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Innovation and experiential knowledge in firm exports: Applying the initial U-model[☆]Valeska V. Geldres-Weiss^{a,*}, Claudina T. Uribe-Bórquez^b, Dafnis N. Coudounaris^c, Joaquín Monreal-Pérez^d^a Department of Business and Economy, Faculty of Law and Business, PO Box: Casilla 54 D, Temuco, Universidad de La Frontera, Chile^b Department of Business and Economy, Universidad de La Frontera, Chile^c Department of Marketing, University of Vaasa, Finland^d Department of Business and Finances, University of Murcia, Spain

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ABSTRACT

Focusing on firm export activity as an important field within international business, this study corroborates the importance of experiential knowledge as the initial Uppsala model predicts. The model builds on the belief that experiential knowledge minimizes the risk and uncertainty of export operations. Additionally, the article examines a firm's capacity to widen this knowledge through its dynamic capacities, honing in on a firm's learning function. Thus, this article analyzes the role of innovation in exporting by investigating export product innovation and export market innovation, both strategic activities that allow experiential knowledge acquisition. The article uses a firm-level official dataset from a small developing country, Chile, examining data from 2006 to 2011. The results indicate, firstly, that experiential knowledge resulting from exporting to different and geographically distant markets increases the firm's export activity. Secondly, such export market innovation takes precedence over export product innovation.

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1. Introduction

Exporting plays a vital role in a firm's strategy and many scholars expect its importance to grow as globalization increases (Pla-Barber & Alegre, 2007). Porter (1991) states that a firm's knowledge acquired through its experience in the export market is key to its innovative behavior and international competitiveness. Both the initial Uppsala model (U-model) (Johanson & Vahlne, 1977) and the learning-by-exporting (LBE) hypothesis (Wagner, 2007) stress this very important role of experiential knowledge.

To become more competitive internationally, a firm has to be able to carry out innovative activities engendering better performance in export markets (Leonidou, Katsikeas, Paliwadana, & Spyropoulou, 2007; Wagner, 2007). Traditionally, inputs such as research and development

(R&D) (Kotabe, Srinivasan, & Aulakh, 2002) or key outputs like product innovations (Monreal-Pérez, Aragón-Sánchez, & Sánchez-Marín, 2012) measure innovation. In this study, innovation, as part of a firm's exporting activity, is key to explaining firm performance. Thus, following Cirera, Marin, and Markwald (2015), this article examines export innovations, that is, new export products and new export markets.

This unique approach to measuring export innovations is one of the contributions of this study. Export market innovation is the main way a firm acquires new knowledge during internationalization, and export product innovation is the means a firm uses to successfully enter export markets. These are also measures of a firm's diversification (Cirera et al., 2015).

This article focuses on two research questions: first, whether experiential knowledge (acquired through export experience, export markets, export product innovations, and greater geographical distance) intensifies a firm's export activities (increases its activity), and second, whether market innovation leads to market export product innovations. Therefore, the objectives of the research are to shed light on the determinants of firm export activity, focusing on the role of experiential knowledge (as stressed in the initial U-model) and to explore the LBE effect on export product innovation.

This study contributes to the literature in several ways. First, the study examines primary data from a small, emerging (not very developed) but very export-oriented market, Chile, which not many studies have analyzed (Álvarez & Robertson, 2004). Second, the study's focus

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on a new specific innovation dimension, export innovation, may provide new information on innovation in a particular environment (export markets) and on a definite activity (exporting).

2. Theoretical framework

2.1. The U-model and the LBE hypothesis

The research framework builds on the theoretical scope of experiential knowledge and internationalization, specifically the initial U-model and the LBE hypothesis. The initial U-model argues that a firm's knowledge and commitment to the market determines that firm's path through the stages of internationalization (Johanson & Vahlne, 1977). Regarding knowledge, the firm enters a foreign market when the firm has acquired the necessary knowledge (Johanson & Wiedersheim-Paul, 1975) to generate new opportunities and reduce uncertainty (Johanson & Vahlne, 1977). Firms can acquire knowledge about a market internally or through trial and error (experiential knowledge) (Eriksson, Johanson, Majkgård, & Sharma, 2000). The commitment to a market usually relates to the quantity of resources a firm ascribes to that market (Johanson & Vahlne, 1977). Johanson and Vahlne find a relationship between knowledge and commitment; they conclude that the more knowledge a firm has about a market, the stronger is its resource commitment to that market.

