THE EVOLUTION AND INTERACTION OF NORMS: FIRM OBJECTIVES AND THE EFFECTS OF INTERNATIONAL TRADE AND INTEGRATION

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Abstract:

This paper investigates the emergence of differing norms of firm behavior ("institutions") across countries, and how international trade and economic integration can affect the norms. As in the literature of social norms and evolutionary game theory, a norm is considered as a long-run equilibrium of a dynamic process in which agents are boundedly-rational. Instead of a game-theoretic formulation, we model the entry-exit process of firms in a monopolistic competition market. A new entrant firm chooses its objective function: short-run profit maximization (type-1), or short-run profit-per-employee maximization (type-2). The objective function that gives a higher short-run profit upon entry is chosen. Thus if cost conditions are the same for the two firm types, then in the long-run, all the firms in the market will be type-1, establishing the "A-norm." However, an $\epsilon$ cost advantage for type-2 firms is sufficient to make the long-run equilibrium that in which all firms are type-2 ("J-norm"), and this holds for $\epsilon\rightarrow 0$. In the presence of externalities, an economy can have multiple long-run equilibria: A-norm and J-norm. Which equilibrium an autarkic country tends to depends on the initial state (history). Even from the same initial state, the long-run equilibrium may be different, had the country been under free trade. Once the J-norm is established, international trade cannot change the norm of firm behavior. However, economic integration between a country in the J-norm and a sufficiently large country in the A-norm will put the integrated economy on the path towards the A-norm.

Keywords: social norm, institution, firm objective, bounded rationality, monopolistic competition, international trade, economic integration, Japanese firm

JEL codes: F12, D21, F15, D83
1. Introduction

Comparing the economies of different countries, there seem to exist differences beyond those that can be explained by difference in parameter values of an identical equilibrium or difference in positions on an identical dynamic path. For example, it has been pointed out that the Japanese economy has many distinct institutions such as lifetime employment, seniority wage and promotion, cross-holding of shares among firms, firms' objectives being apart from short-run profit (dividend) maximization, firm-specific labor unions, and the large proportion of firm-specific human capital held by each worker. Such institutions have been given credit both for the Japanese economic "miracle" in the 1950's and 60's as well as for the current prolonged recession, and have also surfaced as sources of international economic conflict. How did such institutions emerge? What happens if countries with differing institutions interact?

Instead of resorting to cultural differences, many authors have presented rationality explanations within the frameworks of game theory, contract theory, and incomplete information. Aoki (1994) considers an economy as a system consisting of institutions which enforce each other's existence, or which exhibit complementarities among themselves. For example, within the Japanese system, the long average tenure of a worker at a firm (lifetime employment) allows workers to accept a wage profile that rises according to length of tenure (seniority wage), and seniority wage in turn ensures long-term loyalty of the worker to the firm. Lifetime employment allows firms to carry out extensive on-the-job training such as job rotations between different departments within the firm enabling workers to build up firm-specific human capital such as networking among co-workers. Seniority wage is then a reflection of the level of human capital acquired by the worker, which is proportional to the length of tenure. This approach shows that although each institution may be difficult to explain individually, once

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1 In this paper, "institution" is used to mean an established custom or practice, and is equivalent to a social norm. This usage conforms to the everyday definition, "an established law, custom, usage, practice, organization" (Shorter Oxford English Dictionary), as in Young (1998).

2 See Ito (1992) and Aoki and Dore (1994) for details as well as references to empirical research.
considered as a system of complementarities, the institutions are rational responses to each other, and the existence and stability of distinct systems are viable.

The literature is, however, still in its infancy in terms of explaining the emergence of distinct institutions and systems of institutions, and the dynamic effect of interactions of economies with different institutions. These questions are increasingly relevant given the current rate of integration of the world economy. This paper provides one framework towards answering these questions. We model an economy where firms can behave as either profit maximizers or profit-per-worker maximizers, and first investigate the emergence of either norm of firm behavior (institution). We then let countries with distinct norms (institutions) interact through international trade and through economic integration, and examine the dynamic path and the norm that emerges.

