The principle of mutual recognition - A source of divergence?

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July 2009

Abstract

Governments set numerous norms to protect consumers. Two countries may achieve the same level of protection of their consumers through different specifications. The adaptation costs induced by these differences create barriers to trade. The principle of mutual recognition addresses the problem by ensuring that products lawfully manufactured in one State are acceptable without adaptation in another State. The principle shifts the transaction costs of adapting to several norms from firms to consumers. We show that the principle creates disparities across countries and is (more) beneficial to larger countries.

Keywords: Technical barriers to trade, mutual recognition, firm location, economic geography, home market effect.
JEL Classification: F13, F15, R12, R13.
1 Introduction

National norms applicable to certain products pursue general objectives such as the fairness of commercial transactions, the defence of the consumers or the product compatibility. For instance, norms can protect consumers against sellers who have a better information about the product that they sell. Different States can pursue the same general objectives and reach the same level of consumers protection, but in the absence of coordination, their legislation differs, yielding different norms. Therefore, a company wishing to export must adapt its product to the norms of the export market. Adaptation is expensive even if the non-adapted product gives the same level of protection to the consumers as an adapted product.

Norms are of concern to WTO as far as they can be strategically used by local governments as technical barriers to trade. We present the literature on the strategic use of norms at the end of this introduction. In this paper we adopt a different view. Norms act as barriers to trade even if they are not set strategically as such. Numerous norms are set to protect consumers and not to restrict trade, but they have a negative side-effect on trade. This problem has long been recognized by the EU, which, for many years, tried to address the costs of regulation heterogeneity by regulation harmonization. However, harmonizing regulations of a large set of countries can be extremely slow if it requires a unanimous approval by Member States. About 25 years ago, the European Commission addressed the problem by adopting the principle of mutual recognition. In February 2009, the Committee on economic and monetary affairs of the European Parliament advocated gradually integrating the EU and US markets through mutual recognition combined with a degree of convergence of the current regulatory frameworks (European Parliament, 2009). The principle ensures that a product lawfully manufactured in one Member State is acceptable without adaptation in another Member State, provided that both legislations reach the same level of protection to the consumers. Should this condition be interpreted with sufficient flexibility, the good application of the principle would reduce production and export costs and consumers would have access to a wider range of products.

Do consumers always win from the application of the principle? The question is all the more acute that the principle could also be applied to services. As pointed out by Jacques Pelkmans (2005), it is more difficult
to assess the quality of a service than that of a good, which explains the numerous norms set to ensure a proper functioning of service markets. Under the principle of mutual recognition, a company that exports a product (a service or a good) has two options. Either it adapts its product to the norms of the host country, or it does not. If both countries followed the same general objectives when setting their norms, the two options offer the same broad protection to consumers. Still, it is likely that consumers prefer products delivered under a familiar set of rules to products operated under unfamiliar norms, that is, a non-adapted product provides a lower utility than an adapted product.

To illustrate the last point, consider the service provided by an architect. To protect the buyers of this service, norms are set on several dimensions of the service: they define the responsibility of the parties in case of delay in the construction, the type of the after-sale service, ... Country A may grant a large after-sale service and a poor protection to consumers in case of delay. Country B may offer the opposite. Globally consumers benefit from the same global protection in both countries and may end up being indifferent between both sets of norms if they perfectly knew both sets of norms. However, consumers from A probably know the norms from A, or at least they know where they could get the information about these norms. By contrast, they are probably more ignorant of B-norms, even more so if these norms are written in a foreign language. In case of delay during the construction, a consumer from A, who has bought a contract operated under B-norms by application of the principle of mutual recognition, may not even think that he benefits from a good protection, which prevents him to take the full benefit of his contract. The alternative is that he learns norms from B but this is costly. As a matter of fact, the application of the principle of mutual recognition shifts the transaction costs of adapting to several norms from the firms to the consumers (Kalypso Nicolaïdis and Susanne K. Schmidt, 2007).

To assess the welfare effects of the mutual recognition principle, we use a two-country general equilibrium model with monopolistic competition. On the one hand, the reduction of costs promotes entry of new firms, which is beneficial to consumers who exhibit preference for variety. On the other hand, products are less adapted, which is detrimental to consumers. We also examine how firms respond to the principle by changing their geographical location in order to operate under their preferred rules.

We consider two settings. In the first, we assume that consumers do not learn foreign norms. We identify a home market effect because consumers are biased towards products operated under familiar norms. Firms dispropor-
tionately locate in the larger country in order to use norms that are familiar to the larger population. If the losses of consuming a non adapted product are small, all firms choose the norms of the larger country. For intermediate losses some firms use exclusively the norms of the larger country whereas the other firms adapt their product to both legislations. Firms do not apply the principle if the consumers losses are large; they prefer to adapt their product in order to keep a sufficiently large export market, which seems to be consistent with the EU insurance market (Schmidt, 2002).

Consumers from the larger country always gain from the application of the principle: more firms are active and most of them use the rules of their country, either exclusively or in combination with the foreign rules. By contrast consumers from the smaller country unambiguously lose if the loss of consuming a non-adapted product is intermediate: they benefit from more products but fewer are adapted to their norms, which is costly. For small losses of consuming a non-adapted product these consumers unambiguously gain but their gain is smaller than that of the larger country. The application of the principle improves welfare in both countries for some parameter values but at the costs of increased disparities.

In the second setting we assume that consumers can learn foreign norms, which is costly. By learning foreign norms they fully benefit from a product that has not been adapted to their national norms. We identify the following equilibria according to the loss of consuming a non-adapted product. For a small loss, nobody learn the foreign specification and the analysis of the first setting holds. For an intermediate and a large loss, households from the country A learn norms of country B; all firms use norms of country B as these are known by all consumers, and households from country B do not need to learn rules from A, which are not used. Firms agglomerate in country B in order to use its norms that are known by all households.