The research framework here rests on the assumption that firms have imperfect access to information and the internationalization process increases experiential knowledge, which is the key issue in this study. Experiential knowledge not only reduces the risks involved in exporting but also provides a way to acquire information about internal and external resources, and the opportunities to combine them. The original authors of the model have modified the U-model stressing the possibility of acquiring knowledge dynamically through interactions with foreign partners (Johanson & Vahlne, 2009; Vahlne & Johanson, 2013).

The LBE hypothesis describes the alternative explanation of why exporters may perform better than non-exporters (Monreal-Pérez et al., 2012). The exchange of knowledge in international markets, deriving from exchanges with international buyers and competitors, benefits the firms that engage in those markets (Wagner, 2007). The literature that describes the process of internationalization as a sequence of steps for a firm, or as innovation (Johanson & Vahlne, 1977), stresses the idea of exporting as a learning process (Delgado, Fariñas, & Ruano, 2002).

By linking the U-model and LBE theory, this study looks for an explanation for firm international behavior. The U-model deals with knowledge acquisition through a learning activity. This organizational learning affects firm performance, and in particular, the way the firm collects knowledge (Bhatti, Larimo, & Coudounaris, 2016). The LBE hypothesis draws on learning, arguing that a firm learns through its export experience (Wagner, 2007). This learning process, and the subsequent accumulated knowledge, is what connects the U-model and LBE hypothesis. The U-model and LBE hypothesis finds a link in the importance of a firm's exposure to international markets and to foreign partners, when acquiring knowledge and creating international opportunities. Additionally, entering new (export market innovation) and more distant markets enables a firm to reach new partners, thus allowing the firm to create new knowledge and consequently perform better (model and hypothesis 1), and to market new products (export product innovation) (model and hypothesis 2).

2.2. Innovation and international behavior of the firm

According to Porter (1991), firms receive competitive advantage through innovation. Drawing on this strategic aspect of innovation, Lundvall and Johnson (1994) highlight how fundamental learning is in accumulating the knowledge to innovate and thus compete successfully in today's global economy. These authors, crystallizing the

relationships between learning, knowledge, and innovation, outline how learning increases knowledge (i.e., the flow of learning influences knowledge), and knowledge then allows the firm to innovate. Along these same lines, Lynch and Jin (2015) stress the importance of the capacity to learn, arguing that in emerging markets, local firms will only be able to innovate and benefit from cooperation with firms from other developed markets if these local organizations are able to learn.

Specifically, many studies have stressed the importance of following an innovation strategy when focusing on export activity (Leonidou et al., 2007; Pla-Barber & Alegre, 2007). Pla-Barber and Alegre (2007) emphasize the role of innovation in international markets, arguing that a single market may not be broad enough to support the innovations of the firm; for this reason, firms that innovate may try to export. Therefore, internationalization may represent an area where firms can exploit innovations to obtain economic benefit.

According to the initial U-model, market knowledge and market commitment affect both commitment decisions and how firms currently perform their activities. These firm decisions include committing to innovative activities and allocating resources to such activities in the firm's international ventures.

In a similar vein, along with the initial U-model, the literature on innovation and internationalization stresses the importance of knowledge in the development of the innovation process. In fact, many researchers consider new knowledge to be the basis for innovation, seeing innovation as an individual and collective learning process that searches for new ways to solve problems (Kotabe et al., 2002). Innovation seems to depend on the firm's capacity to learn, through which the firm develops, distributes, and uses new knowledge.

Thus, researchers emphasize that highly internationalized firms can improve their ability to innovate by increasing their opportunities to learn (Kafouros, Buckley, Sharp, & Wang, 2008). Furthermore, Kotabe et al. (2002) state that internationalization can reduce costs resulting from innovation: highly internationalized firms can access many markets around the globe, buy materials and R&D from the cheapest available sources, and locate their R&D and other departments in the most productive regions (Kafouros et al., 2008). Internationalization can also improve a firm's ability to innovate by allowing the firm to hire better technologists and access skilled technical expertise (Kafouros et al., 2008). On the other hand, a firm with greater international scope can achieve greater returns from innovation by utilizing many markets (Kafouros et al., 2008).