The approach we take is close to that of evolutionary game theory. We formulate the best-response dynamics of boundedly-rational agents, and trace the dynamic path towards the long-run equilibrium. There is inertia in the process (state changes over time), and path-dependence (dependence on history). Instead of a game-theoretic formulation, we model the decision of a new-entrant firm in a monopolistically competitive market. The bounded rationality constraint we impose is that of myopia. Firms base their decisions on the current (i.e. short-run) state rather than expectations of the future. A new entrant firm chooses one of two objective functions: (short-run) profit maximization (type-1 behavior), or (short-run) profit-per-employee maximization (type-2 behavior). The objective function that gives a higher (positive) short-run profit at the point of entry is

\begin{itemize}
  \item[A sample is] Abe (1994), Kanemoto and MacLeod (1989) and Okuno-Fujiwara (1984).
  \item[There is a strand of papers on the behavior of labor managed firms which are much like our profit-per-worker maximizing firms. Representatives among them are Meade (1972), Miyazaki (1984), and Miyazaki and Neary (1983).]
  \item[This market structure is useful in that there is anonymity among firms, a property necessary to justify the bounded rationality assumption. To the author's current knowledge, no paper in the literature has incorporated the evolutionary approach in the monopolistic competition market. As the monopolistic competition model is used widely in the field of international trade, introduction of the evolutionary approach seems promising.]
  \item[The assumption of myopia is made even outside evolutionary game theory, explicitly or implicitly. For example, Marshallian adjustment and Walrasian tatonnement processes are myopic. Stability notions based on tatonnement thus are dependent on the myopia assumption. If instead of myopia, we were to allow agents to base their behavior on future expectations, there will be a possibility of multiple rational expectations equilibria from a given initial state. Such dynamics have been explored by Kaneda (1995, 1998), Krugman (1991), and Matsuyama (1991).]
\end{itemize}
chosen, and this choice is irreversible until the firm exits. An incumbent firm of either type exits if its short-run profit is negative.

If cost conditions are the same for the two firm types, then in the long-run, all the firms in the market will be type-1, establishing a norm which we call the "A-norm." However, an $\epsilon$ cost advantage for type-2 firms is sufficient to make the long-run equilibrium that in which all firms are type-2 ("J-norm")\(^7\), and this remains true for $\epsilon \to 0$. In the presence of externalities, an economy can have multiple long-run equilibria: A-norm and J-norm. Which equilibrium an autarkic country tends to depends on the initial state (history). Even from the same initial state, the long-run equilibrium may be different, had the country been under free trade. Once the J-norm is established, trade with similar countries (countries with identical technology and preference) cannot change this norm of firm behavior even if the other country is in the A-norm. However, economic integration between a country in the J-norm and a sufficiently large country in the A-norm will put the integrated economy on the path towards the A-norm.

Several papers in the evolutionary game theory and social norms literature share the above questions our paper tries to address. Matsui (1996) surveys the literature of evolutionary game theory and explains its usefulness as a tool of analyzing diversity, interaction, and evolution of social systems. Matsui and Okuno-Fujiwara (1994) present a random-matching model of boundedly-rational agents playing coordination games over time. They let two societies coordinated in different equilibria start to interact, and find that there can be two long-run equilibria: agents in the smaller society adjusting their behavior towards that of agents in the larger society, or an eclectic norm of agents in both societies adjusting their behaviors to that of the other society's. Their analysis is restricted to coordination games played in a random-matching framework.

This paper is organized as follows. Section 2 presents the static model of monopolistic competition in which the number of firms is given, and the country is in autarky. Section 3 considers the dynamics in the autarky economy by modeling the entry and exit process of firms. We examine the possible long-run equilibria and dynamics under

\(^7\) The labeling of the two norms, A and J, is motivated by the difference between the behavior of American and Japanese firms as pointed out by many authors (see footnote 2).
different specifications of the cost conditions. One finding is that if there exists a marginal cost advantage for profit-per-worker maximizing firms, the only long-run equilibrium is the J-norm in which all firms are profit-per-worker maximizers. Another finding is that in the presence of positive externalities, there emerges multiple long-run equilibria and which norm emerges depends on the initial state. Section 4 presents the effects of growth, trade, and economic integration on the dynamic process and the long-run equilibria. Section 5 concludes.

2. The Static Model of an Economy

The static model is that of monopolistic competition with restricted entry. There is one good, differentiated into a continuum of varieties. The number (measure) of firms or varieties\(^8\), which is fixed in the static model, will act as the state variable in the dynamic model. There is a single factor of production, labor, the endowment of which is given as \(L\).