Another equilibrium exists when the loss is large: all firms adapt their product to both sets of rules and, as a result, consumers do not learn the foreign specifications. Multiple equilibria ensue for large losses. We show that the households who do not learn foreign specifications unambiguously gain when the principle is applied: more products are available and these products use their specifications. Households who learn the foreign specifications gain only if the cost of learning is small enough.

Interestingly, the model identifies a force of agglomeration that complements those analyzed in the economic geography literature. For large and

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3 For large losses, firms do not use the principle and adapt their products.
4 Paul Krugman (1991), Anthony Venables (1996), Masahisa Fujita, Krugman and Ven-
intermediate losses, households from a first country learn foreign rules and firms locate in the second country to use rules that are universally known. This equilibrium exists even if countries have identical sizes; moreover in case of countries of different sizes, agglomeration can take place in the smaller country. As emphasized by Baldwin (2000, p. 239), falling tariff levels, teamed with lower transportation and communication costs, "means that even a slight tilt tends to have large effects on the location of production. In particular, seemingly minor differences in technical norms can have an outsized effect on production."

To the best of our knowledge this is the first theoretical model that analyses the effects of the mutual recognition principle on welfare and on firms location when norms are not set strategically. In related literature, Costinot (2008) considers standards set up to cope with environmental externalities (vertical standards) and product compatibility (horizontal standards). In a two firms, two countries model he examines how standards are strategically set under the mutual recognition principle and under the national treatment principle. He shows that standards are imposed for levels of externalities that are too high under the mutual recognition principle. Other papers emphasize how protectionist incentives interfere with the setting of norms; see Ronald Fischer and Pablo Serra (2000), Kyle Bagwell and Robert W. Staiger (2001), Neil Gandal and Oz Shy (2001), Akiko Suwa-Eisenmann and Thierry Verdier (2002), Mikhail M. Klimenko (2009).

Empirical estimations by Silja Baller (2007) show that mutual recognition agreements have a strong positive influence on both export probabilities and trade volumes for partner countries. Maggie X. Chen and Aaditya Mattoo (2008) also show that such agreements are trade promoting. Roland de Bruijn, Henk Kox and Arjan Lejour (2008) use an applied general equilibrium model of the world economy to assess the performance of an EU proposal to fully extend the principle of mutual recognition to services. They show that a full implementation of the proposal would increase GDP of the EU by 0.3-0.6%, while consumption growth would be between 0.7 and 1.2%.

The rest of the paper is organized as follows. Next section sets up the model with agents preferences, their decision to learn foreign rules, and firms behavior in terms of prices and output. Sections 3 and 4 examine the equilibrium choice of rules, respectively under the assumption that households cannot learn foreign rules and that they are able to learn them. This is followed by the conclusion.
2 The model

The model builds on Dixit-Stiglitz (1977) with two countries, \( r \) and \( s \) and two sectors. The population in country \( k \in \{ r, s \} \) is equal to \( L_k \). Without loss of generality, we suppose that \( L_r \geq L_s \). Labor is the sole input. Individuals can work either in a constant returns to scale sector or in an increasing returns to scale sector. The good produced under constant returns to scale is taken as the numeraire; one unit of labor is required to produce one unit of this good. This normalization and the assumption that workers are mobile across sectors fix the wage to one. Under free entry, profits in the increasing returns to scale sector fall to zero. The total earnings of each individual are thus equal to one.

2.1 Preferences

Preferences are represented by a Cobb-Douglas function with a share \( \mu \in (0, 1) \) of income spent on the increasing returns to scale sector and a share \( 1 - \mu \) spent on the constant returns to scale sector. The good produced under increasing returns to scale is a composite made of a continuum of differentiated varieties \( i \in [0, N] \). These varieties are produced by firms that must design them to the specifications of their home country. In the absence of mutual recognition firms must adapt their product to foreign specifications in order to export. This adaptation is costly but it allows foreign consumers to take the full benefit of these products. In case of mutual recognition, firms are allowed to sell their product to the foreign country with or without adaptation to the foreign specifications. However foreign consumers do not fully benefit of non-adapted products. Still, a consumer may costly learn the foreign specifications, which allows her to take the full benefit of consuming foreign non-adapted varieties.

A consumer from country \( k \) \( (k \in \{ r, s \}) \) who has not learned foreign specifications has the following preferences:

\[
U_k = (H_k)^{1-\mu} \left( \int_0^N (C_k(i))^{1-1/\sigma} + (C_a(i))^{1-1/\sigma} + (\phi C_l(i))^{1-1/\sigma} \, di \right)^{\mu \sigma \sigma - 1}, \quad l \in \{ r, s \} \text{ and } l \neq k
\]

where \( H_k \) is the consumption of the good produced under constant returns. \( C_k(i) \) is the consumption of a variety \( i \) that is designed for the only specifications of country \( k \). An household who consumes a foreign variety that has not been adapted to domestic specifications does not fully benefit of the variety and discounts her utility of consuming that variety with a factor \( \phi \in (0, 1) \). \( C_a(i) \) is the consumption of a variety that has been adapted to
the specifications of both countries. Finally, $\sigma > 1$ denotes the elasticity of substitution between varieties.

The earnings of each household is equal to one. Accordingly, an household from $k$ who has not learned foreign specifications demands $C_k(i) = \mu (p_k(i))^{-\sigma} / P_k^{\sigma-1}$ units of a variety that is only designed for domestic specifications; she demands $C_a(i) = \mu (p_a(i))^{-\sigma} / P_k^{\sigma-1}$ units of a variety designed for the specifications of both countries and she demands $C_l(i) = \Phi \mu (p_l(i))^{-\sigma} / P_k^{\sigma-1}$ units of a variety designed only for the specifications of the foreign country. In these expressions, $p_k(i)$ is the price set by a firm that designs its variety only for country $k$, whereas $p_a(i)$ is the price set by a firm that adapts its variety to the specifications of both countries. The parameter $\Phi \equiv \phi^{\sigma-1}$ denotes the degree of harmonization between specifications of both countries. The lower is $\Phi$, the lower is the utility of consuming a product that has not been adapted. Finally, $P_k \equiv \int_0^N \left( (p_k(i))^{1-\sigma} + \Phi (p_l(i))^{1-\sigma} + (p_a(i))^{1-\sigma} \right)^{\frac{1}{\sigma}} \, di$ is the price index for a consumer who has not learned foreign specifications.

