Spring 2026 Issue

Penn Economics Almanac

EDITORS' NOTE

Penn Economics Almanac is an attempt to make economics accessible and interesting.

Economics might be confusing, but not because it needs to be—nor because you need a PhD to decipher the economy's impact on your day to day life. Economics is confusing because the language we use to talk about the economy is anything but inclusive. It's heavy in jargon and all too often the people who claim knowledge do their best to raise—rather than lower—the barrier to entry in economic discussions. As a result, a lot of the voices that should be heard don't feel comfortable enough speaking.

The Almanac is a forum for college students to write and for college students to read. Every semester, we'll publish pieces written by you: college students. In return, we hope you'll try reading something you might not have yesterday. The Almanac is not a forum for economics to be dumbed down. Rather, it's an opportunity to open up economic discussions to new voices, as we believe college students are more than capable of adding to discussions.

Our spring 2026 edition presents a diverse collection of articles examining both the micro and macro dimensions of economics in a rapidly changing world. Inside, you will find examinations of energy and regulation in America, war and labor in Ukraine, and the future of world currency.

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Brendan Warshauer

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Energy Infrastructure Efficiency

Where Biden Economists and Trump Policies Intersect

In 2024, the Solar Energy Industries Association estimated that it takes an average of six years to open a utility-scale solar construction project for commercial service, with four of those years spent on planning and permitting. Stringent energy and infrastructure regulations have certainly been a frustrating issue for decades, but less prescient for the period that US energy demand remained stagnant. Energy consumption has been growing at a greater percentage, up to 4.3% in 2024. In the age of AI, increasing energy supply is crucial to maintaining not only US GDP growth, but lowering costs for the civilian consumer. However, the choice of regulations are limited in what sort of capacity they are applied.

Zachary Liscow, a member of the prior White House's Office of Management and Budget, published a spring 2024 paper pointing to the regulation inefficiencies that have stifled energy production. Some of the regulations, particularly those that pertain to Nixon's National Environmental Protection Act of 1970 (NEPA), have been reversed by the Trump Administration on grounds of increasing efficiency. While the Trump administration cuts incentivize oil, stifle clean energy production, and make development more susceptible to environmental harm and environmental racism, they also, to some extent, are aligned with the Biden Administration's Economists' goals for effective deregulation.

Liscow points to the benefits of increasing federal power in the regulatory space. Liscow states that NEPA had significant issues for development; for example, it was triggered anytime a development project crossed federal land, such as a highway. Particularly in the Western U.S., he called crossing federal land "all but guaranteed" (p. 155), and the average energy site installation site in federal waters. Moreover, most clean energy projects receiving federal funding were subject to NEPA requirements.

Liscow suggested a prioritization system for clean energy projects. The Fiscal Responsibility Act of 2023 had taken steps to loosen NEPA restrictions, particularly with respect to speeding up the environmental review process. Liscow called for a "green bargain", striking the balance between executive power and planning capacity. "But with all such concerns duly noted" he said, "the 'green bargain' suggests that in exchange for improved planning and broader early-stage participation, the executive should have greater scope for decision-making" (p. 176) Obviously, a "green bargain" isn't happening on a federal level any time soon. The One Big Beautiful Bill Act instituted a pay-to-play style system. For a fee set by the Council on Environmental Quality (CEQ), a project sponsor can receive a shorter NEPA review period. While this will certainly be beneficial for the private sector, it likely won't incentivize projects and pricing schemes beneficial to the average American energy consumer. The lack of a clear pricing scheme also raises questions as to the political favor of the client. While less relevant to the immediate macroeconomic trends and return on investments from a financial perspective, it's worth noting Trump's regulatory NEPA cuts also eliminate environmental racism and climate change concerns that could lead to substantial health impacts that were present in prior NEPA regulations. According to a paper by Oxfam, a self-proclaimed global organization that fights inequality to end poverty and injustice, NEPA was responsible for stopping fracking in New Mexico Indigenous populations because NEPA required an assessment of cumulative impacts on water and air pollution from the fracking wells. It also stopped plans for an oil pipeline designed to go from West Virginia to North Carolina, cutting through Appalachia and specifically majority Black Appalachian communities.

