in  $\gamma$ .

## 2.2 Production

There is a continuum of firms, each producing a differentiated variety  $i$  using a Leontief technology. Production of any variety requires combining two inputs,  $\alpha_R$  units of  $R$  and  $\alpha_M$  units of  $M$  or equivalently,  $\alpha_R$  efficiency units of production workers and  $\alpha_M$  efficiency units of non-production managerial workers:<sup>4</sup>

$$x(i) = \min \left( \frac{R(i)}{\alpha_R}, \frac{M(i)}{\alpha_M} \right). \quad (6)$$

Firms are free to enter the market and choose whether or not to engage in interna-

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<sup>4</sup>These two inputs can also be viewed as blue-collar tasks and white-collar tasks which are not substitutable in general. Introducing some substitutability between the two inputs is straightforward, but that would only complicates the analysis with no additional insight gained.

tional trade according to CEO's managerial vision.<sup>5</sup> Adopting either strategy incurs strategy-specific fixed costs  $f_s$ ,  $s \in \{D, E\}$ , measured in terms of firms' foregone output.<sup>6</sup> We assume that  $f_D < f_E$ .

Firms are atomistic profit-maximizers and produce goods under monopolistic competition, so that firms charge a constant mark-up over marginal production costs. From the Leontief technology (6), prices are given by:

$$p_s = \frac{\sigma}{\sigma - 1} (\alpha_R w + \alpha_M w_s), \quad s \in \{D, E\}, \quad (7)$$

where  $w$  and  $w_s$ ,  $s \in \{D, E\}$ , are unit production costs of each input (or task-specific efficiency wage rates).

### 2.3 Self-selection of workers

Assuming in what follows that both firm types,  $D$  (domestic) and  $E$  (exporting), exist in equilibrium, workers will sort based on their respective organization belief  $z$ . Let  $z_1$ ,  $z_2$  and  $z_3$  be equilibrium thresholds with  $0 < z_1 < z_2 < z_3 < 1$ . Then from Eqs. (1) and (2), workers with low  $z$ ,  $z \in [0, z_1]$ , would self-select to develop and provide  $D$ -specific managerial inputs ( $M_D$ ), whereas workers with high  $z$ ,  $z \in [z_3, 1]$ , would self-select to develop and provide  $E$ -specific managerial inputs ( $M_E$ ). The middling workers,  $z \in [z_1, z_3]$ , are relatively indifferent to both strategies, and thus provide their inherently endowed raw inputs  $R$  without making any investment to obtain managerial skills. Assuming further that workers with relatively similar beliefs work together, workers with  $z \in [z_1, z_2]$  provide  $R$  in domestic firms, while workers with  $z \in [z_2, z_3]$  provide  $R$  in exporting firms.<sup>7</sup>

From Eq. (5), competitive wage of a worker  $z$  net of any learning costs  $c_s$  is therefore given by:

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<sup>5</sup>Why CEOs have different vision is out of the scope of this paper, but it is widely documented that firm policies and/or strategies systematically depend on the identity of the CEO. See e.g. Bertrand and Schoar (2003).

<sup>6</sup>Given that in what follows we focus on wage distribution due to individual employees' self-selection and do not model explicitly the earnings of CEOs, these fixed costs can also be viewed as including the payments to CEOs.

<sup>7</sup>Given that all the workers with  $z \in [z_1, z_3]$  offer homogeneous  $R$ , this distinction has no effect on the main results of the paper. But it serves for the boundary between the two firm-types as well as corresponds to the widely documented corporate culture literature in the management.



$$w(z) = \begin{cases} w_D \left[ \frac{w_D [1+v_D(1-z)]^2}{2\gamma} - c_D \right] & 0 \leq z \leq z_1 \\ w & z_1 \leq z \leq z_3 \\ w_E \left[ \frac{w_E [1+v_E z]^2}{2\gamma} - c_E \right] & z_3 \leq z \leq 1, \end{cases} \quad (8)$$

where we choose  $w$  as our numeraire:  $w = 1$ .

In a perfectly competitive labor market, no-arbitrage conditions for the threshold workers lead to:

$$w_D \left[ \frac{w_D [1 + v_D (1 - z_1)]^2}{2\gamma} - c_D \right] = 1, \quad \text{and} \quad (9)$$

$$w_E \left[ \frac{w_E [1 + v_E z_3]^2}{2\gamma} - c_E \right] = 1, \quad (10)$$

which implicitly pin down  $z_1$  and  $z_3$  as a function of  $w_D$  and  $w_E$ , respectively, and vice versa. Investigating Eqs. (9) and (10) leads immediately to following lemma.<sup>8</sup>

**Lemma 1** *A rise (fall) in  $w_D$  increases (decreases) the threshold  $z_1$ , while a rise (fall) in  $w_E$  decreases (increases) the threshold  $z_3$ :  $\frac{dz_1}{dw_D} > 0$  and  $\frac{dz_3}{dw_E} < 0$ .*

Intuitively, higher managerial wages attract more workers to invest and develop managerial skills rather than simply offering their inherently endowed  $R$ .

Following Figure 1 illustrates the equilibrium individual wage distribution for different organizational beliefs.

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<sup>8</sup>Totally differentiating Eq. (9) and using Eq. (9), we get  $\frac{dz_1}{dw_D} = \frac{\gamma(2+c_D w_D)}{v_D w_D^3 [1+v_D(1-z_1)]} > 0$ . Similarly, totally differentiating Eq. (10), we get  $\frac{dz_3}{dw_E} = -\frac{\gamma(2+c_E w_E)}{v_E w_E^3 (1+v_E z_3)} < 0$ .

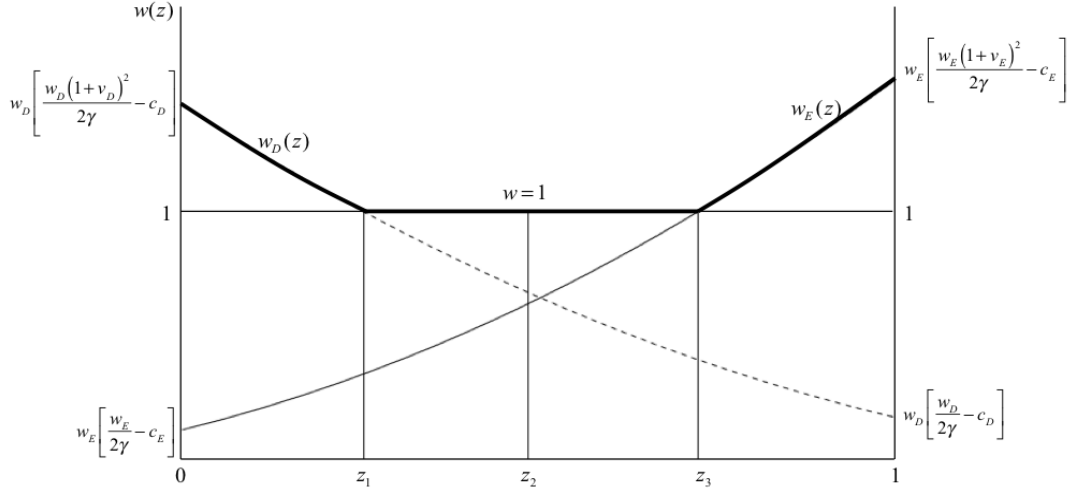


Figure 1: The equilibrium individual wage distribution

As the figure shows, workers with high  $z$  (high  $E$ -belief) get paid the most when they work for exporting firms as managerial workers, while workers with low  $z$  (high  $D$ -belief) get paid the most when they work for domestic firms as managerial workers. The middling workers having relatively indifferent beliefs get the highest wage when they work as production workers without making any investment to be a manager. Finally, the outer bold curve in Figure 1 represents the equilibrium individual wage distribution resulting from self-selection of workers based on their individual organizational beliefs.<sup>9</sup>

## 2.4 Demand

Households have Dixit-Stiglitz preferences over a continuum of differentiated varieties:

$$C = \left[ \int_{i \in N} x(i)^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}}, \quad (11)$$