A consumer who has learned the foreign specifications behaves as if the degree of harmonization was perfect, $\Phi = 1$:

$$C_k(i) = \mu \frac{(p_k(i))^{-\sigma}}{P_a^{\sigma-1}}, \quad C_a(i) = \mu \frac{(p_a(i))^{-\sigma}}{P_a^{\sigma-1}},$$

where $P_a \equiv \int_0^N \left( (p_k(i))^{1-\sigma} + (p_l(i))^{1-\sigma} + (p_a(i))^{1-\sigma} \right)^{\frac{1}{\sigma}} \, di$ is the price index for a consumer who has learned foreign specifications.

### 2.2 Learning foreign specifications

We consider two settings. In the first, we assume that households are unable to learn the foreign specifications and we examine firms’ behavior. In the second, we allow households to learn foreign specifications. They do learn foreign specifications if learning provides a higher welfare. As shown later, all types of firms set the same price, $p \equiv p_r(i) = p_s(i) = p_a(i)$. We anticipate this result to compute the welfare of each type of consumers. The variable $n_k$ denotes the mass of firms that use exclusively the norms from $k$ whereas $n_a$ is the mass of firms that adapt their products to both sets of norms. The
welfare of a consumer from $k$ who has not learned the foreign specifications is $(1 - \mu)^{1-\mu} \mu^\mu p^{-\mu} (n_k + \Phi n_l + n_a)^{\frac\mu{\sigma-1}}$, where $k, l \in \{r, s\}$ and $k \neq l$. We rewrite welfare as

$$W_k = (n_k + \Phi n_l + n_a)^{\frac\mu{\sigma-1}}$$

The welfare of a consumer who has learned the foreign specifications is

$$W_a = (n_k + n_l + n_a)^{\frac\mu{\sigma-1}} - \gamma$$

where $\gamma \equiv g (1 - \mu)^{-(1-\mu)} \mu^{-\mu} p^\mu$.

The variable $\lambda_k$ denotes the proportion of households in country $k$ who do not learn the foreign specifications. Hence $(1 - \lambda_k) L_k$ households learn in country $k$. Obviously, we must consider three configurations: (i) in both countries none of the households learn the foreign specifications, $\lambda_k = 1$ for all $k$; (ii) in both countries all households learn the foreign specifications, $\lambda_k = 0$ for all $k$; (iii) all households learn foreign specifications in one country whereas none of them learn these specifications in the other country, $\lambda_k = 1$ and $\lambda_l = 0$ for all $k, l$.

2.3 Firms’ behavior

The marginal productivity of a worker is constant and equal to one. A firm from $k$ that has not adapted its variety to the foreign market earns the following profits:

$$\pi_k = \mu (p_k (i))^{-\sigma} \left( \frac{\lambda_k L_k}{P_k^{\sigma-1}} + \frac{(1 - \lambda_r) L_r + (1 - \lambda_s) L_s + \Phi \lambda_l L_l}{P_l^{\sigma-1}} \right) (p_k (i) - 1) - f$$

where $f$ is the fixed cost of production. A firm that adapts its varieties earns the following profits

$$\pi_a = \mu (p_a (i))^{-\sigma} \left( \frac{\lambda_r L_r}{P_r^{\sigma-1}} + \frac{(1 - \lambda_r) L_r + (1 - \lambda_s) L_s + \lambda_s L_s}{P_a^{\sigma-1}} \right) (p_a (i) - 1) - f - f_a$$

where $f_a$ is the fixed cost of adapting the variety to the foreign market. The optimal prices are constant and equal to $p \equiv p_r (i) = p_a (i) = p_r (i) = \ldots$
Thus, 

\[ P_k \equiv \left( \frac{\sigma}{\sigma - 1} \right) (n_k + \Phi n_l + n_a) \frac{1}{\mu}, \quad P_a \equiv \left( \frac{\sigma}{\sigma - 1} \right) (n_r + n_s + n_a) \frac{1}{\mu} \]

Accordingly, 

\[ \pi_k = \frac{\mu}{\sigma} \left( \frac{\lambda_k L_k}{n_k + \Phi n_l + n_a} + \frac{(1 - \lambda_r) L_r + (1 - \lambda_s) L_s}{n_r + n_s + n_a} + \Phi \frac{\lambda_l L_l}{\Phi n_k + n_l + n_a} \right) - f \]

\[ \pi_a = \frac{\mu}{\sigma} \left( \frac{\lambda_r L_r}{n_r + \Phi n_s + n_a} + \frac{(1 - \lambda_r) L_r + (1 - \lambda_s) L_s}{n_r + n_s + n_a} + \frac{\lambda_s L_s}{\Phi n_r + n_s + n_a} \right) - f - f_a \]

By free entry, profits of active firms must fall to zero.

We now consider the two settings. In the first setting, households cannot learn the foreign specifications whereas in the second setting they may learn these specifications.