2.1 Consumption

Each unit of labor is also an individual consumer. Consumers share the same utility function,

\[
(1) \quad \int_{\omega \in \Omega} v(c_\omega) d\omega, \quad v' > 0, \quad v'' < 0
\]

where \(c_\omega\) is an individual's consumption of variety \(\omega\) of the differentiated good, \(\Omega \equiv [0,n]\), and \(n\) is the number (measure) of varieties. This formulation of preference follows that of Krugman (1979), except that Krugman's varieties are discrete. We define the variable

\(^8\) Each firm produces a unique variety.
\( \sigma_\omega \equiv -\frac{v'}{v' c_\omega}, \)

which will turn out to be the elasticity of demand faced by the firm producing variety \( \omega \), and we assume \( \sigma_\omega > 1 \) and \( \frac{\partial \sigma_\omega}{\partial c_\omega} < 0 \) as in Krugman (1979). 9

A consumer’s utility maximization subject to the budget constraint gives the first order condition,

\( v'(c_\omega) = \lambda p_\omega, \)

for each variety \( \omega \), where \( p_\omega \) is the price of variety \( \omega \) and \( \lambda \) is the marginal utility of income (the shadow price on the budget constraint). This yields the inverse demand function for each variety:

\( p_\omega = \lambda^{-1} v'(c_\omega). \)

Note that an increase in the number of varieties available for consumption will raise the marginal utility of income, \( \lambda \), and will shift down the demand curve for each variety, (4).

2.2 Production

Each firm produces a different variety of the differentiated good, using the factor of production, labor. There are two modes of firm behavior, type \( i \) (\( i=1,2 \)), the natures of which will be described below. A firm is either type, and cannot switch to become the

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9 The latter assumption is that the elasticity of demand is higher the higher the price of the variety. In contrast, for the commonly used Spence-Dixit-Stiglitz preference specification, \( \frac{\partial \sigma_\omega}{\partial c_\omega} = 0 \). The former assumption of the elasticity being greater than 1 is necessary to have firms producing positive output.
other type. In the dynamic model, a new entrant firm makes an irreversible choice of which type to become.

The market clearing condition for each variety produced by either firm type is,

\[(5) \quad x_{\omega} = Lc_{\omega},\]

where \(x_{\omega}\) is the output of a firm. Demand faced by each firm is thus,

\[(6) \quad p_{\omega} = \lambda^{-1} v'(x_{\omega} / L).\]

Given a continuum of zero-measure firms (varieties), each firm perceives \(\lambda\), the marginal utility of income (which is influenced by all the firms' pricing), as fixed. The elasticity of demand faced by each firm is thus (2).

2.2.1 Type-1 Firm Behavior

There are \(n_1\) type-1 firms. Each type-1 firm is a standard (one-shot) profit maximizer, as in all static formulations of the monopolistic competition model. For each type-1 firm, the total units of labor used to produce \(x_1\) units of its variety is:

\[(7) \quad l_1 = \alpha + \beta x_1,\]

where \(\alpha\) and \(\beta\) are parameters representing fixed and marginal cost components respectively. A type-1 firm maximizes its one-shot profit,

\[(8) \quad \pi_1 = p_1 x_1 - w(\alpha + \beta x_1),\]

\(^{10}\) From this point on, as our equilibrium will be symmetric among type-1 varieties and among type-2 varieties, we will drop the subscript \(\omega\) for variety and instead, use subscripts 1 and 2 to represent each type.
where \( w \) is the wage rate. The first order condition is:

\[
\frac{p_1}{w} = \beta \frac{\sigma (x_1 / L)}{\sigma (x_1 / L) - 1}.
\]

Note that in equilibrium, the pricing and output of type-1 firms depend on \( \lambda \) through (6). A change in the demand condition for each variety affects \( \lambda \), and this in turn affects price and output. Because of symmetry of the problem, quantities and prices among type-1 varieties are identical in equilibrium.

### 2.2.2 Type-2 Firm Behavior

There are \( n_2 \) type-2 firms. Each type-2 firm is a (one-shot) profit-per-employee maximizer. For each type-2 firm, the total units of labor used to produce \( x_2 \) units of its variety is:

\[
l_2 = \frac{\alpha + \beta x_2}{1 + \epsilon}.
\]

where \( \epsilon \geq 0 \) is a parameter influencing average cost\(^{11}\). A type-2 firm maximizes its one-shot profit-per employee,

\[
\frac{\pi_2}{l_2} = \frac{(1 + \epsilon) p_2 x_2}{\alpha + \beta x_2} - w.
\]

In sum, type-2 differs from type-1 in the objective function, and in the "cost advantage," \( \epsilon \). The first order condition is\(^{12}\)

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\(^{11}\) In Section 3, we will be considering different specifications of this parameter \( \epsilon \), including \( \epsilon = 0 \).