<sup>9</sup>Note that in each firm-type (domestic or exporting), firms are identical so that the same number of workers for each belief level is employed: each domestic (exporting) firm employs all the workers with  $z \in [0, z_2]$  ( $z \in [z_2, 1]$ ), respectively. Why do firms employ all the workers with different belief levels rather than employ some specific belief-level workers given that all of them offer homogeneous  $R$  or  $M$ ? Though current paper does not model it explicitly, it can be easily justified by the externalities from diversity.

where  $N$  represents the mass of available varieties, and  $\sigma > 1$  is the elasticity of substitution between varieties. Consumer's optimization yields demand schedule for each variety:

$$x(i) = \left[ \frac{P_C}{p(i)} \right]^\sigma C, \quad (12)$$

associated with an aggregate price index:

$$P_C = \left[ \int_{i \in N} p(i)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}. \quad (13)$$

We assume that exporting goods is associated with iceberg trade costs  $\tau > 1$  per unit. The domestic demands for domestically produced and imported goods are then given respectively by:

$$x_s^d = \left[ \frac{P_C}{p_s} \right]^\sigma C, \quad s \in \{D, E\}, \quad \text{and} \quad x_m^d = \tau^{1-\sigma} \left[ \frac{P_C}{p_E^*} \right]^\sigma C, \quad (14)$$

where  $p_E^*$  denotes foreign exporters price.<sup>10</sup>

The aggregate consumption price index (13) can be written as:

$$P_C = \left[ N_D p_D^{1-\sigma} + N_E p_E^{1-\sigma} + N_E^* (\tau p_E^*)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \quad (15)$$

where  $N_D$ ,  $N_E$  and  $N_E^*$  denote the number of domestic, exporting and foreign exporting firms, respectively, and  $N_E = N_E^*$  and  $p_E = p_E^*$  from the symmetry.

## 2.5 Equilibrium

From previously defined  $z_1$ ,  $z_2$  and  $z_3$ , the total supply of  $R_s$ ,  $s \in \{D, E\}$ , is given by:

$$R_D = \int_{z_1}^{z_2} 1g(z)dz, \quad \text{and} \quad R_E = \int_{z_2}^{z_3} 1g(z)dz, \quad (16)$$

which also can be written simply as  $R_D = z_2 - z_1$  and  $R_E = z_3 - z_2$  from our uniform distribution assumption. The total supply of  $M_s$ ,  $s \in \{D, E\}$ , is given respectively by:

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<sup>10</sup>In what follows, we use an asterisk to denote foreign variables.

$$\begin{aligned}
M_D &= \int_0^{z_1} \left[ \frac{w_D [1+v_D(1-z)]^2}{2\gamma} - c_D \right] g(z) dz, \\
M_E &= \int_{z_3}^1 \left[ \frac{w_E [1+v_E z]^2}{2\gamma} - c_E \right] g(z) dz.
\end{aligned} \tag{17}$$

From the technology (6) and Eqs. (16) and (17), it follows then that:

$$\frac{1}{\alpha_R} \int_{z_1}^{z_2} 1g(z) dz = \frac{1}{\alpha_M} \int_0^{z_1} \left[ \frac{w_D [1+v_D(1-z)]^2}{2\gamma} - c_D \right] g(z) dz, \tag{18}$$

$$\frac{1}{\alpha_R} \int_{z_2}^{z_3} 1g(z) dz = \frac{1}{\alpha_M} \int_{z_3}^1 \left[ \frac{w_E [1+v_E z]^2}{2\gamma} - c_E \right] g(z) dz. \tag{19}$$

Free entry ensures zero profits for both firm types, so that mark-up revenues exactly cover the fixed costs (forgone outputs):

$$\frac{1}{\sigma} p_s x_s = (\alpha_R w + \alpha_M w_s) f_s, \quad s \in \{D, E\}, \tag{20}$$

where  $x_D = x_D^d$  and  $x_E = x_E^d + x_m^{d*}$ . Now consider the revenue ratio between domestic firms and exporters. From (7), (14) and (20), we have:

$$\left[ \frac{\alpha_R w + \alpha_M w_E}{\alpha_R w + \alpha_M w_D} \right] = \left[ \frac{f_E}{(1 + \tau^{1-\sigma}) f_D} \right]^{-\frac{1}{\sigma}}. \tag{21}$$

Here from the assumption that domestic firms serve only domestic market (or equivalently, domestic firms exist in equilibrium), it can be easily derived that  $w_E < w_D$ , implying that  $p_E < p_D$ .<sup>11</sup> Given the presence of both fixed cost to exporting and iceberg trade cost, entering the export market requires to offer their products at cheaper prices than their local competitors to be profitable. Also, from our characterization of fixed costs as foregone output and from the technology (6), we have the following equilibrium condition:

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<sup>11</sup>Suppose potential revenue of  $D$ -firms,  $y_D^*$ , if they would engage in international trade too after paying the fixed cost to exporting  $f_E$ . The fact that domestic firms serve only domestic market implies that the potential mark-up revenue from exporting does not cover the necessary fixed costs:  $\frac{1}{\sigma} y_D^* < (\alpha_R w + \alpha_M w_D) f_E$ . Now consider the revenue ratio between exporting  $E$ -firms and these potential  $D$ -firms. From Eqs. (7), (14) and (20), and now by substituting  $x_D^* = x_D^d + x_m^{d*}$  and  $f_E$  for  $x_D$  and  $f_D$ , respectively, we get  $\frac{\sigma y_E}{\sigma y_D^*} = \left( \frac{\alpha_R w + \alpha_M w_E}{\alpha_R w + \alpha_M w_D} \right)^{1-\sigma}$ , while the fixed cost ratio is given by  $\frac{(\alpha_R w + \alpha_M w_E) f_E}{(\alpha_R w + \alpha_M w_D) f_E}$ . Now we have  $\left( \frac{\alpha_R w + \alpha_M w_E}{\alpha_R w + \alpha_M w_D} \right)^{1-\sigma} > \frac{(\alpha_R w + \alpha_M w_E) f_E}{(\alpha_R w + \alpha_M w_D) f_E}$  since  $\frac{1}{\sigma} y_D^* < (\alpha_R w + \alpha_M w_D) f_E$ . Arranging this leads to  $\frac{\alpha_R w + \alpha_M w_E}{\alpha_R w + \alpha_M w_D} < 1$ , which implies that  $w_E < w_D$  and  $p_E < p_D$ .

$$\frac{1}{\alpha_M} M_s = (x_s + f_s) N_s, \quad s \in \{D, E\}. \quad (22)$$

Finally, aggregate income follows from factor supplies and prices:

$$Inc = w(R_D + R_E) + w_D M_D + w_E M_E. \quad (23)$$

To sum up, in this model the equilibrium is characterized by five key variables –  $z_1$ ,  $z_2$ ,  $z_3$ ,  $w_D$  and  $w_E$  –, which are determined by five equations (9), (10), (18), (19) and (21). In the following sections, we therefore focus on how these variables are affected by parameter changes in  $\tau$ ,  $v_E$  and  $v_D$ .

### 3 Trade liberalization

In this section we investigate the impacts of trade liberalization. For this, we begin by studying possible relations between the thresholds ( $z_1$ ,  $z_2$  and  $z_3$ ) and  $w_s$ ,  $s \in \{D, E\}$ . It can be done by investigating Eqs. (18) and (19). Consider now a rise in  $z_1$ . From Lemma 1 ( $dz_1/dw_D > 0$ ), this increases RHS of Eq. (18) unambiguously, which in turn induces a rise in  $z_2$  due to a rise in demand for  $R$  in domestic firms. This rise in  $z_2$  decreases LHS of (19) for a given  $z_3$ . Then from Lemma 1 ( $dz_3/dw_E < 0$ ) again, it is straightforward to check that a rise in  $z_3$  is the only possibility to recover the equilibrium condition (19). A fall in  $z_1$  induces inverse effects from the same reasoning. The following lemma establishes.

**Lemma 2**  $z_1$ ,  $z_2$  and  $z_3$  move in the same direction. And if  $z_1$ ,  $z_2$  and  $z_3$  increase,  $w_D$  rises and  $w_E$  falls, while if  $z_1$ ,  $z_2$  and  $z_3$  decrease,  $w_D$  falls and  $w_E$  rises.