Here, the U-model and the LBE hypothesis merge in their application to innovation: exporting firms can use the learning process in dealing with international markets to enhance their competency base. Using this advantage, they can foster innovation.

2.3. Experiential knowledge and export activity

Eriksson, Johanson, Majkgård, and Sharma (1997) define experiential knowledge as the integration of business knowledge (cooperative agreements with foreign firms, subsidiaries), institutional knowledge (foreign laws/norms/standards, foreign languages), and internationalization knowledge (foreign experience, unique knowledge/competence). A few years later, drawing on learning theory, the authors examine the effect of varied international business operations on experiential knowledge development in firm internationalization. The results show that variation in international geographical operations positively affects the accumulation of experiential knowledge in internationalizing firms. Autio, Sapienza, and Almeida (2000) confirm this conclusion, arguing that exporting firms must comprehend, share, and assimilate new knowledge in order to compete and grow in markets in which they have little or no previous experience.

Both the initial U-model and later research based on this seminal work (see Eriksson et al., 2000) posit that firm participation in international markets provides experiential knowledge. Using a firm's presence

in new markets with new products, each of the previous activities of a firm can act as proxy for international experience (these are the explanatory variables in the study). Firms cannot transfer this kind of knowledge to another firm or across markets; instead, a firm gains the knowledge firm after facing problems and opportunities through current activities and subsequent decision-making (Eriksson et al., 2000).

The U-model deals with knowledge acquisition through learning activities (Forsgren, 2002). This organizational learning affects firm performance, and, in particular, the way the firm collects knowledge (Bhatti et al., 2016; Forsgren, 2002). The LBE hypothesis also draws on learning, arguing that the firm learns through its export experience (Wagner, 2007). In addition, this learning process and the subsequent accumulated knowledge are what connect the U-model and LBE hypothesis.

2.3.1. Market innovation and export activity

Based on the importance of the knowledge of foreign operations emphasized in the initial U-model and the significance of international learning (Wagner, 2007) in the LBE hypothesis, this study begins by focusing on new markets, which are seemingly the main way to learn from foreign partners and accumulate knowledge. In addition, taking into account that, according to the OECD's Oslo manual, one of the main outputs of innovation is a new market, the study defines this concept as *market innovation*.

Autio et al. (2000) point out that knowledge of international markets and operations is an important determinant of international sales growth. The authors obtain strong evidence for their hypothesis that knowledge intensity presents an association with growth of international sales. Their results reveal an inverted U-shaped relationship, implying that diversifying into a few markets improves export performance; however, going beyond a certain number degrades performance.

H1a. A significant positive relationship exists between export activity and the acquisition of knowledge about foreign markets and operations, manifested through export market innovation (new export markets).

2.3.2. Geographical distance and export activity

The U-model predicts that as the firm accumulates more knowledge through more experience, the firm will reduce uncertainty from its export activity (specifically, uncertainty in export markets). Thus, the firm will raise its commitment, manifested through exporting increasingly to more geographically distant markets at greater risk (Johanson & Vahlne, 1977). In this regard, according to the argument of Monreal-Pérez et al. (2012), the firm faces bigger costs (mainly transportation) when addressing geographically distant markets, and these costs will increase as the firm's exports increase. Therefore, this study posits that the relation between geographical distance and export activity is positive.

H1b. A significant positive relationship exists between export activity and the acquisition of knowledge about foreign markets and operations, manifested through exporting to more geographically distant markets.

2.3.3. Export experience and export activity

According to Eriksson et al. (2000), a lack of experiential knowledge increases the firm's costs of export. As the initial U-model predicts, the market-specific knowledge will increase, and so will the learning from the greater exposure to foreign markets, as per the LBE hypothesis.

H1c. A significant positive relationship exists between export activity and the acquisition of knowledge about foreign markets and operations, manifested through more export experience.

2.3.4. Export product innovation and export activity

The firm's introduction of new products in export markets is a consequence of the specific knowledge acquired about these markets,

strategically important in both the initial U-Model and the LBE hypothesis. Therefore, this study examines the impact of this kind of innovation on the intensity of the firm's export activity.