And aside from the efficiency-environmentalism debate, the most recent Trump Administration is certainly at odds with Biden Era environmental policies as a whole. It has cut Biden's 2022 Inflation Reduction

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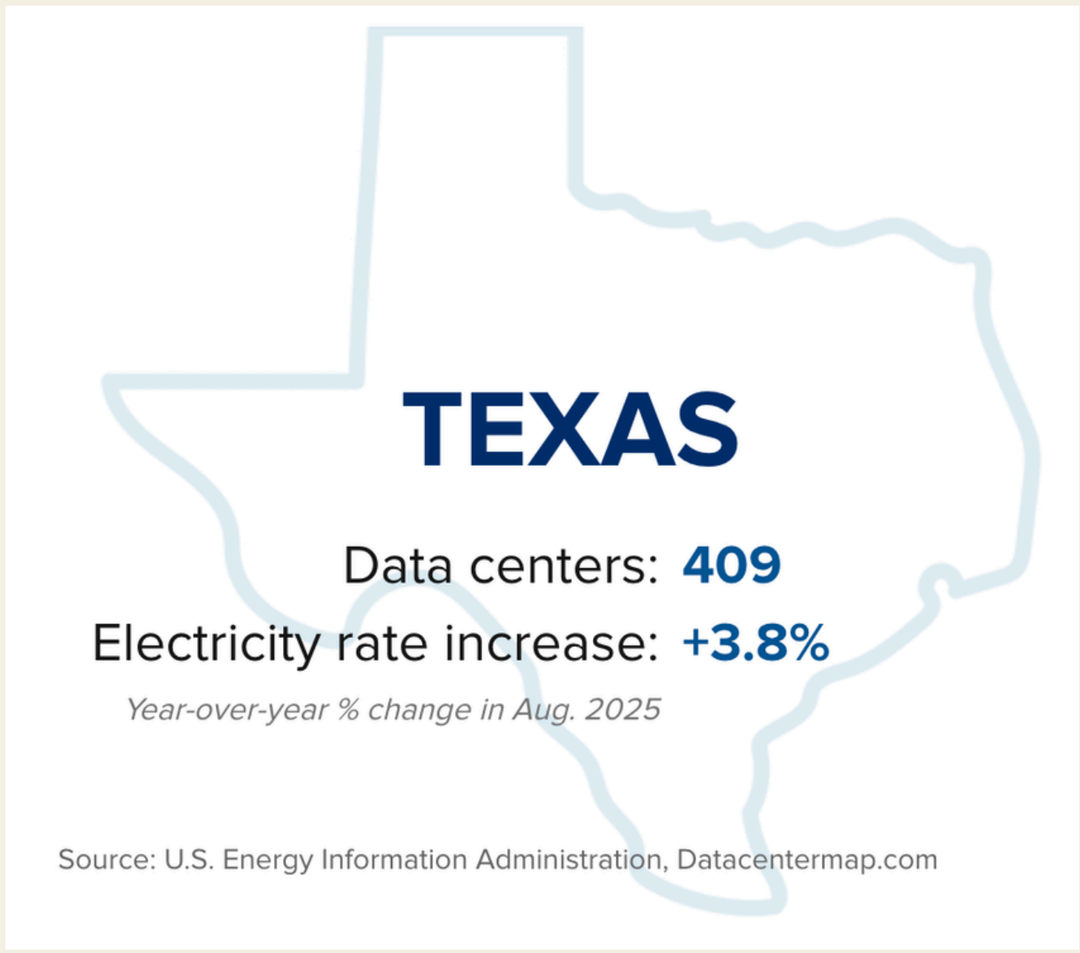
Act subsidies for clean energy, which have the consequence of not only reducing clean energy production but also put Texas' energy grid as a whole at a further risk. In a 2025 Bloomberg article, the vice president of strategy and advocacy of Clean Energy for America said that Trump's cutbacks on sustainable energy tax credits are "just completely making it so difficult to add more energy to the grid." Pablo Vegas, the CEO of the Electric Reliability Council of Texas, which manages the electricity grid for 90% of Texas, testified to the importance of a "balanced mix of generation resources" to congress in March.

Liscow highlights a variety of ways to increase efficiency in the environmental review process, but as the Trump administration has cut environmental restrictions through the rollback of NEPA, unleashing a host of negative externalities (negative consequences that won't be felt by the producer) onto present and future generations of America and the globe, it is challenging to compare the tradeoff between environmental deadweight loss (loss in future environmental resources due to today's environmental decisions) and unknown externalities. The private sector, particularly private equity (PE) firms, have benefited from the lack of public sector initiatives and high barriers to entry to build out the power grid.

Moreover, a key issue for NEPA permitting that arises through multiple areas are issues related to staffing shortages: inefficiencies and permitting wait times, the need to hire out consultants that an in-house staff could do for a lesser cost. But what the Trump Administration has amplified is how a failure in internal management and staffing shortages impacted efficiency with respect to environmental regulations. These efficiency issues are not stemming from environmental setbacks, and likely will not be resolved by NEPA cuts. An article by the Clean Air Task Force calls NEPA a scapegoat for efficiency issues while "a complex web of factors, including a lack of coordination and capacity at the federal level, play much more of a role."