We now consider trade liberalization. Trade liberalization can occur either from a fall in  $\tau$  or from a fall in fixed costs to exporting  $f_E$ , both of which induce very similar qualitative effects from Eq. (21).<sup>12</sup> Let us consider a fall in  $\tau$ . This increases RHS of Eq. (21) unambiguously, which in turn induces a rise in  $w_E/w_D$  to recover

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<sup>12</sup>One difference lies on the individual firm size adjustments. In this type of monopolistic competition models, changing the marginal costs to exporting ( $\tau$ ) indirectly affects the relative individual firm size from the market competition, while changing firms' fixed costs directly influences the individual firm size.

the equilibrium. Then, from Eq. (21) and Lemma 2, following proposition establishes immediately.

**Proposition 1** *A fall in  $\tau$  induces a fall in  $w_D$  and a rise in  $w_E$ , and  $z_1$ ,  $z_2$  and  $z_3$  decrease.*

From Proposition 1 and Eqs. (4) and (5), following corollaries follow then immediately.

**Corollary 1** *A fall in  $\tau$  increases the optimal effort level of exporting-firm managerial workers, while decreases that of domestic-firm managerial workers. Consequently, exporting firms' overall productivity increases, while that of domestic firms decreases.*

**Corollary 2** *A fall in  $\tau$  increases between-firm relative managerial incomes in favor of exporting firms; decreases within-firm income inequality in domestic firms, while increases it in exporting firms:  $d\left(\frac{w_E}{w}\right)/d\tau < 0$ ,  $d\left(\frac{w_D}{w}\right)/d\tau > 0$ , and  $d\left(\frac{w_E}{w_D}\right)/d\tau < 0$ .*

Following Figure 2 illustrates the induced changes in the equilibrium wage distribution.

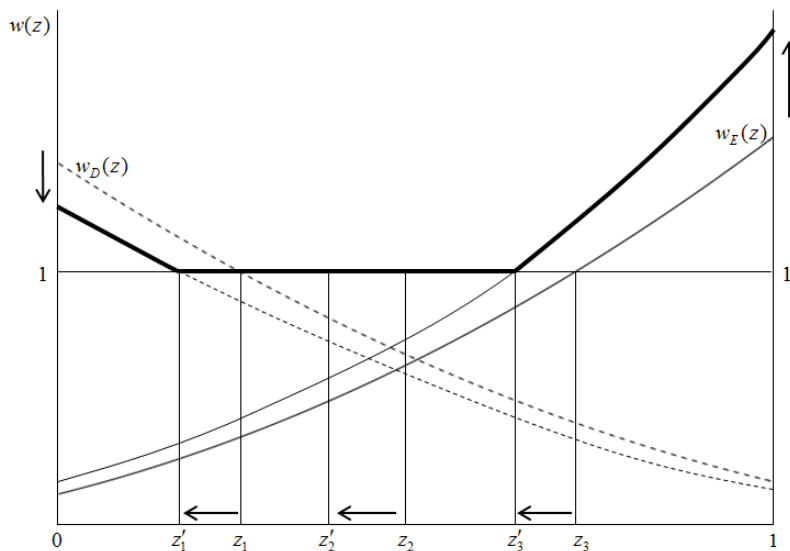


Figure 2: The effects of a fall in  $\tau$  on the equilibrium wage distribution

The rise in  $w_E$  attracts more workers,  $z \in [z'_3, z_3]$ , to invest in obtaining managerial skills and to become managers in exporting firms, while the fall in  $w_D$  induces some managers with relatively low  $D$ -beliefs,  $z \in [z'_1, z_1]$ , to disinvest and turn to production workers in domestic firms. The expansion (compression) of exporting (domestic) firms leads to more (less) employment of production workers in exporting (domestic) firms, so that some production workers previously employed in domestic firms,  $z \in [z'_2, z_2]$ , are now employed by exporting firms.

The impact of a fall in  $\tau$  on market concentration can be investigated as follows. From Eqs. (7), (17), (20) and (22), we have:

$$\begin{aligned} N_D &= \frac{1}{\sigma f_D \alpha_M} \int_0^{z_1} \left[ \frac{w_D [1+v_D(1-z)]^2}{2\gamma} - c_D \right] g(z) dz, \\ N_E &= \frac{1}{\sigma f_E \alpha_M} \int_{z_3}^1 \left[ \frac{w_E [1+v_E z]^2}{2\gamma} - c_E \right] g(z) dz. \end{aligned} \quad (24)$$

From Proposition 1, following corollary follows immediately.

**Corollary 3** *A fall in  $\tau$  reduces the number of domestic firms ( $N_D$ ), while increases that of exporting firms ( $N_E$ ).*

## 4 The impacts of managerial vision

In this section we now investigate the impacts of changes in managerial vision. Note that the analysis is not as simple as before since changes in managerial vision directly affect the productivity factor in Eq. (2) from the externality between workers' organizational beliefs and CEO's managerial vision, so that now Lemmas 1 and 2 do not hold a priori. The impacts can be investigated in the following steps instead. Given that the same reasoning applies for changes in  $v_E$  or  $v_D$ , here we focus on a rise in  $v_E$ .

First, consider relatively short-run within-exporting-firm impacts. (i) For given employment level and measured-in-efficiency-units wage rate (given  $z_2$  and  $w_E$ ), the first-order direct impact of a rise in  $v_E$  is to increase expected remunerations for managerial workers, which induces a fall in  $z_3$ . (ii) Then, to recover the within-firm factor clearing condition (19),  $w_E$  starts to decrease and  $z_3$  is shifted back, but finally is situated somewhere below the initial  $z_3$ . By considering  $w(z)/w_E$  schedule from Eq. (8)

and from Eq. (10), following figure illustrates the short-run within-exporting-firm adjustments, where  $z_3^0$  denotes the initial level of  $z_3$ , while  $z_3^1$  and  $z_3^2$  denote the sequential changes in  $z_3$ .

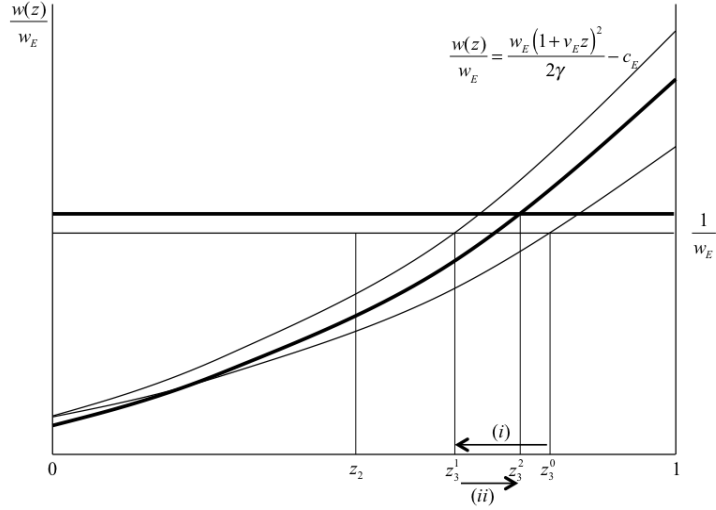


Figure 3: First impacts of a rise in  $v_E$  within exporting firms

These changes will then induce between-firm repercussions. From Eq. (21), a fall in  $w_E$  induces a fall in  $w_D$ , which in turn induces a fall in  $z_1$  from Eq. (9). The final equilibrium requires overall factors' market clearing conditions (18) and (19). Note from Figure 3 that  $w(z)/w_E$  schedule represents also individual's output (net of learning cost  $c_E$ ) schedule from Eq. (5). A rise in  $v_E$  together with the induced leftward shift of  $z_3$  requires more employment of production workers within exporting firms. On the other hand, a fall in  $w_D$  together with leftward shift of  $z_1$  clearly implies less employment of production workers within domestic firms. Finally, from Eqs. (18) and (19)  $z_2$  should shift left to ensure the overall factors' market clearing.