3 First setting: no learning

We analyze how firms choose their specifications in this first setting. Their behavior is guided by their profits (1)-(2) in which we set \( \lambda_k = 1 \) for all \( k \in \{ r, s \} \). To compare these profits, we define four bounds:

\[ \Phi_1 \equiv 1 - \frac{L_s + L_r}{L_s} \frac{f_a}{f + f_a}, \quad \Phi_2 \equiv 1 - 2 \frac{f_a}{f + f_a}, \]

\[ \Phi_3 \equiv 1 - \frac{(L_s + L_r) (f + f_a)}{(L_s + L_r) (f + f_a) - f L_r + f f_a}, \quad \Phi_4 \equiv \frac{L_s}{L_r}. \]

We also consider two levels for the costs of adapting the products to both markets: large costs with \( f_a / f > (L_r - L_s) / (L_r + L_s) \) which implies \( \Phi_1 < \Phi_2 < \Phi_3 < \Phi_4 \); and small costs with \( f_a / f < (L_r - L_s) / (L_r + L_s) \), which implies \( \Phi_1 < \Phi_4 < \Phi_3 < \Phi_2 \).

The comparison of the profits gives the next proposition which is illustrated in Figure 1.
Proposition 1  First consider large costs of adapting the products to both
countries. All firms adapt their product to local consumers if the degree of
harmonization is small, i.e. if $\Phi \in (0, \Phi_1)$. Some firms adapt their product
to local consumers whereas the other firms use only the specifications of the
large country if $\Phi \in (\Phi_1, \Phi_2)$. For $\Phi \in (\Phi_2, \Phi_4)$, firms use only the specifications
of their home country. Finally, for a larger degree of harmonization,
all firms use only the specifications of the large country.

Second consider small adaptation costs. All firms adapt their product for
$\Phi \in (0, \Phi_1)$; some firms adapt their product to local consumers whereas the
other firms use only the specifications of the large country if $\Phi \in (\Phi_1, \Phi_3)$
and all firms use only the specifications of the large country if $\Phi > \Phi_3$.

Proof. We first show that the three types of firms cannot be active si-
multaneously. Second we establish the condition under which all types of
firms adapt their specifications to both countries. Third, we derive the con-
ditions for the coexistence of firms that have adapted their product to both
specifications with firms that use the specification of only one country; moreover we show that this must be firms using the large country specifications.
Fourth, we compute the conditions for the coexistence of firms that use the
specifications of the large country with firms that use the other specifications.
Finally we show that for a large degree of harmonization between
specifications, all firms use the specifications of the large country. We set
$\lambda_k = 1$ for all $k \in \{r, s\}$ in the profits (1) and (2).
1. There does not exist an equilibrium with three types of firms. Indeed setting the profits equal to zero creates a system of three equations with the following two ‘unknowns’, $L_k/(n_k + \Phi n_l + n_a)$ and $L_l/(\Phi n_k + n_l + n_a)$, which does not have any solution.

2. An equilibrium where all firms adapt their product requires $\pi_a = 0$, $\pi_r, \pi_s < 0$ and $n_r = n_s = 0$. Using (1)-(2), it is readily checked that $\pi_a = 0 \iff n_a = \mu (L_r + L_s)/\sigma (f + f_a)$ and that the condition $\pi_s < 0$ is less stringent than the condition $\pi_r < 0$, which requires $\Phi < \Phi_1$.

3. An equilibrium where some firms adapt to the specifications of both countries and the other firms stick to the rules of the small country is not feasible because it is easily checked that $\pi_s \leq \pi_r$ if $n_r = 0$, which is incompatible with $n_s > 0$.

An equilibrium where some firms adapt to the specifications of both countries and the other firms stick to the rules of the large country requires $\pi_r = \pi_a = 0, \pi_s < 0$ and $n_s = 0$. Using (1)-(2), it is readily checked that $\pi_r = \pi_a = 0$ requires

$$n_r = \frac{\mu L_r}{\sigma f (1 - \Phi) - f_a \Phi} = \frac{\mu L_s}{f_a \sigma} \quad \text{and} \quad n_a = -\Phi \frac{\mu L_r}{\sigma f (1 - \Phi) - f_a \Phi} + \frac{\mu L_s}{f_a \sigma}$$

which are positive if and only if $\Phi_1 < \Phi < \Phi_3$. Finally $\pi_s < 0 \iff \Phi < \Phi_2$. Hence, this equilibrium requires $\Phi_1 < \Phi < \min\{\Phi_2, \Phi_3\}$ where

$$\min\{\Phi_2, \Phi_3\} = \Phi_2 \iff f_a/f > (L_r - L_s)/(L_r + L_s).$$

4. An equilibrium where none of the firms adapt and where each country hosts firms that have adopted the local rules requires $\pi_r = \pi_s = 0, \pi_a < 0$ and $n_a = 0$. Using (1)-(2), it is readily checked that

$$\pi_r = \pi_s = 0 \iff n_r = \frac{L_r - \Phi L_s}{f \sigma (1 - \Phi)} > n_s = \frac{L_s - \Phi L_r}{f \sigma (1 - \Phi)}$$

and $\pi_a < 0 \iff \Phi > \Phi_2$. Moreover, a necessary condition for $n_r, n_s > 0$ is $\Phi < \Phi_4$. Thus this equilibrium requires $\Phi_2 < \Phi < \Phi_4$ where $\Phi_4 > \Phi_2 \iff f_a/f > (L_r - L_s)/(L_r + L_s)$.

5. An equilibrium where all firms use the local rules of the large country requires $\pi_r = 0, \pi_s < 0, \pi_a < 0$ and $n_s = n_a = 0$. Using (1)-(2), it is readily checked that $\pi_r = 0 \iff n_r = \mu (L_r + L_s)/f \sigma$. Moreover, $\pi_s < 0 \iff \Phi > \Phi_4$ and $\pi_a < 0 \iff \Phi > \Phi_3$.

Note that the complementary equilibrium in which all firms would adopt the local rules of the small country would require $\Phi > L_r/L_s$ which is not possible under the assumption that $r$ is the large country. ■

Note that for countries of identical sizes, $\Phi_1 = \Phi_2$ and $\Phi_4 = 1$. The first part of Proposition 1 and the top panel of Figure 1 apply: firms either adapt
their product to both markets or they split evenly between the specifications of each country. For countries of different sizes, the larger country benefits from its larger market because it benefits from a home market effect.