Focusing on new exports, defined as new export products, Cirera et al. (2015) argue that efforts to develop new and unique technological knowledge play an important role in export performance. Likewise, Lages, Silva, and Styles (2009) conclude that product innovation produces a positive effect on economic performance. Cassiman and Golovko (2011) find that product innovation affects the probability of a firm's even starting to export.

H1d. A significant positive relationship exists between export activity and the acquisition of knowledge manifested through export product innovation.

2.3.5. Effect of market innovation on export product innovation

The introduction of new products to export markets results from the knowledge accumulated when entering other foreign markets (predicted in the initial U-model and the LBE hypothesis).

Cirera et al. (2015) point out that decisions about the commitment of resources to introduce new products for export take place at the firm level. Love, Roper, and Zhou (2015) provide evidence that the knowledge firms obtain from exporting to different and highly competitive markets helps them generate new and improved products, which in turn enables entry to further export markets.

H2. A significant positive relationship exists between market innovation, new and more geographically distant markets, and export product innovation.

3. Method

3.1. Data

This article analyzes the behavior of exporting firms in a region of Chile, La Araucanía, for the period 2006–2011. During this period, the total number of firms exporting in the region reached 46 (Table 1). Of these, 19 were permanent exporters (41.3%) and 27 were sporadic exporters (58.7%).

A regional export firm is a firm that has either a head office or a decentralized regional subsidiary in the region.

The number of regional exporters decreased by 40% from 2009 to 2011. In contrast, the average number of export markets increased by 55% during that same timeframe. However, on average, the number of exported products remained stable.

The firms in the region showed (Table 2) that they were highly innovative, with new products representing over half of their exported products (51.8%). They also expanded their export markets significantly over that time period, with new export markets representing 45.2% of their export markets.

Table 1
Number of exporting firms, destination markets, and exported products.

	Number of exporting firms	Average number of foreign markets	Average number of exported products
2006	37	3.1	3.2
2007	32	4.2	3.9
2008	34	3.6	3.4
2009	33	3.4	3.0
2010	28	4.0	3.0
2011	22	4.8	3.0
2006–2011	46	5.4	6.0
Average (2006–2011)	31	3.8	3.2

Table 2
Export innovation 2006–2011.

	New export products		New export markets	
	Average of firms' new export products	New export products/total export products (%)	Average of firms' new export markets	New export markets/total export markets (%)
2006–2011	3.09	51.8	2.46	45.2

3.2. Variables measurement

The variables in the model are as follows:

Export activity: export sales (free on board (FOB) value) for each company.

Export product innovation: new products the firm exports, calculated as new products exported in the period analyzed and not in the first year of exporting.

Export market innovation: new export markets of the firm, calculated as new export markets within the said period that were not markets in the first year of exporting.

Export geographical distance: distance between the country of origin (Chile) and the export market. The study used information from the French Research Center in International Economics to measure distances.

Export experience: Number of years exporting.

3.3. Model specifications

The study includes two models. In the first one, the dependent variable is export activity (*ExpACT*), comprising export product innovation, export market innovation (new export markets and more geographically distant markets), export experience, age, size, and sector. Model 1 is as follows:

$$ExpACT_i = \beta_0 + \beta_1 ExpPI_i + \beta_2 ExpMI_i + \beta_3 ExpGeoDist_i + \beta_4 ExpEx_i + \beta_5 Age_i + \beta_6 Size_i + \beta_7 Sector_i + \epsilon_i$$

ExpACT represents the sum of the amount exported. The explanatory variables are the number of new products (*ExpPI_i*), the number of new markets (*ExpMI_i*), geographical distance (*ExpGeoDist_i*), export experience (*ExpEx_i*), age, size, and industry.

In the second model, the dependent variable is new export products (*ExpPI_i*), which is the result of export market innovation and export experience, age, size, and sector. The second model is as follows:

$$ExpPI_i = \beta_0 + \beta_1 ExpMI_i + \beta_2 ExpGeoDist_i + \beta_3 ExpEx_i + \beta_4 Age_i + \beta_5 Size_i + \beta_6 Sector_i + \epsilon_i$$

ExpPI_i represents the number of the new products exported, the explanatory variables being the number of new markets (*ExpMI_i*),

geographical distance (*ExpGeoDist_i*), export experience (*ExpEx_i*), age, size, and industry.

