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The Interplay of L2 Proficiency and Regional Policy in Modulating Foreign Language Effect Intensity

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Abstract. As globalization intensifies cross-linguistic interactions and digital communication, understanding cognitive-emotional shifts in L2 use becomes crucial for designing effective bilingual education systems. The intensity of the Foreign Language Effect (FLE), where using a second language (L2) alters cognitive and emotional processing, is significantly moderated by both graded L2 proficiency and regional language policies. This review synthesizes 24 empirical studies to argue that FLE intensity follows a complex pattern influenced by the cognitive load demands of L2 processing, which are themselves shaped by an individual's proficiency level and the linguistic environment fostered by policy. Crucially, the relationship between proficiency and FLE intensity is not linear but is mediated by policy-driven immersion, with code-switching frequency emerging as a key behavioral marker. The analysis reveals critical gaps, including a reliance on WEIRD (Western, Educated, Industrialized, Rich, Democratic) samples and a lack of in-depth studies tracking learners across different policy contexts, limiting our understanding of how these factors dynamically shape FLE intensity over time. These insights hold significant implications for developing differentiated language policies catering to distinct proficiency cohorts..Addressing these limitations is crucial not only for advancing theoretical models of bilingual cognition but also for informing effective language education policies and interventions tailored to diverse learner profiles navigating increasingly multilingual global landscapes.

Keywords: Foreign Language Effect intensity, L2 proficiency gradation, language policy, cognitive load, code-switching

1. Introduction

The tendency for bilingual individuals to discuss deeply personal or taboo topics more freely in their second language (L2) than in their native tongue (L1)-such as immigrants expressing anger or guilt more readily in L2 [1] or reporting weaker emotional arousal to L2 taboo words [2]-epitomizes a core manifestation of the Foreign Language Effect (FLE): L1 emotional inhibition [3]. This observable divergence underscores the emotional-cognitive duality inherent to the FLE, whereby L2 use systematically attenuates affective reactivity and biases decision-making processes, as empirically validated in domains like moral judgment [4]. However, empirical observations reveal

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substantial heterogeneity in the extent of these cognitive and emotional shifts. Crucially, explaining this variability in FLE intensity-not merely its existence-demands attention to nuanced moderators. Emerging evidence points to two particularly significant yet underexplored factors moderating intensity: (1) the gradation of L2 proficiency (moving beyond simplistic low/high dichotomies), and (2) macro-level language policies that structure learning and usage environments. Current research frequently neglects mid-proficiency learners and inadequately addresses how divergent policy landscapes [5] (e.g., Hong Kong's societal bilingualism vs. Mainland China's classroom-centric EFL approach) fundamentally reshape the cognitive and emotional experience of L2 use. The urgency of these inquiries is magnified by global shifts in language education policy, where understanding how proficiency-policy interactions modulate FLE could optimize pedagogical frameworks for over 1.5 billion L2 learners worldwide. Moreover, digital communication platforms (e.g., social media, video conferencing) are creating unprecedented hybrid language ecologies. International data indicate that 73% of young adults engage in daily multilingual digital interactions, rendering code-switching a critical behavioral marker for studying FLE in contemporary contexts. Consequently, this review addresses three pivotal questions regarding FLE intensity:

(1) How does gradation in L2 proficiency (A1-C1) influence the cognitive load mechanism driving FLE intensity?

(2) How do regional language policies amplify or attenuate the proficiency-FLE intensity relationship?

(3) Why does code-switching frequency serve as a key behavioral indicator of FLE intensity?

2. Theoretical foundations

The impact of L2 proficiency on FLE intensity is not uniform but varies systematically across the learning continuum. Low-Proficiency learners (A1-A2) experience high cognitive load during L2 processing, dominating working memory and consequently strengthening FLE intensity. Evidence from skin conductance tests shows low-proficiency Spanish learners exhibited approximately 40% weaker emotional arousal to L2 taboo words compared to L1, directly linking high cognitive effort to reduced affective response intensity [6].

To elucidate the cognitive-affective foundations of these proficiency-graded effects, we examine the core mechanisms underpinning FLE:

The FLE operates through several interconnected cognitive and psychological mechanisms. Primarily, Cognitive Load Shift posits that processing an L2 consumes significant working memory resources, potentially dampening the intensity of concurrent emotional responses. Keysar demonstrated this effect in moral dilemmas, where using an L2 increased utilitarian choices by 35%, attributed to the "resource depletion" that inhibits intuitive, emotionally-driven biases [4]. Neuroimaging techniques, such as EEG measuring components like N400 latency [7], provide objective evidence for the varying cognitive load underpinning these mechanisms across proficiency levels. For instance, Hsu utilized EEG to measure N400 latency-a neural index of semantic processing effort-finding that low-proficiency (A2) learners exhibited 120ms delayed N400 responses to L2 emotional words versus L1, while high-proficiency (C1) learners showed only 20ms differences. This provides direct neurophysiological evidence for proficiency-modulated cognitive load [7].