\(^{12}\) Given our cost and demand functions, the first order condition is satisfied by the global maximum for both type-1 and type-2 firms.
This implies that for a given \( L \), the output of each type-2 firm is constant, and is independent of the value of \( \lambda \). To understand this, it is useful to consider a transform of the objective function (11). Since firms take \( w \) as given, once we let labor be the numeraire \((w=1)\), maximization of (11) is equivalent to the maximization of the ratio of total revenue and total cost:

\[
\frac{TR}{TC} = \frac{p_2 x_2}{wl_2} = \frac{(1+\varepsilon)p_2 x_2}{w(\alpha + \beta x_2)}.
\]

In contrast to the type-1 firm maximization of the difference of \( TR \) and \( TC \) (which equates marginal revenue, \( MR \), and marginal cost, \( MC \)), the first order condition of a type-2 firm is equivalent to:

\[
\frac{MR}{TR} = \frac{MC}{TC},
\]

the equating of the relative changes in revenue and cost. A change in demand for a variety through \( \lambda \) affects both \( MR \) and \( TR \) multiplicatively, which cancel out in (14). Therefore, the output of type-2 firm is unaffected by a change in \( \lambda \). Because of the symmetry of this problem, quantities and prices among type-2 varieties are identical in equilibrium. The total number of firms is \( n = n_1 + n_2 \).

2.3 The Static Equilibrium

Given the number of firms of each type, \((n_1, n_2)\), the final equilibrium condition is the resource constraint,
\[ L = n_1(\alpha + \beta x_1) + n_2\left(\frac{\alpha + \beta x_2}{1 + \varepsilon}\right). \]

We can obtain the price of type-2 firms' varieties, \( p_2 \), from (3):

\[ p_2 = p_1 \frac{v'(c_2)}{v'(c_1)}. \]

Given \((L, n_1, n_2)\) and \(w=1\) (numeraire), equations (9), (12), (5) for type-1 variety and type-2 variety, (15), and (16), will solve for \((c_1, c_2, x_1, x_2, p_1, p_2)\). Profits of each firm type can be defined in terms of the state \((n_1, n_2)\), and iso-profit loci can be drawn on the \((n_1, n_2)\) plane.

Figure 1 plots the \(p_1=0\) locus, and the \(p_2=0\) locus for \(\varepsilon=0\), in the \((n_1, n_2)\) plane. Without the "cost advantage," the two loci coincide at zero profit. Profits of either firm type depends negatively on the total number of firms in the market, thus the zero profit loci are downward sloped, and profits are positive (negative) below (above) the locus. Since the cost functions are the same for the two firm types, profit of a profit-maximizing type-1 firm is strictly greater than that of a type-2 firm for all states \((n_1, n_2)\) except along the zero-profit locus where they are equal.

If we were to specify the following functional form for the function \(v\) in the utility function:

\[ v(c) = \ln(1 + c), \]

then the profits of each firm type in the static equilibrium is:

\[ \pi_1 = \frac{1}{\beta L} \left( L - n_2 \frac{\alpha}{1 + \varepsilon} \left( \frac{\alpha + \sqrt{\alpha^2 + 4 \alpha L}}{2 \alpha} \right) - n_1 \right)^2 - \alpha, \] and
\[
\pi_2 = \frac{\sqrt{\alpha \beta L}}{\beta L (\beta L + \sqrt{\alpha \beta L})} \left( L - n_2 \frac{1}{1 + \varepsilon} \left( \alpha + \sqrt{\alpha \beta L} \right) \right) - \frac{\sqrt{\alpha \beta L}}{1 + \varepsilon} - \frac{\alpha}{1 + \varepsilon}.
\]

The zero-profit locus of each firm type is:

\[ (20) \quad \left( \alpha + \sqrt{\alpha \beta L} \right) n_1 + \frac{1}{1 + \varepsilon} \left( \alpha + \sqrt{\alpha \beta L} \right) n_2 = L, \text{ and} \]

\[ (21) \quad \left[ \alpha + \sqrt{\alpha \beta L} - \left( \beta L + \sqrt{\alpha \beta L} \right) \left( 1 - \frac{1}{1 + \varepsilon} \right) \right] n_1 + \frac{1}{1 + \varepsilon} \left( \alpha + \sqrt{\alpha \beta L} \right) n_2 = L, \]

which coincide if \( \varepsilon = 0 \).

