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Asymmetric amplification: New lens for China's e-cigarette policies on youth influence

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Abstract: China introduced universal e-cigarette regulations in 2018 to curb youth vaping, including flavor bans, online sales prohibitions, and taxation. While these policies are not explicitly age-targeted, their design disproportionately impacts adolescents due to young people's price sensitivity, preference for flavored products, and reliance on online purchases. This study examines how such regulations achieve outcomes akin to age-based bans without directly restricting moral agency or risking discrimination. We believe that universal measures like flavor restrictions and taxes amplify their impact on youth through behavioral and economic mechanisms — termed "asymmetric amplification". Results suggest these policies effectively reduce youth vaping while sidestepping ethical controversies tied to generational bans. However, challenges like informal sales channels and adolescent stigma require complementary enforcement. This paper highlights a pragmatic and ethically sound approach to youth tobacco control and offers new insights into policy design for public health practitioners and regulators worldwide.

***Keywords*:** e-cigarette, regulation, adolescence, China

Introduction

Since 2018, China has introduced several significant policies aimed at regulating e-cigarettes to combat tobacco use, particularly among young people. These regulations, which include taxing e-cigarettes at the same rate as traditional cigarettes, prohibiting online sales, and banning all but traditional tobacco-flavored e-cigarettes (*1*), reflect a concerted effort to reduce the number of e-cigarette users. Although these regulations are not explicitly age-based, they disproportionately impact younger users due to their unique consumption habits and demographic characteristics, namely an "asymmetric amplification" effect.

This paper explores how these policies, while neutral in design, function similarly to policies that restrict access for specific cohorts, avoiding ethical concerns related to moral agency and discrimination while still help achieve significant public health objectives.

Asymmetric amplification

The concept of asymmetric amplification describes the uneven distribution of regulatory effects, where certain groups — typically the more vulnerable — bear the brunt of the policies. In this case, while China's regulations on e-cigarettes are intended to reduce smoking and vaping across all demographics, young people face a disproportionate burden due to their consumption habits. Adolescents are often more price-sensitive than adults and, as a result, may be significantly impacted by the increased costs of e-cigarettes due to the new taxation policies. In addition, youth are more likely to be drawn to flavored e-cigarettes, which are now banned under the current regulations. The appeal of flavored products, which range from fruity to candy-like tastes, has been a key driver of e-cigarette consumption among younger individuals (*2*). By limiting the availability of these flavors, the regulations not only reduce choice but also diminish the attractiveness of e-cigarettes for young people, who may be more inclined to quit using them if their preferred flavors are unavailable. Similarly, the prohibition of online sales curtails access for youth, who rely more heavily on digital platforms for purchases compared to older generations. These restrictions, though aimed at protecting health, create

a situation where young users are disproportionately affected by policies that might otherwise have a more neutral effect on older users (Figure 1).

This asymmetric amplification effect is particularly evident when comparing e-cigarette usage rates between China and other countries. In the U.S. 11.3% of high school students use e-cigarettes in 2021, and 2.8% of middle school students use e-cigarettes (*3*). By 2024 10% of high school students in the U.S. use e-cigarettes and 4.6% of middle school students use e-cigarettes (*4*). In Organisation for Economic Co-operation and Development (OECD) countries, the vaping rate among adolescents was 6.1% in 2021 (*5*), while in China, the rate was 2.4% in 2023, showing a decline from 3.6% in 2021 (*6*). By indirectly targeting the behaviors and preferences of youth, the regulations achieve outcomes similar to policies that explicitly ban tobacco products for specific age groups, without raising the same ethical concerns.

One significant advantage of this approach is its ability to sidestep the contentious debates surrounding generational bans, particularly issues of moral agency and discrimination. Generational bans, as discussed by Kniess, can be criticized for denying moral agency by implying that younger individuals lack the capacity to make informed choices about their health (*7*). Additionally, such bans may be viewed as discriminatory, as they create legal distinctions between individuals based solely on the arbitrary factor of their birth year. These e-cigarette policies in China, by contrast, do not explicitly single out any group based on age or birth cohort. Instead, they rely on universal measures that naturally have a greater effect on youth due to their consumption patterns. This design avoids the perception of paternalism or unfair treatment while still prioritizing the protection of young people's health. More importantly, flavor restrictions and taxes have the strongest evidence to support effective control of e-cigarettes, while age restrictions, which might involve moral issues, needs powerful enforcement and meaningful penalties to ensure effectiveness (*2*).