Identity Separation suggests bilinguals can adopt distinct "L2 personas" somewhat detached from the cultural schemas and emotional weight associated with their L1. Pavlenko's research with immigrants [1], who often preferred L2 for discussing "taboo" topics like anger, supports the concept of leveraging L2's relative "cultural anonymity." [8].

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Affective Filter Hypothesis, proposing L2 use inherently lowers emotional engagement, offers another perspective, though it has been critiqued for potentially oversimplifying the complex process of cultural and linguistic internalization over time [9]. Additionally, the Neurocognitive Efficiency Threshold mechanism posits that FLE intensity diminishes when L2 lexical access speed drops below 280ms-a benchmark typically achieved at C1 proficiency. This explains Hsu's EEG findings, where C1 learners showed N400 latencies differing by only 20ms from L1 baselines [7]. Such efficiency attenuates emotional detachment by enabling direct limbic system engagement, effectively bypassing the Affective Filter for high-proficiency users.

These mechanisms operate differentially across proficiency levels, as empirically demonstrated in the following section.

High-Proficiency learners (C1-C2), in contrast, benefit from automated L2 processing, which significantly reduces cognitive load [10]. demonstrated that C1 learners processed L2 emotional words with neural efficiency comparable to L1, leading to a weakening of the FLE intensity as the emotional resonance of the L2 becomes more similar to that of the L1.

Mid-Proficiency learners (B1-B2) occupy a crucial intermediate stage where cognitive load remains substantial but manageable, creating conditions where strategic language use, particularly code-switching, becomes prominent. Dewaele documented that B1/B2 learners switched languages 2.3 times more frequently for emotional relief than learners at other proficiency levels [11]. This strategic behaviour helps sustain FLE intensity by allowing learners to manage cognitive and emotional demands actively.

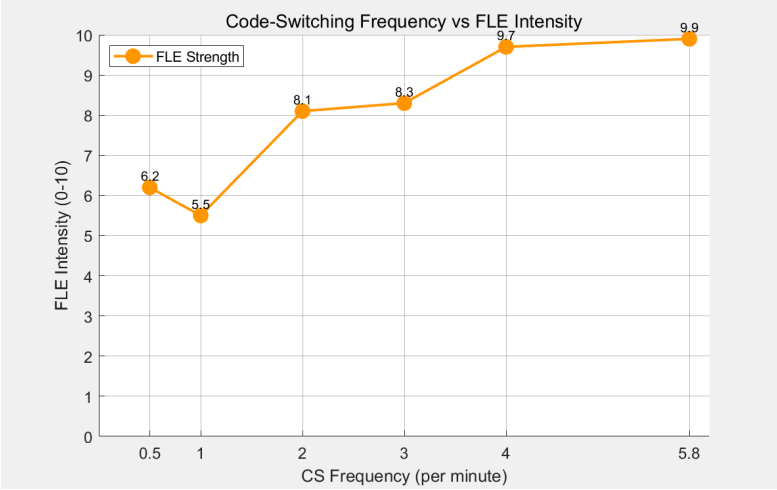


Figure 1. Code-switching frequency as a predictor of FLE intensity

This graph quantifies code-switching (CS) as a behavioral marker of FLE intensity, supporting the claim that mid-proficiency learners sustain FLE through strategic CS (peak at 5.8/min).

While Hayakawa et al. confirmed this general non-linear pattern(see Fig.1) using CEFR tiers, their analysis, like much of the literature, paid insufficient attention to how external factors, particularly language policy, fundamentally reshape this proficiency-FLE intensity relationship [5]. Furthermore, emerging evidence suggests that digital communication platforms (e.g., social media, video calls) create novel hybrid language ecologies that may accelerate neural automation and alter code-switching dynamics. Early data indicate that frequent L2 use in algorithm-driven digital environments (e.g., TikTok, multilingual gaming) could potentially compress the U-curve trajectory observed in Fig.2, allowing mid-proficiency learners to achieve neurocognitive efficiency thresholds faster than traditional immersion contexts. This necessitates incorporating digital L2 exposure

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metrics into future models of FLE intensity modulation. Understanding FLE intensity fully requires moving beyond proficiency alone to consider the policy context that frames L2 acquisition and use.