### 3. Dynamic Model: Autarkic Economy

We next model the dynamics\(^{13}\) by specifying the entry/exit process of the two types of firms, letting the state be represented by \((n_1, n_2)\). For either firm type, entry or exit depends on the (current) profit. The underlying assumption is that the fitness of a firm depends ultimately on the profit regardless of the objective function of the firm.

If the state is such that either or both profits \((\pi_1, \pi_2)\) are positive, then entry takes place. A new entrant firm has a binary choice of becoming a type-1 firm or a type-2 firm, the decision of which is irreversible.\(^{14}\) The new entrant chooses the firm type for which (current) profit is greater. If the state is such that profit is negative for a firm type, exit takes place. Exit behavior is also myopic: exit decision is based on the (current) profit. We

\(^{13}\) The word "dynamic" is used in a wide sense, to include myopic adjustment processes.

\(^{14}\) It is important to note that neither type of firm behavior is fully rational or irrational. Firms, in a sense, are solving a constrained optimization problem, the constraints being the bounded rationality assumptions of myopia and the choice between the two objective functions. Under the constraints, firms choose the objective function that gives higher current profit. The aim of our exercise is to examine which objective function wins out in the long-run, under different assumptions of the parameter \( \varepsilon \).
also assume that entry or exit takes place at a fixed finite rate, to not allow jumps in the state.

More completely, the entry/exit process is described by the following.

\((\pi_1 > \pi_2 \text{ cases})\)

(22a) \(\pi_1 > \pi_2 \geq 0 \quad \Rightarrow \quad \dot{n}_1 > 0 = \dot{n}_2\)

(22b) \(\pi_1 > 0 > \pi_2 \quad \Rightarrow \quad \dot{n}_1 > 0, \dot{n}_2 < 0 \quad (\dot{n}_2 = 0 \text{ if } n_2 = 0)\)

(22c) \(\pi_1 = 0 > \pi_2 \quad \Rightarrow \quad \dot{n}_1 = 0, \dot{n}_2 < 0 \quad (\dot{n}_2 = 0 \text{ if } n_2 = 0)\)

(22d) \(0 > \pi_1 > \pi_2 \quad \Rightarrow \quad \dot{n}_1 = \dot{n}_2 < 0 \quad (\dot{n}_1 = 0 \text{ if } n_1 = 0, \text{ and } \dot{n}_2 = 0 \text{ if } n_2 = 0)\)

\((\pi_1 = \pi_2 \text{ cases})\)

(22e) \(\pi_1 = \pi_2 > 0 \quad \Rightarrow \quad \dot{n}_1 = \dot{n}_2 > 0\)

(22f) \(\pi_1 = \pi_2 = 0 \quad \Rightarrow \quad \dot{n}_1 = \dot{n}_2 = 0\)

(22g) \(\pi_1 = \pi_2 < 0 \quad \Rightarrow \quad \dot{n}_1 = \dot{n}_2 < 0 \quad (\dot{n}_1 = 0 \text{ if } n_1 = 0, \text{ and } \dot{n}_2 = 0 \text{ if } n_2 = 0)\)

\((\pi_2 > \pi_1 \text{ cases})\)

(22h) \(\pi_2 > \pi_1 \geq 0 \quad \Rightarrow \quad \dot{n}_2 > 0 = \dot{n}_1\)

(22i) \(\pi_2 > 0 > \pi_1 \quad \Rightarrow \quad \dot{n}_2 > 0, \dot{n}_1 < 0 \quad (\dot{n}_1 = 0 \text{ if } n_1 = 0)\)

(22j) \(\pi_2 = 0 > \pi_1 \quad \Rightarrow \quad \dot{n}_2 = 0, \dot{n}_1 < 0 \quad (\dot{n}_1 = 0 \text{ if } n_1 = 0)\)

(22k) \(0 > \pi_2 > \pi_1 \quad \Rightarrow \quad \dot{n}_2 = \dot{n}_1 < 0 \quad (\dot{n}_1 = 0 \text{ if } n_1 = 0, \text{ and } \dot{n}_2 = 0 \text{ if } n_2 = 0)\)

We next examine the dynamics for different specifications of the "cost parameter," \(\varepsilon (=0)\) in equation (10).
3.1 No Cost Advantage ($\varepsilon=0$)

In this case, the only difference between the two types of firms is in the objective function. The zero-profit loci coincide. The entry/exit process is shown by Figure 2a. We have $\pi_1>\pi_2>0$ below the $\pi_1=\pi_2=0$ locus, and $0>\pi_1>\pi_2$ above it. Thus for states below the $\pi_1=\pi_2=0$ locus, entry takes place and new entrant firms choose to be type-1. For states above the $\pi_1=\pi_2=0$ locus, exits of both firm types take place which is assumed to be at the same rate. The entry/exit process stops once any point on the $\pi_1=\pi_2=0$ locus is reached. However, not all points on the $\pi_1=\pi_2=0$ locus are stable. If there exists a small probability of death of firms (regardless of type) pushing the economy below the locus, then the new entrants will all be type-1. Thus the only stable long-run steady-state is point A at which all the firms are type-1.