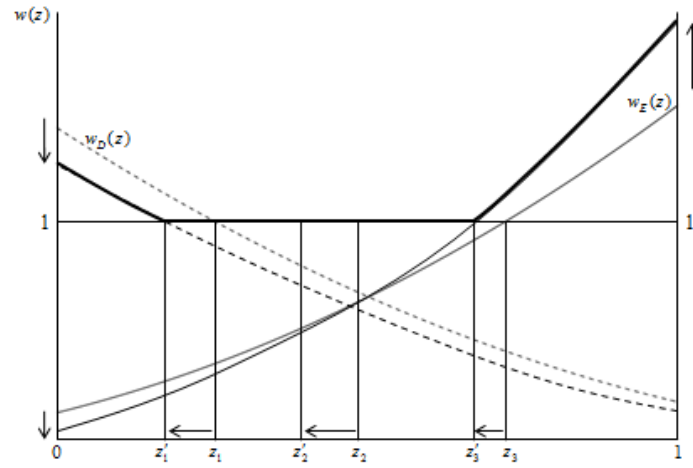
The same reasoning applies for a rise in  $v_D$ , which induces falls in  $w_D$  and  $w_E$ , and rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$ . The effects are summarized in the following proposition.

**Proposition 2** *In this economy, a rise in  $v_E$  induces falls in  $w_D$  and  $w_E$ , and leftward*

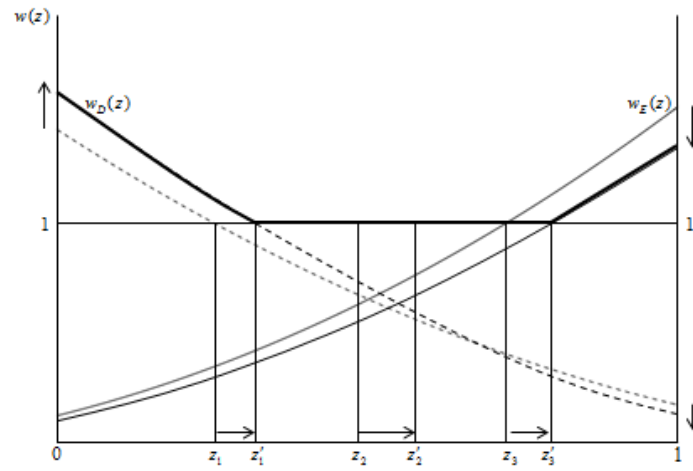


shifts of  $z_1$ ,  $z_2$  and  $z_3$ . A rise in  $v_D$  induces falls in  $w_D$  and  $w_E$ , and rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$ .

Following Figure 4 illustrates the induced changes.



(a) Arise in  $v_E$



(b) Arise in  $v_D$

Figure 4: The effects of a rise in  $v_E$  and  $v_D$  on the equilibrium wage distribution

Note the positive relationships among the optimal effort level (4), output level (5), and wage schedule of workers (8). Following corollary follows immediately.

**Corollary 4** A rise in  $v_E$  ( $v_D$ ) increases (decreases) the optimal effort and output lev-

els of exporting-firm managerial workers, while decreases (increases) those of domestic-firm managerial workers.

Also, as Figure 4 shows, following corollary follows immediately concerning income changes.

**Corollary 5** *A rise in  $v_E$  increases between-firm relative managerial incomes in favor of exporting firms; decreases within-firm income inequality in domestic firms, while increases it in exporting firms. Contrarily, a rise in  $v_D$  induces the inverse effects.*

Note however that the effects on the measured-in-efficiency-units wages are not the same as the changes in income in this case. In this economy, a rise in  $v_E$  (or  $v_D$ ) acts like a technological shock that positively affects the associated workers' productivity. Though a rise in  $v_E$  (or  $v_D$ ) decreases the associated measured-in-efficiency-units wage rate  $w_E$  (or  $w_D$ ), the final income of managerial workers increases due to the positive productivity effect. Thus in this economy, CEO's stronger vision attracts more workers to invest in obtaining related managerial skills and to become managers within firms, while the opposite occurs within competitors.<sup>13</sup>

From the above induced changes and from Eq. (24), following corollary follows.

**Corollary 6** *A rise in  $v_E$  ( $v_D$ ) increases the number of exporting (domestic) firms, while reduces the number of domestic (exporting) firms.*

## 5 Externalities from the similar $v$ and $z$

Our analyses so far have been based on a simplifying assumption that  $\varphi_z^E$  and  $\varphi_z^D$  monotonically increase in both workers' beliefs,  $z$  and  $(1 - z)$ , and CEO's managerial vision,  $v_E$  and  $v_D$ , respectively. Though simple enough to highlight the main mechanisms, such simplifying assumption is limited in investigating the interactions between CEO's managerial vision and workers' organizational beliefs. In this section we extend

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<sup>13</sup>Equivalently, we could consider the impacts of changes in workers' organizational beliefs. This could be done by adding shift parameters  $\theta_D$  and  $\theta_E$  to workers' belief schedules  $(1 - z)$  and  $z$ , respectively, so that Eq. (2) is now modified to:  $\varphi_z^D = 1 + v_D\theta_D(1 - z)$ , and  $\varphi_z^E = 1 + v_E\theta_E z$ . Changing  $\theta_D$  or  $\theta_E$  acts also like a technological shock that affects the associated workers' productivity, and leads just to the same results as changes in  $v_D$  or  $v_E$ .

the model to incorporate more explicitly externalities from the similar CEO's managerial vision and workers' organizational beliefs. The extension requires only minor modification. We now assume that:

$$\varphi_z^D = a_D - (v_D - z)^2, \quad \text{and} \quad \varphi_z^E = a_E - (v_E - z)^2, \quad (25)$$

where  $a_D$  and  $a_E$  are parameters representing the maximum productivity of a worker who has the same belief as that of CEO in domestic and exporting firms, respectively. We assume that  $a_E > a_D$  given the higher learning cost to obtain export market managerial skills:  $c_E > c_D$ . Replacing these in Eq. (3), optimal effort level of a worker  $z$  is now given by:

$$e_z^{Opt} = \begin{cases} \frac{w_D [a_D - (v_D - z)^2]}{2\gamma} & \text{if } s = D \\ \frac{w_E [a_E - (v_E - z)^2]}{2\gamma} & \text{if } s = E, \end{cases} \quad (26)$$

and the output of a worker  $z$  is given by:

$$q_z^{Opt} = \begin{cases} \frac{w_D [a_D - (v_D - z)^2]^2}{2\gamma} & \text{if } s = D \\ \frac{w_E [a_E - (v_E - z)^2]^2}{2\gamma} & \text{if } s = E. \end{cases} \quad (27)$$

Note from above that differently from the previous model  $e_z^{Opt}$  and  $q_z^{Opt}$  increase now in the similarity between  $z$  and  $v_s$ ,  $s \in \{D, E\}$ . From above, the modified wage schedules are given by:

$$w(z) = \begin{cases} w_D \left[ \frac{w_D [a_D - (v_D - z)^2]^2}{2\gamma} - c_D \right] & 0 \leq z \leq z_1 \\ w & z_1 \leq z \leq z_3 \\ w_E \left[ \frac{w_E [a_E - (v_E - z)^2]^2}{2\gamma} - c_E \right] & z_3 \leq z \leq 1. \end{cases} \quad (28)$$

Previous no-arbitrage conditions in Eqs. (9) and (10) and  $M_s$ ,  $s \in \{D, E\}$ , supply equations in Eq. (17) are modified accordingly to:

$$w_D \left[ \frac{w_D [a_D - (v_D - z_1)^2]^2}{2\gamma} - c_D \right] = 1, \quad \text{and} \quad (29)$$

$$w_E \left[ \frac{w_E [a_E - (v_E - z_3)^2]^2}{2\gamma} - c_E \right] = 1, \quad (30)$$

and

$$\begin{aligned} M_D &= \int_0^{z_1} \left[ \frac{w_D [a_D - (v_D - z)^2]^2}{2\gamma} - c_D \right] g(z) dz, \\ M_E &= \int_{z_3}^1 \left[ \frac{w_E [a_E - (v_E - z)^2]^2}{2\gamma} - c_E \right] g(z) dz, \end{aligned} \quad (31)$$

from which factors clearing conditions (18) and (19) are also modified accordingly to:

$$\frac{1}{\alpha_R} \int_{z_1}^{z_2} g(z) dz = \frac{1}{\alpha_M} \int_0^{z_1} \left[ \frac{w_D [a_D - (v_D - z)^2]^2}{2\gamma} - c_D \right] g(z) dz, \quad (32)$$

$$\frac{1}{\alpha_R} \int_{z_2}^{z_3} g(z) dz = \frac{1}{\alpha_M} \int_{z_3}^1 \left[ \frac{w_E [a_E - (v_E - z)^2]^2}{2\gamma} - c_E \right] g(z) dz. \quad (33)$$

As before, the equilibrium is characterized by five key variables –  $z_1$ ,  $z_2$ ,  $z_3$ ,  $w_D$  and  $w_E$  –, which are determined accordingly in this case by five equations (21), (29), (30), (32) and (33). Note however from Eqs. (29) and (30) that in this case the initial  $v_D$  and  $v_E$  relative to workers' overall beliefs matter. If initially  $v_D < z_1$  and  $v_E > z_3$ , we have  $\frac{dw_D}{dz_1} > 0$  and  $\frac{dw_E}{dz_3} < 0$ . Though much less plausible, however, if initially  $v_D > z_1$  and  $v_E < z_3$ , we would have  $\frac{dw_D}{dz_1} < 0$  and  $\frac{dw_E}{dz_3} > 0$ .<sup>14</sup> Following Figure 5 illustrates the modified equilibrium wage distribution for the former case.