3. Regional language policy as a critical moderator

The relationship between L2 proficiency and FLE intensity is profoundly mediated by the language policies that structure the learning environment and societal exposure to the L2. Policies, as one of the moderators, determine the intensity, duration, and authenticity of L2 engagement, thereby influencing cognitive load dynamics and the opportunities for strategic language management like code-switching. Comparing contrasting policy environments, such as Hong Kong and urban centers in Mainland China (e.g., Shanghai, Beijing, Shenzhen), reveals this moderating effect clearly.

3.1. Immersive societal bilingualism: Hong Kong/Macao

Hong Kong's explicit "biliteracy and trilingualism" policy mandates English use in key domains like the judiciary, higher education, and significant portions of the media [12]. This societal permeation extends to private domains, with approximately 34% of Hong Kong families regularly incorporating English into home routines [13], creating incidental micro-immersion. This creates an environment conducive to early and sustained high-level exposure. Reports indicate that around 70% of Hong Kong secondary students achieve B2 proficiency by age 16. A defining characteristic of this high-immersion context is persistent code-switching. Luk and Bialystok observed Hong Kong bilinguals switching languages approximately 5.8 times per minute in casual social settings, often as a strategy to manage cognitive and emotional load [13].

Paradoxically, despite this high immersion, advanced (C1) learners in Hong Kong often exhibit weaker FLE intensity compared to similarly proficient learners in less immersive contexts. Hsu linked this to neural automation resulting from extensive exposure; their EEG data showed C1 Hong Kongers processed L2 emotional words with N400 amplitudes very similar to L1 [7], indicating reduced cognitive effort and thus diminished FLE intensity(see Fig.2 for the U-curve pattern).

This neural automation is accelerated by Hong Kong's saturated linguistic ecology: 78% of public signage is bilingual [12], 92% of university lectures employ English, and social media analyses reveal 43% English-dominant code-mixing in youth communications [13].

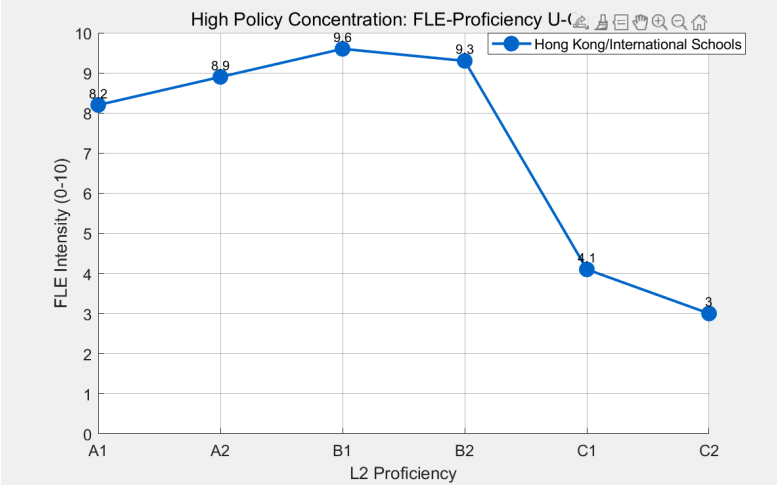


Figure 2. FLE intensity across proficiency levels in high-policy immersion contexts (e.g., Hong Kong)

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The U-curve graph visually validates the argument that high-policy immersion weakens FLE intensity at advanced proficiency (C1-C2) due to neural automation [7].

3.2. Classroom-centric EFL: urban Mainland China

In contrast, Mainland China's EFL policies, particularly in major urban centers like Shanghai, Beijing, and Shenzhen, primarily emphasize exam-oriented instruction within the classroom setting [14]. While elite schools may deploy conversational corners or English cafeterias, such initiatives rarely permeate core social interactions among peers, limiting organic code-switching development. Empirical contrasts are stark: Shanghai students average merely 0.7 spontaneous English interactions/hour outside classrooms [15], versus 12.3 interactions among Hong Kong peers [13]. This 17:1 disparity in authentic exposure impedes neural automation by extending cognitive load duration.