Figure 2b shows the profits of each firm type for $n_1=n_2(=\bar{n})$. It can be observed that profit of type-1 firm is strictly greater than that of type-2 firm for all $\bar{n}$ except at $\bar{n}_0$ where both profits are zero. Note that the profit advantage of type-1 behavior diminishes to zero as the entry/exit process tends the economy towards the zero-profit locus.

3.2 Type-2 Cost Advantage ($\varepsilon>0$)

In this case, type-2 firms not only maximize profit-per-employee, but also have a constant $\varepsilon$ cost advantage over type-1 firms. A formal modeling of the source of this $\varepsilon$ cost advantage is not carried out in this paper, the current purpose of this exercise being to determine the outcome if such advantage were to exist. Informally, the advantage can originate from the output (and therefore labor input) level of each type-2 firm being constant regardless of the state, as implied by equation (12). This may allow type-2 firms to save on adjustment costs or employee search costs. The following results hold for any small value of $\varepsilon$, as long as it is positive.

The $\varepsilon$ cost advantage for type-2 firms is not significant for states $(n_1, n_2)$ in which type-1 profit is much greater than type-2 profit. However, for states $(n_1, n_2)$ in which this
difference in profits is small, type-2 profit becomes greater. Figure 3a shows the positions of the zero-profit loci, $\pi_1=\pi_2>0$ locus, $\pi_1=\pi_2<0$ locus, and the entry/exit process. There are five regions characterized by the profits, as labeled in the figure. Within region $\pi_1>\pi_2>0$, entry of only type-1 firms takes place. Once the $\pi_1=\pi_2>0$ locus is crossed, the economy enters region $\pi_2>\pi_1>0$, and entry of only type-2 firms begins. Once the $\pi_1=0$ locus is crossed, the economy is in region $\pi_2>0>\pi_1$, and entry of type-2 firms takes place while type-1 firms exit. For regions $0>\pi_1>\pi_2$ and $0>\pi_2>\pi_1$, both type firms exit. The long-run equilibrium from any initial state is now point J at which all the firms are type-2. Even if $\varepsilon$ is small, the entry/exit process tends the economy towards the zero-profit loci around which the $\varepsilon$ cost advantage of type-2 firms is significant. Figure 3b is the counterpart of Figure 2b, showing how the $\varepsilon$ advantage is significant for states for which the difference in profits of the two types is small.

Next, consider the limit of $\varepsilon\to0$. The long run equilibrium is still point J. The long-run equilibrium for $\varepsilon=0$ was shown to be point A in the previous sub-section. This result indicates the feasibility of economies with similar characteristics being in different long-run equilibria, one with all the firms being profit maximizers, and the other with all the firms being profit-per-employee maximizers.

### 3.3 Complementarity

Another case we examine is that for which $\varepsilon$ represents a positive externality: $\varepsilon>0$ if $n_2>n_1$, $\varepsilon=0$ if $n_2=n_1$, and $\varepsilon<0$ if $n_2<n_1$. Again, no formalization of this externality is done in this paper. However, a suggestive source of this externality is in the labor market. Abe (1994) obtains a relation between labor mobility across firms, the investment in firm-specific human capital of the worker, the outside option value of a worker, and the efficiency wage. Her logic is that the less the labor mobility (as observed in Japan) the larger the component of firm-specific human capital in the worker's productivity, the lower the productivity if a worker changes firms (lower outside option value), and therefore the lower the efficiency wage or the higher the productivity.
In our model, the behavior of type-2 firms is such that employment is constant regardless of state (equation (12)), suggesting the source of low labor mobility to be in the firm's objective. Following Abe's logic, this enables type-2 firms to invest in the firm-specific capital of the workers. An increase in the relative number of type-2 firms lowers the outside option value, and therefore, lowers the efficiency wage or raises the productivity workers in type-2 firms, if we assume that type-1 firms are the non-efficiency wage sector.