These changes in policy have affected the private sector in a variety of ways. Changes to the infrastructure asset class, which has tripled since the financial crisis and bears significant portfolio share for its financial stability and inflation hedge (strength against inflation), could bear significant financial consequences. An article in The Texas Lawyer by Michael Blankenship and Pete Staviski of Winston and Strawn LLP called the increase in renewable energy investments a result of not just market trends but also "federal and state policies promoting clean energy



CNBC, "Data centers are concentrated in these states. Here's what's happening to electricity prices"

investments," 2022 Inflation Reduction Act's renewable energy tax credits an example of the incentivization of PE participation. An article from Troutman Pepper Locke assessing the state of PE infrastructure investments stated that while oil production is increasing, tariffs were actually boosting solar production, but wind was struggling. Authors highlighted that while the US energy sector is still strong, investment strategies seem to be "driven more by persistent demand than pure politics."

Liscow and other Biden-era economists would likely agree that due to increased energy demands from data centers and subsequent costs, now is the time for bold leadership and federal organization to increase supply, and that NEPA presented notable efficiency issues. However, the current administration has decided to walk back renewable energy subsidies, adding unnecessary risk to Texas' energy grid, and exacerbate federal staffing shortages. These decisions are likely to not only fail to solve the regulatory related efficiency issues but contribute lasting environmental and market damage at a time when the marginal costs of clean energy have just dipped below pollutants, and fail to mitigate the rise in energy costs to the civilian consumer due to data center demand.

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Workforces Where Women Win

Gains and Challenges in Ukraine's Wartime Labor Market

"I would have never thought that I would be working in a mine," Yatsina told The New York Times. At 21, she was a nanny until the war pulled her into one of the most male-dominated workplaces in Ukraine. She was one of thousands of women stepping into roles once considered off-limits for them as the mobilization created urgent labor shortages, restructuring Ukraine's civilian workforce.

Yet the apparent rise in women's labor participation masks a deeper paradox. Many of the working-age women who once formed the backbone of Ukraine's workforce have fled the country, exiting Ukraine's labor market. In other words, while mobilization has pulled new women into the labor market, displacement has simultaneously pushed others out. Understanding the net effect of war on women's economic roles, therefore, requires more than counting new workers. It demands dissecting who left, who stayed, and what kinds of jobs each group gained or lost.

Before the War

Before the full-scale invasion in 2022, Ukraine's labor market was already struggling with structural weaknesses and pronounced gender inequalities. According to the Hoover Institution, labor force participation hovered around 62% (below the OECD average of 73%) while unemployment remained stubbornly high at 9.8%. The COVID-19 pandemic worsened these issues, disproportionately displacing women from service sectors and intensifying their unpaid care burdens.

These conditions solidified a significant gender gap: in 2021, only 42.9% of women were employed compared to 56.9% of men. Gendered structural barriers, such as legal restrictions under Article 174 that barred women from "strenuous or hazardous" work, reinforced a highly segregated workforce. Women were heavily concentrated in education, healthcare, and services, while their presence in industrial and technical fields was minimal (for instance, women constituted only 14% of technical specialists and a mere 2-3% of the underground mining workforce). This segregation was compounded by a persistent gender pay gap, which stood at 18.6% in the pre-war period, limiting women's economic security and entrepreneurial capacity. Together, this paints a picture of a labor market that was not only underperforming but also fundamentally inequitable, setting the stage for the war's disruptive but potentially transformative impact.

Displacement and Mobilization

The war has triggered two powerful, opposing labor market shocks that have reshaped Ukraine's workforce. On one hand, mass outward migration and internal displacement have removed a significant portion of the working-age population from the labor force. According to International Labour Organization estimates, Ukraine has lost approximately 2.4 million jobs (15.5% of its workforce) since 2022, with nearly 1.6 million Ukrainians of working age leaving the country (as of April 2025), the majority being women. Additionally, the internal displacement of 3.7 million people further disrupted the labor market (as of 2024), with women comprising 58% of the displaced population.