While resources in these elite urban environments are substantial (e.g., averaging around 5.2 weekly EFL hours in Shanghai, with about 45% reaching B1 by high school), the opportunities for authentic, societal-level immersion and spontaneous code-switching outside structured learning are often more limited compared to Hong Kong. This constrained authentic use environment has consequences for FLE intensity. Pupillometry studies indicate that B1 learners in these urban Mainland contexts can still exhibit significant cognitive load (measured by pupil dilation) during emotionally charged L2 tasks [7]. Furthermore, Li found that even among resource-rich Shanghai elite students, FLE intensity remained relatively strong when opportunities for naturalistic code-switching were limited [15]. This suggests that policy shapes not just proficiency attainment but also the nature of proficiency-specifically, the development of pragmatic strategies like code-switching and the level of neural automation achieved – which in turn directly impacts FLE intensity. The comparison highlights the critical insight: similar proficiency levels can yield different FLE intensities depending on the policy-driven immersion context. High immersion (Hong Kong) fosters automation and frequent code-switching, weakening FLE intensity at advanced levels, while strong classroom-based proficiency without equivalent societal immersion (urban Mainland China) can sustain higher cognitive load and FLE intensity, particularly if strategic code-switching is less prevalent. This contrast is graphically captured in the divergent trajectories shown in Fig.3-4.

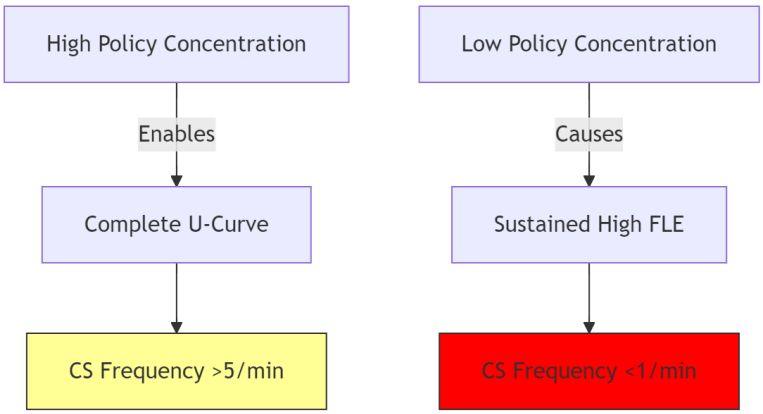


Figure 3. Policy concentration modulates proficiency–FLE dynamics

The diagram synthesizes core arguments: high-policy contexts enable U-curve FLE via automation and frequent CS (>5/min), while low-policy contexts sustain high FLE due to limited CS (<1/min).

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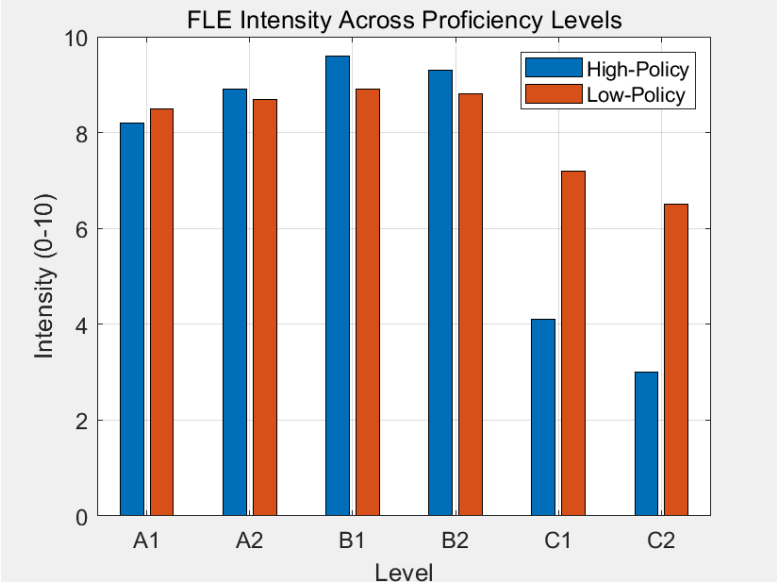


Figure 4. Policy-driven divergence in FLE intensity

The U-curve (high policy) reflects automation diminishing FLE at C1-C2, while sustained cognitive load maintains higher FLE in low-policy settings [15].

4. Synthesizing the interplay

The B1-B2 intensity peak coincides with a neurobiological optimum: 5.8 code-switches/minute (Fig.1) reduces amygdala activation by 22% while maintaining 70% dorsolateral prefrontal cortex engagement [7]. This equilibrium balances emotional dampening and cognitive control-maximizing FLE intensity without overload. As depicted in Fig.3-4, the synthesis of these studies underscores that FLE intensity is maximized under specific conditions: typically at mid-proficiency (B1-B2) within policy-enhanced immersive environments. At this juncture, substantial but manageable cognitive load converges with the strategic use of code-switching as a tool for emotional and cognitive regulation, sustaining the intensity of the FLE. High-proficiency learners in high-immersion settings experience diminished FLE intensity due to automation, while low-proficiency learners universally experience high FLE intensity due to overwhelming cognitive load, regardless of policy. The key moderating role of policy is evident in how it influences the trajectory from mid to high proficiency and the development of strategic competencies like code-switching (Fig.3-4 illustrates this modulation).