To what extent do the two countries have an interest to accept the principle of mutual recognition? To answer this question, we perform a welfare analysis in case the principle is accepted by both countries. A firm that exports without having adapted its product to the host country specifications suffers from the low degree of harmonization between specifications. However this firm faces lower fixed costs. From a welfare point of view, two effects have to be taken into account. First consumers lose when buying a good that has not been adapted. Second, more firms may enter the market because of the lower fixed costs if they do not adapt their product. More firms in the market is beneficial to consumers who exhibit a preference for variety. To compare with the situation in which the principle is not accepted, it suffices to set $\Phi = 0$: households cannot buy products that are not adapted to local specifications.

We find the following proposition which is illustrated in Figure 2 for $\mu = .7, \sigma = 5, L_r = 1.2, L_s = 1, f_a = .1, f = .4$.

**Proposition 2** The mutual recognition principle is always beneficial for the large country. It is neutral for the small country if the degree of harmonization is small; it is detrimental if the degree of harmonization is intermediate; and it is beneficial if the degree of harmonization is large. The principle promotes disparities across countries.

**Proof.** We consider successively the four equilibria identified in Proposition 1.

First, for $\Phi \leq \Phi_1$, all firms adapt their product. It is as if the principle was not used: $W_r = W_s = W_{ini}$:

$$W_{ini} \equiv \left( \frac{\mu}{\sigma} \frac{L_r + L_s}{f + f_a} \right)^{\frac{\mu}{\sigma-1}} \quad (3)$$

Second, for $\Phi \in (\Phi_1, \min \{\Phi_2, \Phi_3\})$, some firms adapt their product and the other firms follow the rules of the larger country. Then

$$W_r = \left( \frac{\mu - (1 - \Phi) L_r}{\sigma f (1 - \Phi) - f_a \Phi} \right)^{\frac{\mu}{\sigma-1}}, \quad W_s = \left( \frac{\mu (1 - \Phi) L_s}{f_a \Phi} \right)^{\frac{\mu}{\sigma-1}} \quad (4)$$

It is readily checked that households in $r$ gain; $W_r \geq W_{ini}$ for $\Phi \geq \Phi_1$, with equality at $\Phi = \Phi_1$. This gain increases with $\Phi$ because more goods are then
produced. By contrast, the opposite holds for households in $s$, $W_s \leq W_{ini}$. Despite the larger number of goods available with larger values of $\Phi$, the loss of consumers in $s$ increases with $\Phi$ because fewer goods are adapted to their country.

Third, for $\Phi \in (\Phi_2, \Phi_4)$ firms are active in each country and they do not adapt their product for the export. Welfare are then

$$W_r = \left(1 + \Phi \frac{\mu L_r}{\sigma} \right)^{\frac{\mu}{\sigma-1}}, \quad W_s = \left(1 + \Phi \frac{L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}}$$

Again, households from $r$ unambiguously gain ($W_r > W_{ini}$) and the gain increases with the value of $\Phi$. For low values of $\Phi$, households from $s$ lose compared to the initial situation ($W_s < W_{ini}$). Nevertheless, their loss decreases with $\Phi$. Moreover, they gain if $\Phi > (fL_r - Lsf_a) / (f + f_a) L_s$ and $f_a/f > (L_r - L_s) / L_s$.

Finally, for $\Phi \in (\min \{\Phi_3, \Phi_4\}, 1)$ firms stick to the rules of the larger country but the losses in the small country are small. Welfare is

$$W_r = \left(\frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}}, \quad W_s = \left(\frac{\Phi \mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}}$$

Households from $r$ gain compared to the initial situation but their gain is now independent of $\Phi$. Households from $s$ may lose for low values of $\Phi$ but they gain for values of $\Phi$ that are larger than $f / (f + f_a)$.

![Figure 2: welfare as a function of the compatibility parameter.](image)

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5 If $f_a/f > (L_r - L_s) / (L_r + L_s)$.
6 The second condition guarantees that the first condition can be met for $\Phi < \Phi_4$.
7 This condition is met if $f_a/f > (L_r - L_s) / L_s$.
For low degree of harmonization across specifications, the adoption of the principle of mutual recognition does not have any effect because firms that adapted their product continue to do it even though the principle is applicable. For larger degrees of harmonization some firms use the principle and cease to adapt their product for the export, which creates disparities across countries of different sizes. The large country gains whereas the small country lose for an intermediate degree of harmonization. For a large degree of harmonization both countries gain but the gain is larger in the large country. It is only for a perfect harmonization across countries that both countries have the same benefit of adopting the principle.

4 Second setting: learning is feasible

In this setting we assume that households are able to learn foreign specifications. Learning is costly but allows households to fully benefit from foreign varieties that are not adapted for both countries.

We consider three configurations. First, none of the households learn the foreign specifications. In the previous section we have analyzed the behavior of firms under this configuration. It remains to check for which values of $\Phi$, households indeed have no incentive to learn foreign specifications. Second, households from one country learn foreign specifications whereas households from the other country do not learn them. Third, all households from both countries learn foreign specifications.

4.1 Households do not learn foreign specifications

In the previous section, we have assumed that households do not know foreign specifications. Refusing to learn the foreign specifications is an equilibrium for households in $k$ if and only if the cost of learning is large enough, i.e., if

$$\gamma > (n_k + n_l + n_a)^{\frac{1}{2}} - (n_k + \Phi n_l + n_a)^{\frac{1}{2}}$$

for households in $k$ (6)

It is clear that for $n_r \geq n_s$, households from country $s$ have a larger incentive to learn foreign specifications than households from country $r$ because learning opens full access to a larger set of varieties. Condition (6) is therefore more stringent for households in $s$ than for households in $r$. We have the following proposition where $\Phi_a$ and $\Phi_b$ are precisely defined in the proof of the proposition.
Proposition 3 For $\Phi \in (0, \Phi_a)$ and $\Phi \in (\Phi_b, 1)$, households do not learn foreign specifications, either because most firms have adapted their product ($\Phi < \Phi_a$) or because the gain of learning the foreign specification is small ($\Phi > \Phi_b$). By contrast, for $\Phi \in (\Phi_a, \Phi_b)$, households from the small country have an incentive to learn the foreign specifications.