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<sup>14</sup>More formally, totally differentiating Eq. (29) and using Eq. (29), we get  $\frac{dw_D}{dz_1} = -\frac{2w_D^3 [a_D - (v_D - z_1)^2] (v_D - z_1)}{\gamma(2 + c_D w_D)}$ , which is negative (positive) if  $v_D > z_1$  ( $v_D < z_1$ ). Similarly, totally differentiating Eq. (30), we get  $\frac{dw_E}{dz_3} = -\frac{2w_E^3 [a_E - (v_E - z_3)^2] (v_E - z_3)}{\gamma(2 + c_E w_E)}$ , which is negative (positive) if  $v_E > z_3$  ( $v_E < z_3$ ).

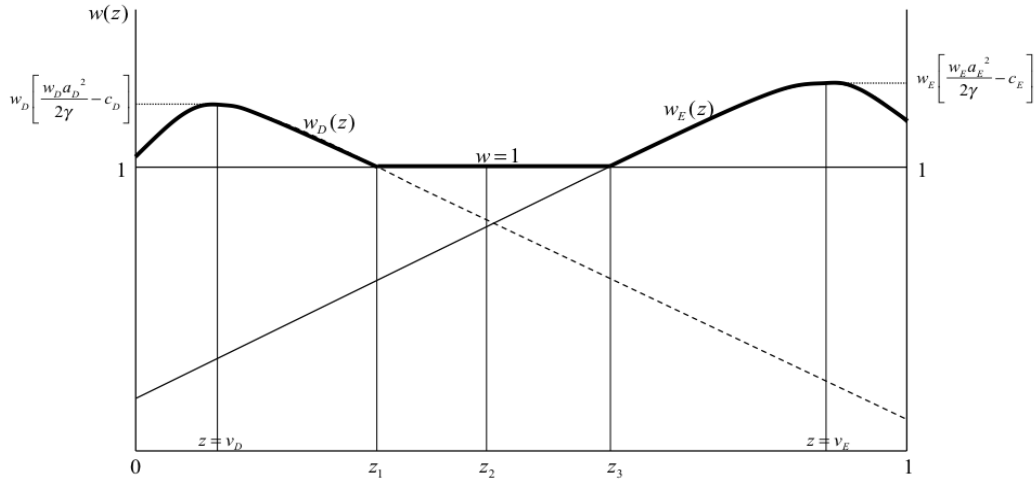


Figure 5: The equilibrium wage distribution when  $\varphi_z^s = a_s - (v_s - z)^2$ ,  $s \in \{D, E\}$

Thus, in this case it is the worker with the same belief as CEO's managerial vision who earns the highest income in each firm-type. Also, the presence of fixed learning costs to obtain managerial skills requires higher remunerations justifying such investments. Note that the sufficient condition for all managerial workers to get higher income than production workers is that initially  $v_E$  and  $v_D$  are stronger than the median belief of managerial workers in each firm-type, i.e.  $v_E > (z_3 + 1)/2$  and  $v_D < z_1/2$ . From the definition of visionary CEO, we focus in what follows on such cases.

Then, it follows immediately that Lemma 2 applies in this case too from the same reasoning as before. It can also be checked easily that a fall in  $\tau$  induces the same effects as before. A fall in  $\tau$  induces a fall in  $w_D$  and a rise in  $w_E$ , and  $z_1$ ,  $z_2$  and  $z_3$  shift leftward.

Following Figure 6 illustrates the effects of a fall in  $\tau$  in this case.

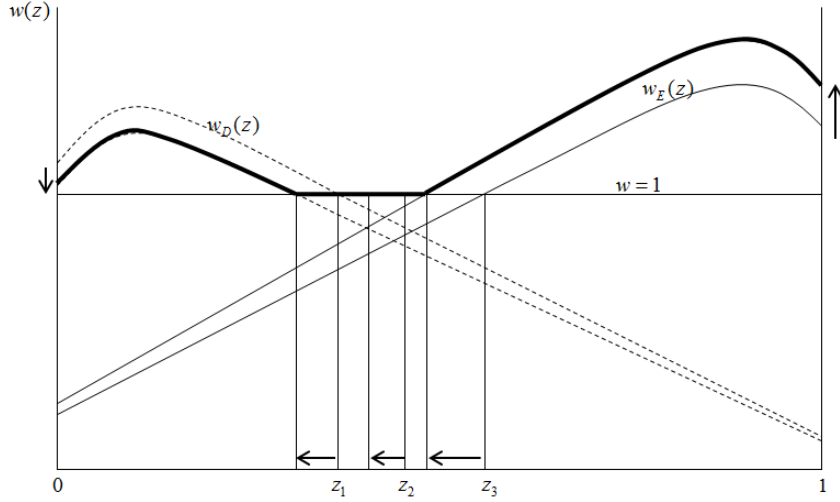


Figure 6: The effects of a fall in  $\tau$  when  $\varphi_z^s = a_s - (v_s - z)^2$ ,  $s \in \{D, E\}$

Note however that in this case within-firm income implications are different from before. It is now the worker with  $z = v_E$  whose income increases the most following a fall in  $\tau$ , while it is the worker with  $z = v_D$  in domestic firms whose income decreases the most. It is due to the presence of fixed learning cost  $c_s$ ,  $s \in \{D, E\}$ . A rise in  $w_E$  due to a fall in  $\tau$  increases also the learning cost in nominal term. And this comes as a relatively less burden to the workers having similar beliefs as that of CEO since initially the proportion of learning cost in their total income is relatively small. Similarly, a fall in  $w_D$  due to a fall in  $\tau$  decreases also the learning cost in nominal term in domestic firms. This beneficial effect is relatively small to the workers having similar beliefs as that of CEO since initially the proportion of learning cost in their total income is relatively small. Consequently, the overall negative impact from a fall in  $w_D$  affects the most negatively the worker with  $z = v_D$ .

We now investigate the impacts of changes in managerial vision in this case. The impacts can be investigated in the same way as before. Consider a rise in  $v_E$ . We start by investigating the first-order direct impact of a rise in  $v_E$  within exporting firms. (i) For given  $z_2$  and  $w_E$ , the first direct impact of a rise in  $v_E$  is to decrease overall expected remunerations for managerial workers since  $v_E$  gets far from the median belief of inside managerial workers, which induces a rise in  $z_3$ . (ii) Then, to recover the within-firm

factor clearing condition (33),  $w_E$  starts to increase and  $z_3$  is shifted back, but finally is situated somewhere above the initial  $z_3$ . Note that for the moment for a given  $z_2$ , the within-firm factor clearing is not yet fully recovered. Following figure illustrates such short-run within-exporting-firm adjustments.