On the other hand, the mass mobilization of approximately 700,000 people (predominantly men) into the Armed Forces in the first 6 months of the war has created severe and immediate labor shortages, particularly in traditionally male-dominated sectors such as construction, transportation, and heavy industry (large-scale manufacturing). This dual shock has created what economists may term a forced labor reallocation where war-induced necessity, rather than gradual economic evolution, is driving occupational and sectoral shifts. Pressure from the recession and the loss of male income has pushed many women to seek work. This shift directly challenged obsolete gender norms, testing whether a crisis could permanently reshape women's economic roles in society.

Sectoral Redistribution

Yet the feminization of Ukraine's workforce has not been uniform: it represents a targeted takeover of specific sectors rather than a blanket transformation.

Key Labor Market Indicators in Wartime Ukraine:		
Indicator	Pre-War Level	Current/Wartime Situation
Total Employment[9]	~17.4 million	~12.5 million (2023)
Women in the Workforce	42.9% of female population	Projected 63.2% by 2032
Women Entrepreneurs	51% of new entrepreneurs (2021)	59% of new entrepreneurs (2024)
IDPs who are Women		58%

This redistribution manifests most visibly in women's entry into traditionally male-dominated fields where labor shortages are most acute (for example, sectors such as transportation, construction, and logistics). This represents a concrete realignment of the workforce, driven by both economic pressures and targeted interventions.

The most profound change, however, may be occurring in the realm of entrepreneurship, where women have moved from peripheral to central actors. Since February 2023, every second new entrepreneur has been a woman, with the share of women among all new entrepreneurs reaching 59% in 2024, up from 51% in 2021. This represents a significant reorientation of women's economic agency, though it reflects a complex mixture of opportunity and necessity. As observed in other fragile states, women in low-income or fragile economic contexts often turn to entrepreneurship or informal work as a default option when formal employment is unavailable, though these ventures typically offer less social protection and security than traditional employment.

The Quantity-Quality Paradox

Increased female participation has not automatically translated into equitable economic empowerment. The most striking example of this quality-quality paradox is the growing gender pay gap, which shifted from only 18.6% before the full-scale invasion to an estimated 41.4% in 2023. This divergence is explained in part by women's exclusion from high-paying roles in booming sectors like construction and technology and in part by a widespread undervaluing of their labor due to discrimination and stereotypes.

The rising informality of women's work from 16.2% in 2021 to 18.8% in 2023 only adds to the rising gap. This trend of informal employment carries significant implications for social protection, job security, and long-term economic resilience. To be more precise, the World Bank states that “informal work complicates the process of securing an official, high-paying job in the future, as candidates often struggle to verify their work experience or provide references.” This results in a vulnerable women’s workforce with limited access to labor protections and social safety nets.

The entrepreneurial sector illustrates this paradox particularly well: while women are creating businesses at unprecedented rates, these ventures often exist in the precarious space of "necessity entrepreneurship" rather than representing genuine opportunity-driven enterprise. This suggests a labor market that is expanding in terms of raw participation, but may fail to deliver a significant improvement in the quality of working conditions for women. These risky labor market conditions are creating a fragile foundation for long-term gender equality in the workplace.

Long-Term Solutions

Changes in women’s roles in Ukraine’s labor market reflect not just a reaction to labor shortages, but also a coordinated effort from both government and non-government actors who see the current moment as an opportunity for change. This multi-stakeholder approach has created a “space for dialogue” between the public and private sectors that didn’t exist before the war. Before the invasion, most businesses saw little benefit in a gender-diverse workforce and had no urgency to change. The war has shifted this perspective, generating both political support and a business incentive for collaboration.

This new collaborative environment has witnessed the creation of numerous innovative programs specifically designed to facilitate women's entry into non-traditional sectors:

1. The Reskilling Ukraine Project:
   - Trains women to become truck drivers, public bus drivers, and operators of heavy equipment.
   - In 2024, it has trained and accompanied in their career transition over 300 female participants.
   - In 2025, approximately 1,000 women are expected to benefit from this training.
2. "She Drives" Project:
   - Focused on creating jobs for women in passenger transportation.
   - Implemented through a partnership between an NGO, UN Women, the Ministry of Community and Territorial Development, and transportation businesses.
3. "Alef Stroy" School of Construction Equipment Operators:
   - Trained 60 women to operate specialized construction equipment between August 2024 and January 2025.
4. State Employment Service Study Vouchers:
   - Covers expenses for learning in-demand professions, with 74% of the 21,000 vouchers issued going to women.
   - The most popular specialties and professions: nursing, psychology, cooking, driving, and preschool education.
5. And more!

These programs are more than temporary fixes for labor shortages, as they have the potential to help women overcome obstacles to working while also offering new opportunities to gain skills and advance in their careers.