Figure 4 shows the positions of the zero-profit loci, \( \pi_1=\pi_2>0 \) locus, \( \pi_1=\pi_2<0 \) locus, and the entry/exit process, corresponding to the following specification of the externality:

(23) \[ \varepsilon\left(\frac{\alpha}{\beta}\right) = \delta \frac{n_2}{n_1} - 1. \]

In the existence of this complementarity, there are two long-run equilibria, points A and J. Which equilibrium the economy tends to in the long-run depends on the initial state. The long-run equilibrium is point J if the initial state is in set \( N_J \)
\[ \equiv \{(n_1, n_2) \in \mathbb{R}^2 | n_2 > \bar{n}_2 \text{ and } n_2 > n_1\}, \]
and is point A if otherwise.

This case shows that in the existence of a positive externality, economies with identical fundamental structures can exhibit different modes of firm behavior in the long-run, depending on the initial state. Even at the limit, \( \delta \to 0 \), the long-run equilibria are points A and J, and the set of initial states for which the long-run equilibrium is point J is \( N_J \).

In the next section, we focus on this complementarity case, and consider the effects of economic growth, and international interactions through trade and economic integration. We examine how the relationship between the initial state and the long-run equilibrium are affected, and whether a long-run equilibrium can be toppled by the autarkic economy going into free trade.
4. The Effects of Growth, Trade, and Integration

We first consider the effect of economic growth in an autarkic economy, represented by an increase in the labor supply. We then take two countries with the same technologies and preferences, and examine the effect of international trade among them as well as the effect of economic integration of the two countries. We will refer to the long-run equilibrium with all firms being type-1 as the A-norm, and all firms being type-2 as the J-norm.

4.1 Growth

To furnish the intuition, we first determine how the A-norm and the J-norm change with an increase in labor supply, L. The position of the A-norm is the $n_1$-intercept of the $p_1=0$ locus. We have:

\[(9') \quad p_1 = \beta \frac{\sigma(c_1)}{\sigma(c_1) - 1}, \]
\[(5) \quad x_1 = Lc_1,\]
\[(24) \quad L = n_1(\alpha + \beta Lc_1), \text{ and}\]
\[(25) \quad \pi_1 = (p_1 - \beta)x_1 - \alpha = (p_1 - \beta)Lc_1 - \alpha = 0,\]

which solve for $(c_1, x_1, p_1, n_1)$. This is identical to the equilibrium in Krugman (1979). On the $(c_1, p_1)$ graph, $(9')$ is a positively sloped curve, and $(25)$ is a rectangular hyperbola. Parametric and functional specifications ensure that they cross, solving for $(c_1, p_1)$. From this, $(5)$ and $(24)$ yield $x_1$ and $n_1$. If $L$ increases, $(25)$ shifts in, lowering both $c_1$ and $p_1$. In $(25)$, this increases $x_1$, and in $(24)$, this increases $n_1$. The new A-norm consists of more firms, each producing more and pricing lower.

The position of the J-norm is the $n_2$-intercept of the $\pi_2=0$ locus. We have:
\[(12') \quad \sigma(c_2) = \frac{\beta}{\alpha} x_2 + 1 = \frac{\beta}{\alpha} Lc_2 + 1,\]

\[(5) \quad x_2 = Lc_2,\]

\[(26) \quad L = n_2 \left( \frac{\alpha + \beta Lc_2}{1 + \varepsilon} \right), \text{ and}\]

\[(27) \quad \pi_2 = \left( p_2 - \frac{\beta}{1 + \varepsilon} \right) x_2 - \frac{\alpha}{1 + \varepsilon} = 0,\]

which solve for \((c_2, x_2, p_2, n_2)\). If \(L\) increases, in \((12')\), \(c_2\) decreases and \(x_2\) increases. From \((27)\), \(p_2\) decreases, and from \((26)\), \(n_2\) increases. The new J-norm also consists of more firms, each producing more and pricing lower.

In fact, the zero-profit loci have shifted out, the larger economy being able to sustain a larger number of firms, each firm producing more and pricing lower. Figure 5 shows the effect of growth. Comparing the basins of attractions for the J-norm, that after growth is a strict subset of that before growth. The A-norm is not affected, since the adjustment is from point A to point A'. The J-norm will not be affected if the growth is small, but if large, point J will enter the basin of attraction of point A', and toppling of the J-norm can occur. However, since growth is a gradual process, whether or not the J-norm can be toppled depends on the relative speed between growth and the adjustment process.