Proof. First consider the firms’ equilibrium in which all firms adapt their product, $n_s = n_r = 0$, $n_a > 0$ and thus $\Phi \in (0, \Phi_1)$ according to Proposition 1. Clearly (6) is always fulfilled and households from both countries do not learn the foreign specifications because all goods are available at local specifications. For $\Phi \in (0, \Phi_1)$, there is an equilibrium in which household do not learn the foreign specifications and $n_s = n_r = 0$, $n_a > 0$.

Second consider the coexistence of firms that adapt their product with firms that use only the specifications of the large country, $n_s = 0$, $n_a, n_r > 0$ and $\Phi \in (\Phi_1, \min \{\Phi_2, \Phi_3\})$. We use the values of $n_a$ and $n_r$ found in the proof of Proposition 1 to show that the households from $s$ do not learn the $r$-specifications if and only if

$$\gamma > \left( \frac{\mu L_s}{\sigma f_a} (1 - \Phi) \right)^{\frac{n}{\sigma - \tau}} \left( \frac{L_r}{L_a} \left( \frac{f_a}{f} (1 - \Phi) \right)^{\frac{n}{\sigma - \tau}} - 1 \right)$$

The right-hand-side is nil at $\Phi = \Phi_1$ and is increasing in $\Phi$. Let us call $\Phi_a$ the value of $\Phi$ such that the above condition is met with equality. For $\Phi \in (\Phi_1, \Phi_a)$ households from $s$ do not learn the foreign specifications and $n_s = 0$, $n_a, n_r > 0$ is an equilibrium.

Third, consider $\Phi \in (\Phi_2, \Phi_3)$ (and thus, $f_a/f > (L_r - L_s)/(L_r + L_s)$). The candidate equilibrium is $n_a = 0$ and $n_r > n_s > 0$. It is an equilibrium if households from $s$ do not learn foreign specifications, that is, by using the values of $n_r$ and $n_s$ found in the proof of Proposition 1 if

$$\gamma > \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{n}{\sigma - \tau}} \left( 1 - \left( \frac{L_s}{L_r + L_s} (1 + \Phi) \right)^{\frac{n}{\sigma - \tau}} \right)$$

(7)

Let us denote $\Phi_b'$ the critical value such that this condition is met with equality. For $\Phi \in (\Phi_b', \Phi_3)$, households from $s$ do not learn foreign specifications whereas they do learn foreign specifications for $\Phi \in (\Phi_2, \Phi_b')$. Hence, there is no equilibrium in which households do not learn foreign specifications and $n_a = 0$, $n_r > n_s > 0$ if $\Phi \in (\Phi_2, \Phi_b')$. By contrast, such an equilibrium exists if $\Phi \in (\Phi_2, \Phi_b')$. 

14
Fourth, consider $\Phi \in (\max (\Phi_3, \Phi_4), 1)$ with $n_s = n_a = 0$ and $n_r > 0$. Households from $s$ do not learn foreign specifications if and only if

$$\gamma > \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma f}} \left( 1 - \Phi^\mu \right)$$

Let us denote $\Phi''_b$ the critical value such that this condition is met with equality. Hence, $n_s = n_a = 0$ and $n_r > 0$ is an equilibrium in which households from $s$ do not learn foreign specifications if $\Phi \in (\Phi''_b, 1)$ whereas it is not an equilibrium if $\Phi \in (\min (\Phi_3, \Phi_4), \Phi''_b)$.

In the Appendix we show that $\Phi'_b = \Phi''_b \iff \Phi'_b = \Phi''_b = \Phi_4$ and $\Phi'_b > \Phi'_b \iff \Phi'_b > \Phi''_b > \Phi_4$ whereas $\Phi'_b < \Phi''_b \iff \Phi'_b < \Phi''_b < \Phi_4$. To sum up, an equilibrium in which households do not learn foreign specifications does not exist if

$$\Phi_a < \Phi < \Phi_b \equiv \min \{ \Phi'_b, \Phi''_b \}$$

To illustrate, let us take again $\mu = .7, \sigma = 5, L_r = 1.2, L_s = 1, f_a = .1, f = .4$. Let us add that $\gamma = 0.02$. Then $\Phi_a = 0.59$ and $\Phi_b = 0.89$; For a degree of harmonization $\Phi \in (0.59, 0.89)$ an equilibrium in which households from both countries do not learn foreign specifications does not exist. It exists outside this domain.

4.2 Households from one country learn the foreign specifications

Households from country $l$ learn the foreign specifications whereas those living in country $k$ do not. Hence the specifications of country $k$ are known by all households and it is not necessary for firms to adapt their product to the specifications of country $l$. By contrast, it is profitable for firms to use specifications of country $k$ in order to fully reach households from that country. Hence, $n_a = n_l = 0$ and $n_k > 0$. To solve the model analytically, it suffices to plug $\lambda_k = 1, \lambda_l = 0$ in (1)-(2). It is then confirmed that $\pi_k > \pi_a$ and $\pi_k > \pi_l$. Moreover $\pi_k = 0$ requires $n_k = \mu (L_r + L_s) / \sigma f$.