However, the asymmetric amplification effect is not without its challenges. While it reduces the accessibility and appeal of e-cigarettes among youth, it may also drive some young users to seek alternative, unregulated sources. Informal sales channels (*8*), such as internet cafes, billiard halls, and bars, continue to offer flavored e-cigarettes that are not available through legal means. These products, often sold without oversight, may pose greater health risks than those regulated by the government. Moreover, the stigma associated with restricted access could inadvertently reinforce rebellious attitudes toward tobacco control among adolescents, further complicating public health efforts.

Future outlooks

It is important to stress that China's e-cigarette regulations are not solely based on asymmetric amplification. While the regulatory burden disproportionately affects young users, there are still age-based regulations in place, such as the prohibition of e-cigarette sales to individuals under the age of 18 and restrictions on the location of e-cigarette stores near schools. These measures form an integral part of China's broader regulatory strategy, targeting the reduction of e-cigarette use among youth and providing a more comprehensive approach to tobacco control. These age-based restrictions complement the asymmetric amplification effects and reflect China's commitment to safeguarding the health of younger populations while also addressing broader concerns about public health. Check Figure 2 for whole regulation map.

China's e-cigarette regulations also raise important questions about the role of public health policies in shaping behavior across different demographic groups. By targeting specific behaviors and preferences rather than demographic characteristics, these policies achieve similar outcomes to age-based restrictions while avoiding the ethical dilemmas associated with explicit

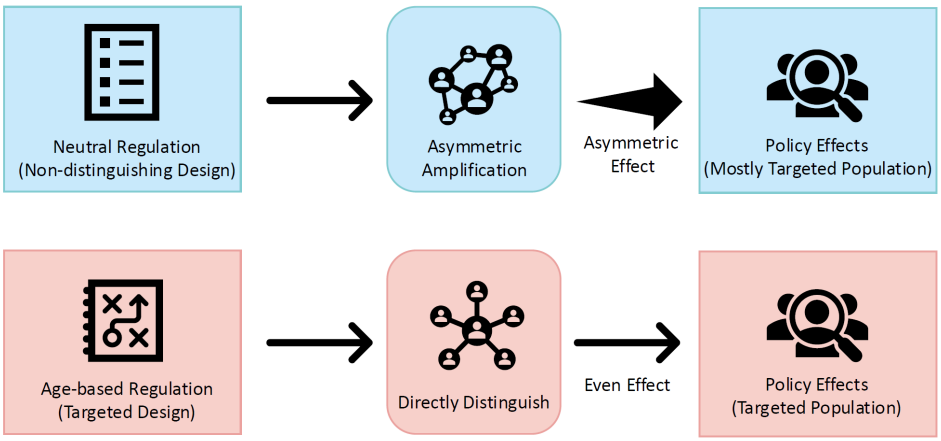

Figure 1. Exhibition of asymmetric amplification effect.