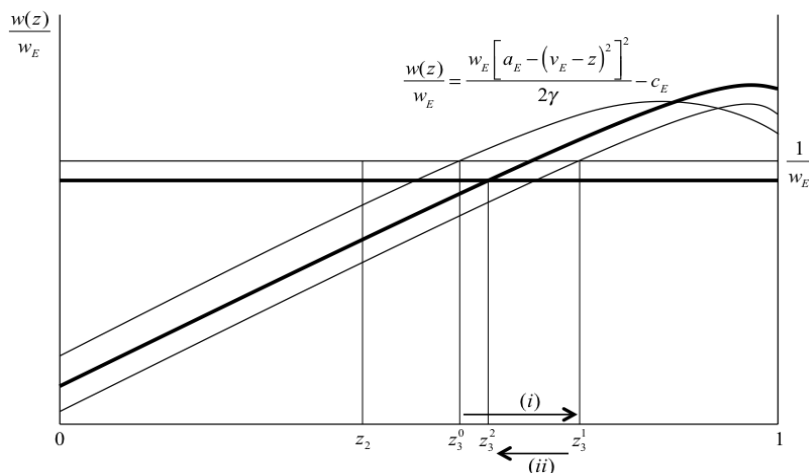


Figure 7: First within impacts of a rise in  $v_E$  when  $\varphi_z^E = a_E - (v_E - z)^2$

Now consider between-firm repercussions of these changes. From Eq. (21), a rise in  $w_E$  induces a rise in  $w_D$ , which in turn induces a rise in  $z_1$  from Eq. (29). The final equilibrium requires overall factors' market clearing (32) and (33), so that  $z_2$  is shifted right to ensure full employment of factors.

The same reasoning applies also for a rise in  $v_D$ , which induces falls in  $w_D$  and  $w_E$ , and rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$ . Note that differently from the case of a rise in  $v_E$ , a rise in  $v_D$  is beneficial to domestic firms where the rise occurs and leads to an expansion of these firms since  $v_D$  gets closer to the median belief of inside managerial workers.<sup>15</sup> The effects are summarized in the following proposition.

**Proposition 3** *In this economy, a rise in  $v_E$  induces rises in  $w_D$  and  $w_E$ , and rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$ . A rise in  $v_D$  induces falls in  $w_D$  and  $w_E$ , and rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$ .*

<sup>15</sup>Note that here a rise of  $v_D$  represents a fall in CEO's managerial vision in domestic firms as  $v_D$  gets far from zero and closer to unity.

Following Figure 8 illustrates the induced changes.

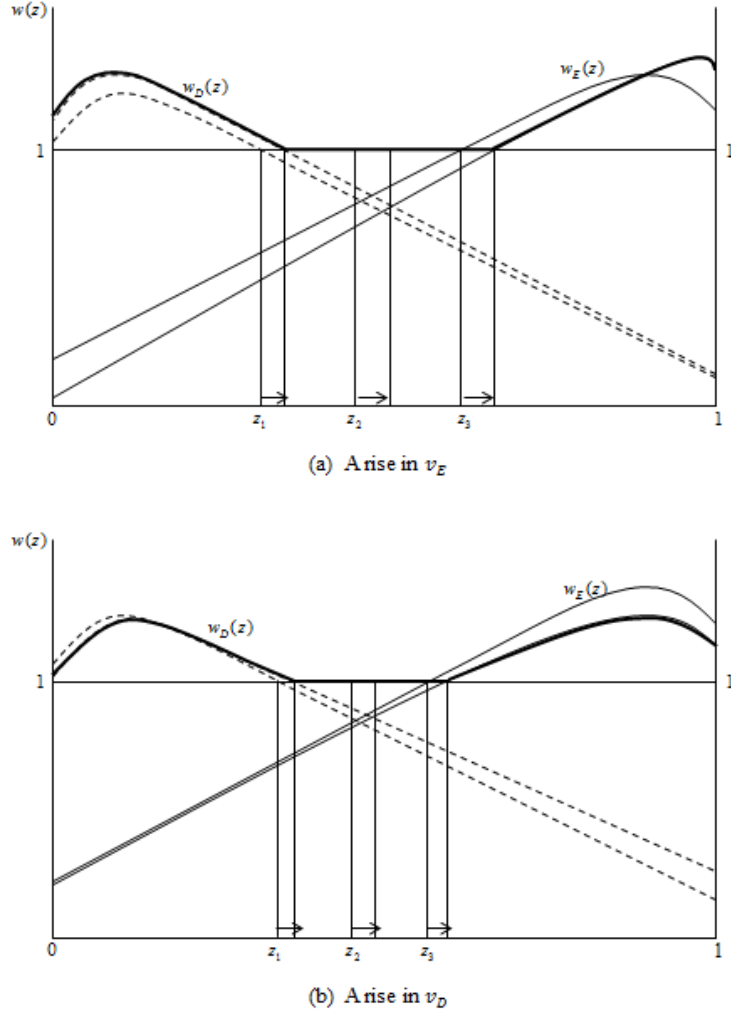


Figure 8: The effects of a rise in  $v_E$  and  $v_D$  when  $\varphi_z^s = a_s - (v_s - z)^2$ ,  $s \in \{D, E\}$

As the figure shows, in this case the income implications are more complex than before. A rise in  $v_E$  may involve some winners and losers within exporting firms. As  $v_E$  gets far from the median belief of inside managerial workers and approaches the highest  $E$ -belief ( $z = 1$ ), inside  $M$ -workers with high  $E$ -belief (high  $z$ ) see their income rise while the income of relatively low  $E$ -belief (low  $z$ )  $M$ -workers reduces. However, if  $v_E$  continues to rise beyond the highest belief level so that a further rise in  $v_E$  affects only negatively all managerial workers, then finally all managerial workers may lose



within exporting firms. Similarly, a rise in  $v_D$  involves some winners and losers within domestic firms. As  $v_D$  gets closer to the median belief of inside managerial workers, inside  $M$ -workers with high  $D$ -belief (low  $z$ ) see their income fall while the income of relatively low  $D$ -belief (high  $z$ )  $M$ -workers increases. Note that in this case though  $v_D$  continues to rise beyond any thresholds (within the range ensuring Eq. (32)), there would be always some inside beneficiaries due to the workers who upgrade their tasks from production to management and earn higher income. On the other hand, both rises in  $v_E$  and  $v_D$  are beneficial to domestic firms (as also shown by rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$  in Figure 8), so that a rise in  $v_E$  increases income of all domestic-firm managerial workers while a rise in  $v_D$  decreases income of all exporting-firm managerial workers. The model therefore may partly explain why firms having highly visionary CEO are not necessarily successful in the market. Whether a stronger (or weaker) CEO's managerial vision benefits the firm or not depends on its extent relative to within-firm workers' overall beliefs.

## 6 A numerical appraisal

In this section we illustrate our theoretical discussions with numerical simulations. The chosen (and/or calibrated) parameter values and initial benchmark equilibrium values for endogenous variables are reported in Appendix A: the base model with  $\varphi_z^D = 1 + v_D(1 - z)$  and  $\varphi_z^E = 1 + v_E z$  in A.1, and the extended model with  $\varphi_z^s = a_s - (v_s - z)^2$ ,  $s \in \{D, E\}$ , in A.2. The base model parameter values are configured so that initially two firm-types have identical employment size:  $z_2 = 1/2$ , as well as the assumptions made on parameters in the text are satisfied. When we move to the extended model,  $a_D$ ,  $a_E$ ,  $v_D$  and  $v_E$  are calibrated (within the range satisfying the assumptions on parameters) so that we keep the same values for  $z_1$ ,  $z_2$  and  $z_3$ . Given the initial equilibrium, Appendix B reports the effects of a fall in  $\tau$  and rises in  $v_D$  and  $v_E$ , respectively: for the base model in B.1 and for the extended model in B.2. All results are percentage changes from the initial equilibrium, which confirms our theoretical analyses.

Here, we are in particular interested in the real wage changes for individual workers.

Real wages are measured by individual's income deflated by the aggregate consumption price index  $P_C$ . The final effect of each shock under study on  $P_C$  (Eq. (15)) is analytically ambiguous since each shock affects the number of each firm-type (available varieties) as well as the prices. Following Figure 9 and 10 first display the real wage changes for individual workers induced by a fall in  $\tau$  and rises in  $v_D$  and  $v_E$ , respectively, for the case of the base model. In the following figures, horizontal axis represents individual worker's belief level,  $z \in [0, 1]$ , and benchmark  $R$ -workers' real wages are normalized to unity.