4. Results

Table 3 provides information about the means, standard deviations, and correlations among the variables used in the basic regression models.

The highest correlation coefficient is 0.54, which is the maximum recommended value for the test of multicollinearity. No correlations exceeded that value.

Table 4 shows the impact of some variables (according to the literature, key instruments to acquire experiential knowledge) on firm export activity (Model 1), and the impact of export market innovation on export product innovation (Model 2). Regarding the hypotheses, geographical distance seems the main driver of firm exports, confirming **H1b**. Nevertheless, the other variables—export products, market innovation, and export experience—also have a positive, although non-significant effect on firm foreign sales. For this reason, the results fail to support **H1a**, **H1c**, and **H1c**. The implication is that, according to the U-Model and LBE hypothesis, geographical distance is the most important factor for firms' learning and knowledge acquisition, which drives further exports.

However, regarding new exports, innovation is a principal activity that enhances a firm's international competitiveness (**Porter, 1991**). Thus, regarding the impact on export product innovation, a firm's export market innovation is an important antecedent to produce more new export products. Therefore, the results support **H2**.

5. Discussion

The findings suggest that accumulating export experience, and consequently knowledge about export activity, improves a firm's performance and aggressiveness in export markets. The initial U-model and LBE hypothesis predict this link, and specifically, the strategic role of knowledge as an important determinant in exporting activity.

To test this hypothesis, this study examines the main ways a firm acquires knowledge, following these variables as key ones in the above-mentioned theoretical frameworks, in previous literature on the topic, and the researchers' personal beliefs. First, among the proxies for export

Table 3
Means, standard deviations and correlations.

	Mean	SD	1	2	3	4	5	6	7
1. Export activity	13.03	2.89							
2. Export product innovation	3.09	4.44	0.49***						
3. Export market innovation	2.46	4.17	0.57***	0.51***					
4. Export geographical distance	4982.0	3818.3	0.66***	0.52**	0.54***				
5. Export experience	8.52	5.97	0.38***	0.22	0.02	0.22			
6. Age	18.65	14.69	0.03	0.01	-0.06	-0.10	0.54**		
7. Size	2.65	1.06	0.57***	0.33**	0.31**	0.19	0.41**	0.18	
8. Sector	2.15	1.07	-0.35**	0.21	-0.25	-0.10	-0.02	-0.03	-0.03

* p < 0.100.
** p < 0.050.
*** p < 0.001.

Table 4
Parameters of regression and significance.

	Export activity		Export product Innovation	
	Parameter	P-value	Parameter	P-value
Constant	10.02	0.000***	−4.73	0.017**
Export product innovation	0.10	0.162		
Export market innovation	0.06	0.483	0.42	0.011**
Geographical distance	0.00	0.001***	0.00	0.052*
Export experience	0.07	0.178	0.07	0.540
Age	−0.02	0.389	0.00	0.997
Size	0.98	0.001***	0.52	0.361
Sector	−0.85	0.002**	1.43	0.006**
R-square (adjusted)	0.71		0.41	
Number of observations	46.00		46.00	

* p < 0.100.

** p < 0.050.

*** p < 0.001.

performance, the study tries to explain the export intensity of the firm (Model 1) considering the following parameters:

- Firm export market innovation: the results prove this impact to be non-significant. This finding is congruent with the conclusions of [Aulakh, Rotate, and Teegen \(2000\)](#), who state that the effect follows an inverted U-shape: at the beginning, a firm acquires exponentially more knowledge when entering new markets, but once the firm has gained *sufficient* knowledge, more new markets (most similar to the old ones) do not contribute any more to existing expertise.
- Geographic distance: the results prove this factor has a significant influence on export intensity. Consistent with previous literature, as the firm moves further afield, the firm accumulates valuable knowledge and thus reduces uncertainty in its export operations ([Johanson & Vahlne, 1977](#)). These findings confirm the insights of [Monreal-Pérez et al. \(2012\)](#) in arguing that only a high level of export performance, which includes consolidating export operations, can overcome greater costs resulting from selling to more distant markets.
- Export experience: the absence of a significant effect here may owe to the fact that the relevant parameter is not the number of years exporting, but rather the extent to which new exports provide new knowledge. For example, in the case of Chile, if a firm is a *long-time* exporter but always operates in China—according to the [OECD \(2015\)](#), in 2014, China was the main market for Chile, accounting for 23% of Chilean external trade—its firm knowledge will not increase significantly as the firm exports longer (for more years). Consequently, the firm does not minimize its risk, as predicted by [Eriksson et al. \(2000\)](#).