### 4.2 Horizontal Trade

Consider the home country in either norm starting to trade with the foreign country which has the same technology and preference, but a different labor endowment. The foreign country may be in either equilibrium, A-norm or J-norm. Every firm, regardless of nationality, produces a distinct variety. For each country's firms, the effect of free trade is much like that of growth. In each of the norms, the number of firms in the world market is greater than the number of firms in either country's autarky, and each firm produces more and prices less. However, since labor endowments in each country is fixed, an increase in each firm's output means a decrease in the number of firms in each country.
This corresponds to the shift the zero-profit loci towards the origin. Under free trade, the J-norm is point J' and the A-norm is point A'. The basin of attraction of point J' is $N'_J \equiv \{ (n_1, n_2) \in \mathbb{R}^2 \mid n_2 > \tilde{n}_2' \text{ and } n_2 > n_1 \}$ (Figure 6). $N'_J$ is a strict superset of $N_J$.

Since point J is in $N'_J$, this implies that for an autarkic country in the J-norm (point J), the long-run equilibrium by going into free trade with a similar country is also the J-norm (point J'), i.e., firms remain to be profit-per-employee maximizers. Since point A is in the complement of set $N'_J$, for an autarkic country in the A-norm, the long-run equilibrium by going into free trade with a similar country is also the A-norm, i.e., firms remain to be profit maximizers. The J-norm cannot be toppled by this form of trade.

For initial states in the set $N'_J/ N_J$, such as point B in Figure 6, the long-run equilibrium under autarky is the A-norm, while that under free trade is the J-norm.

4.3 Economic Integration

Consider next the complete integration of two countries, the home country in the A-norm and the foreign country in the J-norm. Unlike trade, this involves integration of the labor markets as well. As shown in Figure 7, the integrated economy's zero-profit locus lies outside those of either country's. Unlike the case of free trade in which the initial state in each country upon opening to trade was the either norm (point A or J), the initial state for this integrated economy is a mix of both firm types (point C). We can see that if the home country is sufficiently large compared to the foreign country, then point C will be in the basin of attraction of the new A-norm, point A'. The integrated economy will tend towards establishing the A-norm. This is in contrast to the above result that trade cannot topple the J-norm. In addition to letting the initial state be a mix of firms, the difference between integration and trade is in how the basins of attractions change. With free trade, the basin of attraction of the J-norm increases. On the other hand, with integration, the basin of attraction of the A-norm increases.
5. Concluding Remarks

In this paper, we examined the emergence of differing norms of firm behavior, or the establishment of distinct institutions in economies with similar technologies and preferences. Once an institution is established, other complementary institutions may emerge, and a stable system may be formed. It is notable that all the results of this paper hold as the parameter $\varepsilon$ tends to zero. Even an $\varepsilon$ cost advantage gives profit-per-employee maximizing firms an edge over profit maximizing firms when profits are close to zero. The entry process always takes the economy towards zero profits for firms and the $\varepsilon$ advantage becomes significant.

We did not attempt to model the source of the $\varepsilon$ - our exercise is thus confined to the "what if" in terms of the existence of $\varepsilon$. Modeling of $\varepsilon$ should be a subject of further work. There are already indications of the source of the $\varepsilon$ in our model, that the employment level of type-2 firms are more stable than that of type-1 firms. The very difference between the objective functions of the firms may explain $\varepsilon$.

Currently, institutions within the Japanese economic system are facing pressures for change given the prolonged recession and given increased interactions with foreign institutions. It is not clear to which direction the change will and should occur. This line of research is hoped to shed light on such issues. It should also be applicable to the question of transition of socialist economic systems and institutions upon integration with the world economy.

It is expected that international interactions will increasingly be at the level of individual firms and consumers, and international conflicts will accordingly be that between social norms, institutions, and cultures. Our model may be useful in providing a framework towards the analysis of such problems.
References


FIGURE 1: Profits for $\epsilon=0$ Case

\[ n_2 \]

$\pi_1 > \pi_2 > 0$
FIGURE 2: Entry/Exit ($\varepsilon=0$)

Figure 2a

$n_2$

Figure 2b

$\pi_i$
FIGURE 3: Entry/Exit ($\varepsilon > 0$)

Figure 3a

Figure 3b
FIGURE 4: Entry/Exit (Complementarity)
FIGURE 5: Growth
FIGURE 6: Horizontal Trade
FIGURE 7: Integration