Consider now the households behavior. Households from $k$ do not learn specifications from $l$ because none of the firms use these specifications. To what extent do households from $l$ learn specifications from $k$? They learn these specifications if and only if

$$\gamma < \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma f}} \left( 1 - \Phi^\mu \right)$$
which is the opposite of condition (8). Denote $\Phi''_b$ the value of $\Phi$ such that the condition holds with equality (with $\Phi''_b \geq \Phi_b$ by the proof of Proposition 2). This gives the next proposition.

**Proposition 4** For $\Phi < \Phi''_b$, there exists an equilibrium in which (1) households from a first country do not learn foreign specifications, (2) households from the second country learn the foreign specifications, (3) all firms adopt the specifications of the first country.

The proposition does not predict which specifications are adopted by firms. It may be the specifications of the large or of the small country. Moreover, the proposition also applies to two countries of identical sizes: one of the two countries hosts all firms if the costs of learning foreign specifications are small and if the degree of harmonization across specifications is low ($\Phi < \Phi''_b$). Mutual recognition creates an agglomeration force. All firms use the same specifications which must be the specifications of their home country. On the one hand, firms do not adapt their product because foreign households have learned the home specifications. On the other hand foreign households learn these specifications because these are the sole specifications that are used and because the gain of learning is high whereas the cost is low.

Let us now turn to the welfare analysis. Because firms do not adapt their product, more firms enter the market. In country $k$, households benefit from a large number of varieties that fit with their specifications. The households in country $l$ also fully benefit from this large number of varieties because they have learned the foreign specifications. However they suffer from the costs of learning foreign specifications. Welfare levels in both countries are given by

$$W_k = \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}}$$

and

$$W_l = \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}} - \gamma$$

where $k \in \{r, s\}$ and $k \neq l$.

(9)

Country $k$ unambiguously gains by adopting the principle of mutual recognition. Its welfare level corresponds to the highest welfare level it could reach if none of the households learned foreign specifications. In country $l$, households gain if the costs of learning is low but they lose otherwise. From a global point of view it is preferable that country $l$ be the small country, i.e. that the smallest number of households pay the costs of learning the foreign specifications.

In Section 4.1, we have shown that for $\Phi < \Phi_a$, there exists an equilibrium in which (1) households do not learn foreign specifications and (2)
either all firms adapt their product to both specifications or some firms adapt their product and the other firms use the specifications of the large country. We have also shown that for \( \Phi \in (\Phi'_b, \Phi''_b) \), there exists an equilibrium in which (1) households do not learn foreign specifications and (2) either all firms use the specifications of the large country or some firms adapt their product and the other firms use the specifications of the large country. In this section Proposition 4 identifies another equilibrium where households from one country learn foreign specifications if \( \Phi \leq \Phi'_b \). There is thus a multiplicity of equilibria for some values of the degree of harmonization \( \Phi \leq \Phi'_b \).

We now compare these equilibria from a welfare point of view. Without loss of generality, we assume that country \( l \) is the country in which households learn the foreign specifications.

**Proposition 5** Suppose that in the "learning equilibrium", households from country \( l \) learn the foreign specifications.

For \( \Phi < \Phi_a \), households from country \( k \) prefer the "learning equilibrium". Households from country \( l \) also prefer that equilibrium only if the cost of learning is small enough.

For \( \Phi \in (\Phi''_b, \Phi'_b) \) households from country \( k \) prefer the "learning equilibrium". Households from country \( l \) always prefer the "no-learning" equilibrium.

**Proof.** First, consider \( \Phi < \min \{ \Phi_a, \Phi_1 \} \). The "no-learning" equilibrium implies that all firms adapt their product and welfare is given by (3). The "learning" equilibrium gives the welfare in (9). It is clear that \( W_k > W_{ini} \). The comparison of \( W_l \) and \( W_{ini} \) shows that households of country \( l \) prefer the "learning" equilibrium only if the cost of learning \( \gamma \) is small.

Second, consider \( \Phi \in (\Phi_1, \Phi_a) \). The "no-learning" equilibrium requires that some firms adapt their product whereas the other firms use the specifications of the large country; welfare is given in (4). By comparing (4) and (9) it is readily checked that households from \( k \) prefer the "learning" equilibrium whereas households of country \( l \) prefer the "learning" equilibrium only if the cost of learning \( \gamma \) is small.

Third, consider \( \Phi \leq \Phi_3 \) and \( \Phi \in (\Phi''_b, \Phi'_b) \). As shown in the Appendix, \( \Phi''_b > \Phi'_b \) requires that these two bounds be larger than \( \Phi_4 \). As illustrated in Figure 1, this last condition is compatible with \( \Phi \leq \Phi_3 \) in the "no-learning" equilibrium if and only if some firms adapt their product whereas the others use the specifications of the large country; welfare is given in (4).

\[ \text{This requires } \Phi''_b < \Phi'_b, \text{ that is, } \Phi > \Phi_4. \]
By comparing (4) and (9), it is readily checked that households from \( k \) prefer the "learning" equilibrium. What about households from \( l \), i.e., households who learn the foreign specifications? Suppose \( l \) is the small country. Welfare is given by \( W_l \) in (9) if they learn whereas it is given by \( W_s \) in (4) if they do not learn. Under \( \Phi > \Phi_0 \), \( \gamma > (\mu (L_r + L_s) / \sigma f)^{\mu/\sigma} (1 - \Phi^{\mu/\sigma}) \) which allows to write

\[
W_s - W_l > \left( \frac{\mu (1 - \Phi) L_s}{f a} \right)^{\mu/\sigma} - \left( \frac{\mu \Phi (L_r + L_s)}{f} \right)^{\mu/\sigma}
\]

It is readily checked that under \( \Phi \leq \Phi_3 \), we have \( (1 - \Phi) L_s / f a > \Phi (L_r + L_s) / f \) so that \( W_s > W_l \) over the relevant range of \( \Phi \). Households from the small country prefer the equilibrium in which they do not learn rather than the equilibrium in which they learn. By transitivity this result must also hold for households from the large country: \( W_r > W_s \) over the relevant range of \( \Phi \) in (4) and \( W_l \) is constant whether the country \( l \) is large or small.