Finally, the study considers the effect of exporting new products. The findings show no significant effect from exporting new products on export firm activity. This result may owe to these products' novelty on the export activity, but not necessarily to the firm (this kind of export market innovation being the exteriorization of new knowledge on export markets). In line with this idea, [Cassiman and Golovko \(2011\)](#) and [Love et al. \(2015\)](#) conclude that product innovation is relevant to the decision to start export operations but not to exporting more aggressively.

The finding on the significant impact of market innovation on product innovation shows that new and significant knowledge comes from *new* and *different* markets (as in the definition of [Eriksson et al., 2000](#)).

6. Conclusions

The study findings confirm the importance of experiential knowledge in a firm's marketing, confirming the predictions of the initial U-model and literature such as [Eriksson et al. \(2000\)](#): accumulating

experience is the key to successfully facing risky and uncertain export activity. As a means to acquire such knowledge, exporting to distant and *different* markets is important. This finding may explain why export experience and new markets within the same geographical area are insignificant for firm export activity: such strategies do not necessarily provide new knowledge if addressing exports to similar destinations.

In that sense, the innovation of markets favors export product innovation to a great extent: what improves firm performance (and the introduction of new products is an illustration of such performance) is knowing about the market needs and its consumers' preferences. This finding may explain why neither [Cassiman and Golovko \(2011\)](#) nor [Love et al. \(2015\)](#) find that product innovation ever affects positively any measure of export performance.

Another important conclusion derives from the arguments from the LBE hypothesis: in order to acquire relevant knowledge, the firm's learning process is what is important, and specifically its learning capacity, resulting from a greater exposure to new partners and markets. To learn extensively, a firm has to operate in new and diverse environments, as in its export markets. According to the LBE hypothesis, exporting improves a firm as regards its product innovation efforts.

This work contributes by shedding further light on the relationships between knowledge, innovation, and firm export activity. Additionally, the study considers product innovation specifically in relation to export activity as very few researchers have done so far ([Cirera et al., 2015](#); [Lages et al., 2009](#)). In addition, to better explain the variable's dynamics, this article studies export product innovation jointly with market innovation.

Another notable contribution of this article is that, drawing on two behavioral theories of the firm (the initial U-model and the LBE hypothesis), this article takes a first step in linking a purely internal dimension of the firm, namely, learning or innovation, with an external dimension, namely, export activity (because, as Porter suggests (1991), a number of environmental factors deeply affect innovation, competitiveness, and therefore, export activity).

6.1. Implications

The results may benefit exporters: if they want to improve their performance, they need to accumulate knowledge by learning more closely from their export markets. Once they have done this, market innovation is the key to exporting more new products.

At an institutional level, policymakers can use the findings to support firms' international competitiveness by confirming its success in selling to distant markets or promoting knowledge about new and unknown markets.

6.2. Limitations and future research directions

This study has some limitations. First, many factors with low controllability affect export activity variables, thus the results of this study require a careful interpretation. Second, the analysis concentrates on exporting, the most popular international mode of market entry, leaving to future research other interesting areas of study, especially in relation to other industries, markets, and international modes of entry (foreign direct investment (FDI), alliances, licensing, and joint ventures). In this sense, [Salomon and Shaver \(2005\)](#) point out that although exporting facilitates an information flow from the host market, exporting does not provide a sufficient information flow compared to more involved methods such as FDI. Additionally, further research should evaluate the importance of the export products/markets to investigate their real contribution to a firm's export performance.

Finally, the interpretation of the results must take into account the context of a country like Chile, still an emerging market country, whose trade mainly targets countries with foreign trade agreements (according to the [OECD \(2015\)](#), in 2014, 94% of its foreign trade was with countries where Chilean firms may already have knowledge).

In addition, the small average size of the sample and the great importance in Chile of foreign investments are also important conditioning factors.

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