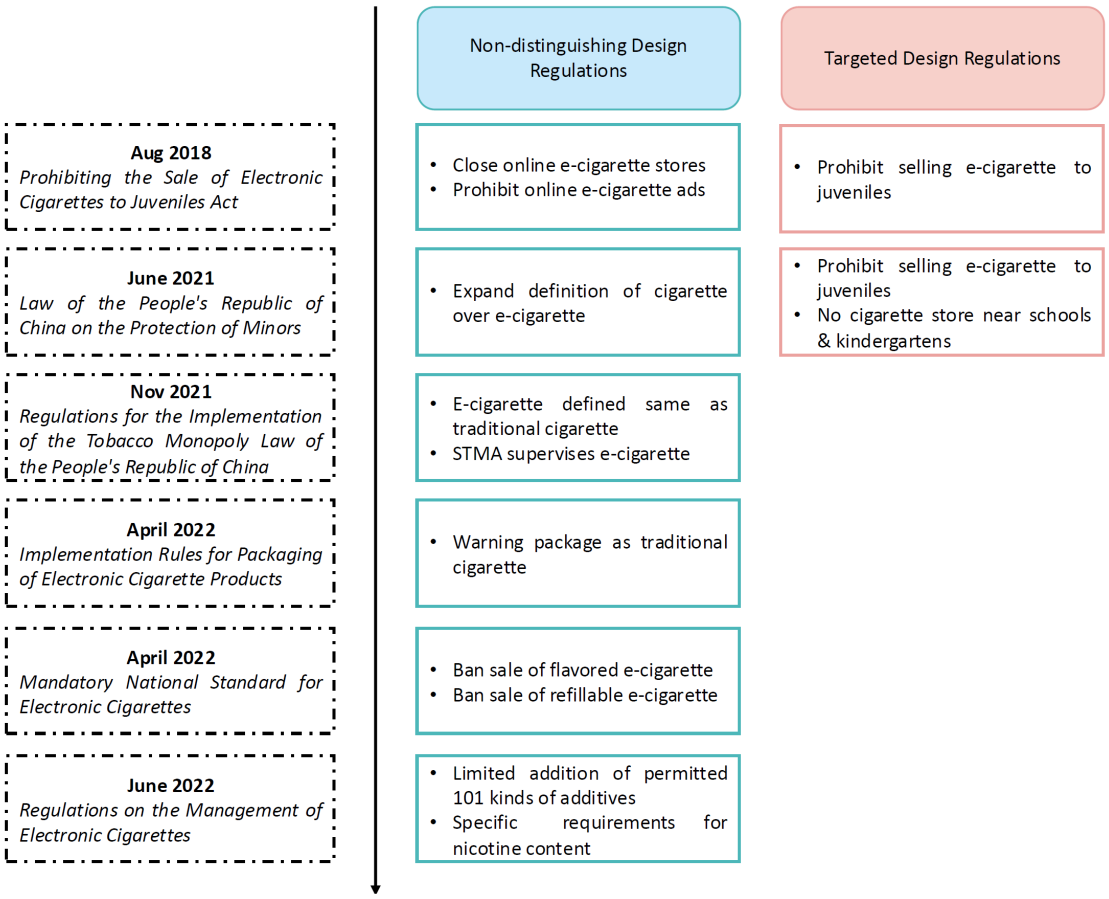

Figure 2. Chinese e-cigarette regulation map. STMA: State Tobacco Monopoly Administration.

discrimination or denial of agency. This approach represents a pragmatic balance between public health objectives and ethical considerations, demonstrating that it is possible to design policies that protect vulnerable populations without creating perceptions of unfair treatment (*9*).

While the concept of "asymmetric amplification" has not been explicitly used in other countries, several international policy measures reflect similar dynamics. For example, high excise taxes on e-cigarettes in U.S. have disproportionately affected youth at different age groups, who are more price-sensitive than adults (*8,10*). Similarly, flavor bans adopted in countries like Finland and Hungary target all users but have the greatest impact on adolescents due to their flavor preferences (*11,12*). Canada's nicotine cap, though universally applied, also limits access to products favored by young users (*13*). These policies share a common feature: universal designs that generate amplified effects on youth through behavioral or economic mechanisms, aligning with the asymmetric amplification framework proposed in this paper.

Conclusions

In conclusion, China's asymmetric amplification-based e-cigarette regulations offer a compelling case study in the design of public health policies. By leveraging universal measures that naturally affect younger users more significantly, these policies avoid the ethical controversies associated with age-based bans while achieving meaningful reductions in youth e-cigarette use. However, the challenges posed by informal markets and potential stigma highlight the need for complementary measures to address unintended consequences. As governments worldwide continue to grapple with the public health challenges posed by e-cigarettes, China's approach offers valuable insights into how regulatory frameworks can balance effectiveness with ethical integrity.

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