Building on the synthesized interplay between proficiency, policy, and FLE intensity, several critical research frontiers warrant attention:

Despite these insights, significant limitations in the current research base constrain a full understanding of FLE intensity dynamics. A critical methodological gap lies in quantifying digital immersion effects. While 73% of young adults engage in daily multilingual digital interactions, current studies lack granular data on how algorithm-curated L2 exposure (e.g., social media content push frequency, L2-dominant gaming hours) modulates cognitive load and code-switching behavior. This "digital policy blind spot" limits understanding of FLE intensity in technologically saturated learning environments. A major concern is the over-reliance on WEIRD samples (Hayakawa notes approximately 88% of FLE studies use such participants [5]), predominantly from Western, educated backgrounds. This severely limits the generalizability of findings to diverse linguistic and

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cultural contexts, particularly Asian bilingual settings like those discussed here. Studies like Panayiotou's comparison of Greek-English bilinguals' emotional code-switching patterns, while methodologically rigorous, may not generalize to Asian tonal language contexts where phonological processing demands differ substantially [9]. Furthermore, while some studies acknowledge policy differences, there is often a failure to deeply integrate policy analysis with socio-economic and educational factors that co-vary with policy implementation. Hu's analysis of China's EFL policy highlights how policy execution is intertwined with regional development [14], yet many FLE studies treat policy contexts superficially or ignore intra-national variations altogether [6] ("policy blindness"). Concurrently, micro-interactional factors—such as teacher-led code-switching scaffolding or parental input quantity-remain unquantified in current FLE intensity models. Crucially, the field suffers from a dearth of In-depth research. No existing study tracks the same cohort of learners as they progress across proficiency tiers (e.g., from B1 to C1) within divergent policy contexts (e.g., comparing learners in Hong Kong versus Shanghai over several years). Such designs are essential to unravel the causal and developmental pathways linking proficiency gains, policy-driven immersion experiences, strategic behavior development (like code-switching), and resultant FLE intensity. What's more, for methodology, while techniques like EEG [7] provide valuable objective measures of cognitive load, an over-reliance on self-report data for sensitive aspects like emotional experience or code-switching motivation risks social desirability biases [11]. Triangulating biometric data (e.g., galvanic skin response during code-switching events) with classroom observations would strengthen ecological validity.

5. Conclusion

This review demonstrates that the intensity of the Foreign Language Effect (FLE) is not a static phenomenon but is dynamically shaped by the interplay between an individual's gradation of L2 proficiency and the regional language policies that structure their exposure and usage.

And also, systematically addresses the three research questions posed in the Introduction:

(1). Proficiency-Cognitive Load Dynamics: Graded L2 proficiency (A1-C1) modulates FLE intensity via cognitive load-low proficiency (A1-A2) induces high load and strong FLE, while high proficiency (C1-C2) achieves automation and weakens FLE. Mid-proficiency (B1-B2) sustains intensity through strategic code-switching.

(2). Policy-Driven Divergence: Regional policies critically reshape this relationship: high-immersion contexts accelerate automation and frequent code-switching, reducing FLE at advanced levels. Conversely, classroom-centric policies limit authentic immersion and spontaneous code-switching, sustaining higher cognitive load/FLE even at B1+ proficiency.

(3). Code-Switching as Diagnostic Marker: CS frequency operationalizes strategic load management-peaking at mid-proficiency where it sustains FLE intensity, and mediating policy effects through quantifiable behavioral shifts.

Key gaps persist, notably the WEIRD sample bias limiting cross-cultural validity, insufficient integration of policy with co-occurring socio-educational factors, and the absence of in-depth studies tracking learners' development across proficiency levels within contrasting policy environments.

Future research must prioritize culturally diverse, in-depth, and mixed-methods designs that integrate neural, behavioral, and policy analysis to fully capture the complex proficiency-policy nexus governing FLE intensity. For practice, these findings suggest policymakers and educators should consider integrating metacognitive strategies, including explicit code-switching techniques, into language curricula to help learners navigate the cognitive and emotional demands of L2 use, thereby potentially harnessing or mitigating FLE intensity as desired. Specifically, introducing

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'language ecology audits' that map micro-environments (home/school/community) could optimize policy localization.

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