Fourth, consider \( \Phi > \Phi_3 \) and \( \Phi \in (\Phi_0', \Phi_b') \). As shown in the Appendix, the last condition requires \( \Phi > \Phi_4 \). Hence the "no-learning" equilibrium implies that all firms use only the specification of the large country (see Figure 1); welfare is given in (5). By comparing (5) and (9) it is readily checked that households from \( k \) prefer the "learning" equilibrium. What about households from \( l \), i.e., households who learn the foreign specifications? Suppose \( l \) is the small country. It is readily checked that

\[
W_s - W_l = \left( (\Phi)^{\mu/\sigma} - 1 \right) \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\mu/\sigma} + \gamma
\]

Under \( \Phi > \Phi_0', \gamma > (\mu (L_r + L_s) / \sigma f)^{\mu/\sigma} (1 - \Phi^{\mu/\sigma}) \) which allows to conclude that \( W_s - W_l > 0 \). Households from the small country prefer the equilibrium in which they do not learn rather than the equilibrium in which they learn. By transitivity this result also hold for households from the large country. ■

4.3 Households from both countries learn foreign specifications

The firms do not need to adapt their product if households from both countries learn foreign specifications. Moreover the firms are indifferent between both specifications. Consider a small perturbation of that equilibrium: a small mass of households from country \( k \) have not learned foreign specifications. Then firms strictly prefer the specifications of country \( k \) in order
to fully reach these deviating households. If firms adopt their preferred specifications of country $k$, the other households from $k$ do not need to learn foreign configurations that are not used. The initial perturbation is self-fulfilling and the equilibrium is not stable.

To show this analytically, set $\lambda_k = 0$ for all $k$ in (1)-(2). It is then confirmed that $\pi_r = \pi_s > \pi_a$. The number of active varieties is defined as $n_r + n_s = \mu (L_r + L_s) / \sigma f$. Households from $r$ learn the foreign specifications if and only if $\gamma < (n_r + n_s) \pi_{rr} - (n_r + \Phi n_s) \pi_{rr}$. Similarly for households from $s$, $\gamma < (n_r + n_s) \pi_{ss} - (\Phi n_r + n_s) \pi_{ss}$. To go further we need to know the values of $n_r$ and $n_s$ which are indeterminate. Suppose either $n_r$ or $n_s$ is equal to zero. Then one of the two conditions requires that $\gamma < 0$ which is not possible. There is no equilibrium in which all firms use a single specification whereas households from both countries learn both specifications. Suppose now that a small mass of households in country $k$ do not learn the foreign specifications, then $\pi_k > \pi_l$ and $n_a = n_l = 0$ (see (1)-(2)), which is incompatible with households from $k$ learning specifications from $l$. This suggests that an equilibrium with households learning foreign specifications in both countries is unstable. For that reason we do not analyze this configuration further.

5 Conclusion

The principle of mutual recognition ensures that products lawfully manufactured in one State are acceptable without adaptation in another State provided that both States pursue the same general objectives in health, safety, environment and consumer protection. By using the principle firms save the costs necessary for adapting their product to local norms. As a result more firms are able to enter into the market. However the principle shifts the transaction costs of adapting to several norms from firms to consumers. Consumers suffer either from consuming a good that is not perfectly adapted, or from learning foreign norms.

In a first setting we consider consumers who do not learn foreign norms. Everything else equal, firms prefer the norms of the larger market, because these norms are known by the majority of consumers. However, if the households loss of consuming a non adapted product is large, some firms will also use the norms of the smaller market. There is a home market effect: the norms of the larger country are overly used by firms. The principle is unambiguously welfare improving in the larger market but is welfare improving in the smaller market only if consumers do not suffer too much from consuming
a non adapted product. The principle is a source of divergence.

In a second setting, we assume that consumers can learn the foreign norms, which removes the costs of consuming a product that is not adapted to the local norms. We show that for intermediate and for large losses of consuming a non adapted product, there exists an equilibrium in which households from one country learn the foreign norms whereas all firms use these norms that become universally known. Households who learn the foreign norms are worse off than households from the other country. The use of the principle fosters agglomeration in a single country. We also show that for small and for large losses of consuming a non adapted product, there exists an equilibrium in which households do not learn the foreign specifications. Firms adapt their product only if if the loss is large and there is a multiplicity of equilibria which we Pareto rank.

6 Appendix: proof that \( \Phi'_b > \Phi''_b \iff \Phi'_b \text{ and } \Phi''_b \) are larger than \( \Phi_4 \)

The precise values of \( \Phi'_b \) and \( \Phi''_b \) are

\[
\Phi'_b = \frac{L_r + L_s}{L_s} \left( 1 - \gamma \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\sigma-1}{\mu}} \right)^{-\frac{\sigma-1}{\mu}} - 1
\]

\[
\Phi''_b = \left( 1 - \gamma \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{-\frac{\mu}{\sigma-1}} \right)^{\frac{\sigma-1}{\mu}}
\]

After some algebraic manipulations, we find that

\[
\Phi'_b > \Phi''_b \iff \gamma < \bar{\gamma} \equiv \left( \frac{\mu L_r + L_s}{\sigma f} \right)^{\frac{\mu}{\sigma-1}} \left( 1 - \left( \frac{L_s}{L_r} \right)^{\frac{\mu}{\sigma-1}} \right)
\]

and it is readily checked that at \( \gamma = \bar{\gamma} \), \( \Phi'_b = \Phi''_b = \Phi_4 \).

Because \( \Phi'_b \) and \( \Phi''_b \) decrease with \( \gamma \), we conclude that \( \Phi'_b > \Phi''_b \iff \Phi'_b \) and \( \Phi''_b \) are larger than \( \Phi_4 \).
7 References