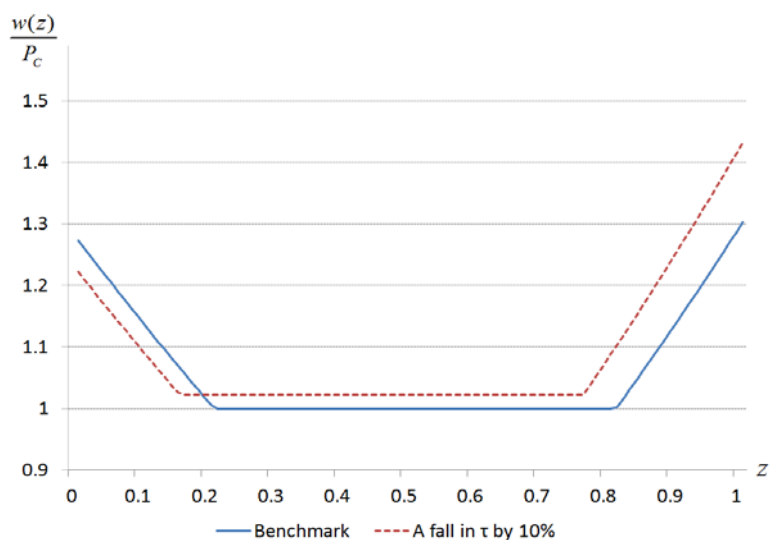


Figure 9: The impact of a fall in  $\tau$  on real wages (Base model)

As shown in Section 3, falling  $\tau$  shifts the thresholds  $z_1$ ,  $z_2$  and  $z_3$  leftward and induces a fall in  $w_D$  and a rise in  $w_E$ , resulting in a fall in  $p_D$  and a rise in  $p_E$ . Also a fall in  $\tau$  increases the number of exporting firms while decreases that of domestic firms. This implies that though overall the exporters' price rises now more varieties are provided at cheaper price since  $p_E < p_D$ . The final effect in our simulation is that  $P_C$  falls. Consequently, as shown in Figure 9 overall real wages rise except for the remaining managerial workers and some workers turning from management to production in domestic firms.

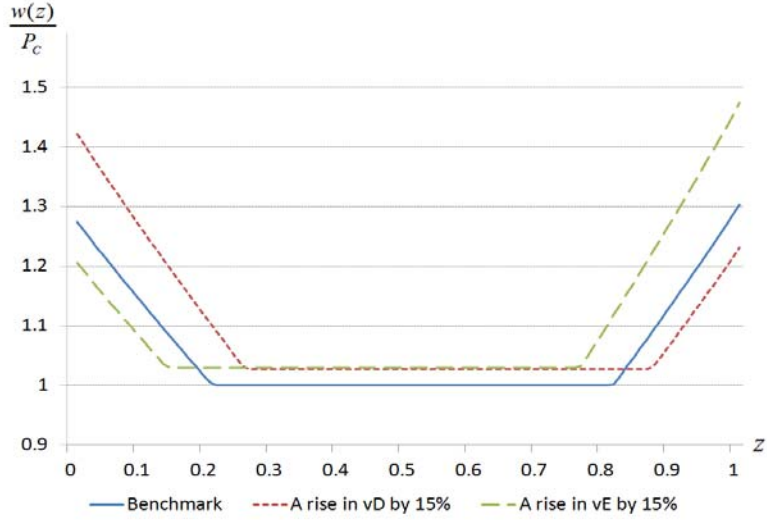


Figure 10: The impact of rises in  $v_D$  and  $v_E$  on real wages (Base model)

On the other hand, as shown in Section 4 both rises in  $v_D$  and  $v_E$  result in falls of both  $w_D$  and  $w_E$ , and thus falls of both  $p_D$  and  $p_E$ . And a rise in  $v_E$  ( $v_D$ ) induces leftward (rightward) shifts of  $z_1$ ,  $z_2$  and  $z_3$  and a rise in  $N_E$  ( $N_D$ ). The final effect in our simulation is that  $P_C$  falls in both cases due to the dominance of overall price reduction effect. Consequently, as shown in Figure 10 overall real wages rise except for the remaining managerial workers and some workers turning from management to production in domestic (exporting) firms for the case of a rise in  $v_E$  ( $v_D$ ).

Similarly, following Figure 11 and 12 display the real wage changes for individual workers induced by a fall in  $\tau$  and rises in  $v_D$  and  $v_E$ , respectively, for the case of the extended model.

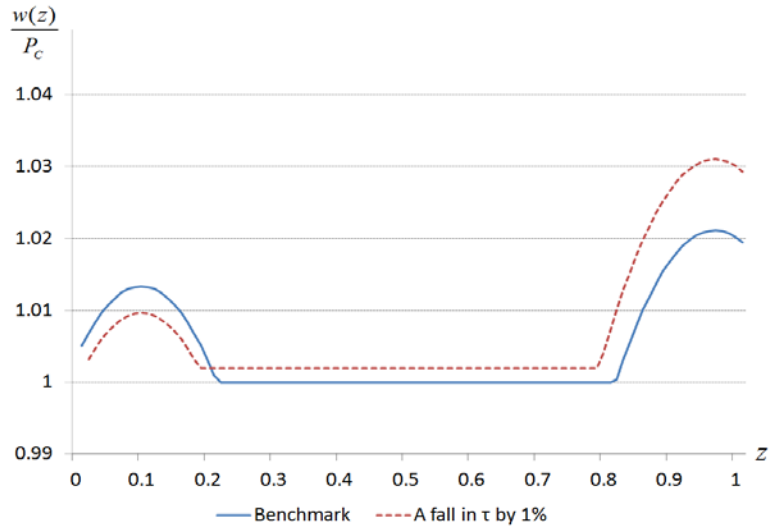


Figure 11: The impact of a fall in  $\tau$  on real wages (Extended model)

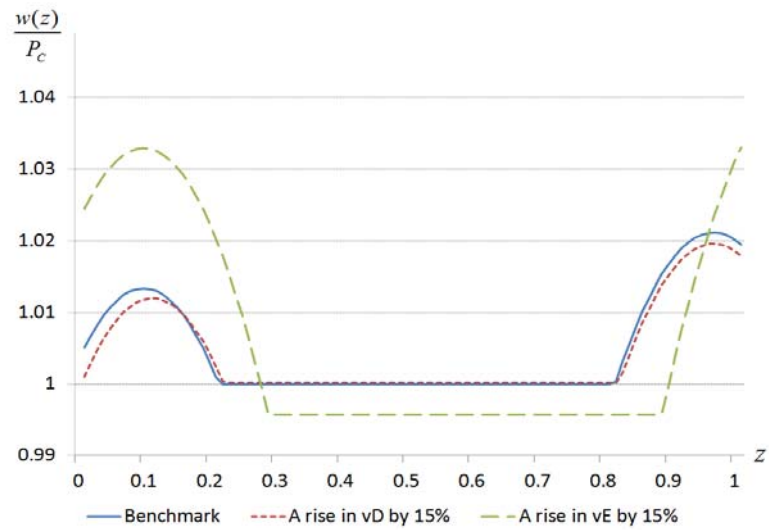


Figure 12: The impact of rises in  $v_D$  and  $v_E$  on real wages (Extended model)

Concerning the impact of a fall in  $\tau$ , we have the same implications as before. As discussed in Section 5, one difference is that welfare increases the most for the worker having the same belief as that of CEO ( $z = v_E$ ) in exporting firms, while decreases

the most for the worker having the same belief as that of CEO ( $z = v_D$ ) in domestic firms.<sup>16</sup>

On the other hand, changes from rises in  $v_D$  and  $v_E$  require more explanation. Both rises in  $v_D$  and  $v_E$  result in rightward shifts of  $z_1$ ,  $z_2$  and  $z_3$  and a rise (fall) in  $N_D$  ( $N_E$ ). The effects on prices are, however, different. A rise in  $v_D$  induces falls in both  $w_D$  and  $w_E$  (and thus, falls in both  $p_D$  and  $p_E$ ), while a rise in  $v_E$  induces rises in both  $w_D$  and  $w_E$  (and thus, rises in both  $p_D$  and  $p_E$ ). The overall price effects dominate so that  $P_C$  falls in the case of a rise in  $v_D$ , while rises in the case of a rise in  $v_E$ . Consequently, as shown in Figure 12 a rise in  $v_D$  increases welfare of relatively middle-belief-level workers, while decreases it at the extremes. In contrast, a rise in  $v_E$  decreases welfare of relatively middle-belief-level workers, while increases it at the extremes.

## 7 Conclusion

It has been widely documented in the management literature that the interaction between workers' organizational beliefs and the CEO's managerial vision has important implications for the firm's behavior and performance. Though recent firm heterogeneity literature in international trade has made substantial advances in highlighting many systematic links between the characteristics of firms and their degree of internationalization as well as bringing many important trade policy implications at the aggregate level, much less attentions has been paid to within-firm managerial mechanisms and the resulting strategic direction and performance of firms.

This paper made a first attempt to bridge the gap by developing a simple general-equilibrium trade model in which heterogeneous employees make an investment decision in acquiring advanced managerial skills and choose their optimal effort level based on their own individual organizational beliefs and managerial vision of the CEO. By modeling explicitly the optimal effort level decision of individual workers, the model

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<sup>16</sup>As one may expect, in this case the same changes in  $\tau$  cause much bigger repercussions on the thresholds than the base model since the same changes in  $w_D$  and  $w_E$  due to a fall in  $\tau$  (from Eq. (21)) result in much bigger adjustments in the thresholds from Eqs. (29), (30), (32) and (33). Such high sensitivity could, of course, easily be controlled by choosing different parameter values, for instance, for  $\gamma$ ,  $\alpha_R$  and  $\alpha_M$ . Since we focus on the qualitative effects, in the simulation some neutral values are chosen for those parameters:  $\gamma = 1$ ,  $\alpha_R = 1$  and  $\alpha_M = 1$ .

highlighted a new source of productivity effect coming from the interplay between workers' beliefs and CEO's managerial vision. Also due to such interplay, it was shown that the income (welfare) effects of trade liberalization and/or changes in managerial vision may not be simply monotonic or proportional as in previous models in the literature. In particular, it was shown that when the similarity of beliefs between CEO and employees matters, whether a stronger (or weaker) CEO's managerial vision benefits the firm or not depends on its extent relative to within-firm workers' overall beliefs, and may involve some winners and losers even within the same firm.

At least in this model's context, it should be clear that both overall workers' beliefs and CEO's managerial vision as well as their interactions are as important factors as tariff reduction movements to enhance international trade. Needless to say, the model abstracts from some important real world issues such as various labor market imperfections. I believe that this paper opens up new avenues for various promising extensions and for future research.

## Appendix A

### A.1 Benchmark equilibrium for the base model

$\sigma$	$\tau$	$c_D$	$c_E$	$\gamma$	$v_D$	$v_E$	$f_D$	$f_E$
3.00	1.30	0.10	0.20	1.00	1.10	1.39	1.00	1.80
$\alpha_R$	$\alpha_M$	$C$	$P_C$	$x_D^d$	$x_E^d$	$x_m^d$	$x_D$	$x_E$
1.00	1.00	0.18	6.02	2.00	2.26	1.34	2.00	3.60
$w$	$w_D$	$w_E$	$R_D$	$R_E$	$M_D$	$M_E$	$z_1$	$z_2$
1.00	0.78	0.71	0.30	0.31	0.30	0.31	0.20	0.50
$z_3$	$N_D$	$N_E$	$p_D$	$p_E$	$Inc$			
0.81	0.10	0.06	2.68	2.57	1.06			

### A.2 Benchmark equilibrium for the extended model

$\sigma$	$\tau$	$c_D$	$c_E$	$\gamma$	$v_D$	$v_E$	$f_D$	$f_E$
3.00	1.30	0.10	0.20	1.00	0.09	0.96	1.00	1.80
$\alpha_R$	$\alpha_M$	$a_D$	$a_E$	$C$	$P_C$	$x_D^d$	$x_E^d$	$x_m^d$
1.00	1.00	2.11	2.41	0.18	5.73	2.00	2.26	1.34
$x_D$	$x_E$	$w$	$w_D$	$w_E$	$R_D$	$R_E$	$M_D$	$M_E$
2.00	3.60	1.00	0.70	0.63	0.30	0.31	0.30	0.31
$z_1$	$z_2$	$z_3$	$N_D$	$N_E$	$p_D$	$p_E$	$Inc$	
0.20	0.50	0.81	0.10	0.06	2.55	2.44	1.01	

## Appendix B

B.1 Base model: a fall in  $\tau$  and rises in  $v_D$  and  $v_E$

	$\tau$		$v_D$		$v_E$	
	A fall by 5%	A fall by 10%	A rise by 10%	A rise by 15%	A rise by 10%	A rise by 15%
$z_1$	-11.963	-25.426	16.614	24.144	-22.758	-33.793
$z_2$	-12.048	-25.571	20.580	30.496	-22.894	-33.957
$z_3$	-2.807	-5.943	4.821	7.154	-4.271	-6.192
$w$	0.000	0.000	0.000	0.000	0.000	0.000
$w_D$	-1.465	-3.063	-2.508	-3.674	-2.751	-4.031
$w_E$	1.610	3.470	-2.649	-3.882	-2.906	-4.258
$C$	1.170	2.849	1.939	3.147	2.217	3.597
$P_C$	-1.028	-2.265	-1.732	-2.625	-1.927	-2.920
$x_D^d$	0.000	0.000	0.000	0.000	0.000	0.000
$x_E^d$	-3.861	-8.021	0.000	0.000	0.000	0.000
$x_m^d$	6.525	13.555	0.000	0.000	0.000	0.000
$R_D$	-12.107	-25.671	23.318	34.881	-22.987	-34.070
$R_E$	12.157	25.841	-20.697	-30.642	25.884	38.766
$M_D$	-12.107	-25.671	23.318	34.881	-22.987	-34.070
$M_E$	12.157	25.841	-20.697	-30.642	25.884	38.766
$N_D$	-12.107	-25.671	23.318	34.881	-22.987	-34.070
$N_E$	12.157	25.841	-20.697	-30.642	25.884	38.766
$p_D$	-0.643	-1.345	-1.101	-1.614	-1.208	-1.770
$p_E$	0.669	1.443	-1.101	-1.614	-1.208	-1.770
$Inc$	0.130	0.520	0.173	0.440	0.247	0.571



B.2 Extended model: a fall in  $\tau$  and rises in  $v_D$  and  $v_E$

	$\tau$		$v_D$		$v_E$	
	A fall by 0.5%	A fall by 1%	A rise by 10%	A rise by 15%	A rise by 10%	A rise by 15%
$z_1$	-6.532	-13.247	2.182	3.269	24.775	36.870
$z_2$	-6.584	-13.342	2.148	3.215	25.088	37.413
$z_3$	-1.543	-3.123	0.504	0.754	5.904	8.784
$w$	0.000	0.000	0.000	0.000	0.000	0.000
$w_D$	-0.141	-0.268	-0.050	-0.074	0.700	1.139
$w_E$	0.173	0.365	-0.053	-0.079	0.745	1.212
$C$	0.110	0.246	-0.029	-0.044	0.071	0.106
$P_C$	-0.095	-0.192	-0.011	-0.016	0.264	0.433
$x_D^d$	0.000	0.000	0.000	0.000	0.000	0.000
$x_E^d$	-0.373	-0.749	0.000	0.000	0.000	0.000
$x_m^d$	0.631	1.266	0.000	0.000	0.000	0.000
$R_D$	-6.620	-13.407	2.124	3.177	25.305	37.787
$R_E$	6.621	13.423	-2.158	-3.230	-25.160	-37.571
$M_D$	-6.620	-13.407	2.124	3.177	25.305	37.787
$M_E$	6.621	13.423	-2.158	-3.230	-25.160	-37.571
$N_D$	-6.620	-13.407	2.124	3.177	25.305	37.787
$N_E$	6.621	13.423	-2.158	-3.230	-25.160	-37.571
$p_D$	-0.058	-0.110	-0.021	-0.031	0.288	0.468
$p_E$	0.067	0.141	-0.021	-0.031	0.288	0.468
$Inc$	0.015	0.054	-0.040	-0.060	0.335	0.539

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