The Sustainability of Change

The critical question for Ukraine's economic future is whether these wartime shifts in women's employment will prove transient or transformative. Historical precedents from conflict and post-conflict societies offer both encouraging and cautionary insights. For example, research on displacement in post-war Bosnia and Herzegovina found that displaced women were more likely to drop out of the labor force, suggesting that crisis-induced gains can prove fragile without sustained institutional support.

However, several factors suggest that Ukraine's current transformation may have a lasting effect. First, the scale of the demographic challenge creates a structural imperative for continued female participation, with Ukraine facing a projected need for 8.6 million additional workers by 2032. Second, EU integration processes are creating external pressure for alignment with European standards on gender equality and non-discrimination. Third, the newly established intervention programs introduce reforms and investments in human capital that could facilitate more sustainable workforce realignment.

However, significant headwinds still pose a threat. Among those are (1) funding vulnerabilities, such as the US Executive Order to suspend USAID programs, (2) the persistent wage gap, and (3) high informality that fosters structural vulnerabilities in women's employment. Additionally, (4) social norms and stereotypes continue to present barriers, with employers in male-dominated sectors still exhibiting bias against hiring women despite labor shortages.

Ukraine's labor market is thus suspended between breakdown and breakthrough. The trajectory of this "quiet revolution" will be determined not by market forces alone, but by conscious policy choices that recognize women's presence in the market as essential, not just a simple wartime necessity. This highlights the need for reconstruction policies that will consciously translate the fragile gains of war into the durable equality of peace.

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The Peptide Boom is Here

Early science suggests natural healing molecules could transform medicine. It's up to economics to decide.

First juice cleanses and jade rollers. Then chia pudding, gua sha, and $20 strawberry smoothies. When it comes to the latest on wellness, it's hard to keep up. Last year it was easy to overlook what society treated as a joke propagated by "looksmaxing" forums obsessed with cosmetic enhancement. But now that celebrities, athletes, finance bros, and even Beverly Hills clinicians are touting routine injections from vials shipped from gray markets in China, it's impossible not to wonder if peptides might pose as the future of regenerative medicine.

What are these superhealers? At their core, peptides are simply short chain amino acids that bind to bodily receptors and trigger specific biological processes. While more recently entering the headlines, peptides such as insulin and GLP-1 receptor agonists have been widely adopted for decades as treatments for diabetes and obesity. Nonetheless, science has much less to say about these newly hyped compounds.

Take the infamous "Wolverine Stack" tagged in thousands of TikTok videos. Composed of regenerative peptides BPC-157 and TB-500, this combination is frequently used by athletes and bodybuilders for injury recovery, inflammation, gut health, and joint mobility. Less popular but equally promising compounds such as KPV are known for reducing inflammatory signaling in intestinal tissue. Nonetheless, due to the lack of long-term human clinical trials (most evidence is anecdotal or rooted in animal studies), the U.S. Food and Drug Administration (F.D.A.) considers most peptides unapproved drugs (whereas in Russia, synthetic peptides such as Selank have been clinically studied and approved for the treatment of anxiety). As a result, eager patients instead turn to illicit overseas shipments or pharmacies producing peptides for "research purposes only." (If you're disappointed by the lack of access to peptides in America, don't fret: the internet is swarming with rumors about Health Secretary Robert F. Kennedy Jr. removing restrictions on over a dozen beloved peptides. By the time this article is published, your own Wolverine Stack could be just clicks away.)

The idea that peptides have been long unproven and even labeled "bro science" is troubling. Considering the success stories and skyrocketing demand by the day, where are the companies eager to fund clinical studies for a profitable treatment? If the F.D.A. is going to warn of potential risks of injecting peptides (such as the entirely theoretical promotion of tumor growth via angiogenesis, or blood vessel formation), wouldn't it be advantageous to clinically prove such reasons for caution?

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`As always, an answer lies in economics. Under the current F.D.A. framework, companies must conduct expensive, multi-phase clinical trials to prove the safety and efficacy of new drugs, often costing well over $100 million and taking years or longer. This heavy upfront investment is incentivized by the promise of substantial financial returns, often secured through intellectual property protection, or patenting potential treatments early. But patenting naturally occurring compounds such as BPC-157 (which literally stands for Body Protective Compound 157) would be the equivalent of purchasing the exclusive right to protein. This makes game theory so relevant to peptides that it's hard to choose which collective action problem to present. Here are two simple yet intertwined applications:

1. Peptides & Prisoners: large profit-motivated companies could cooperate by funding trials together (expanding the market, expediting the regulatory process, and reducing financial burden for all), but each suspects the others will opt not to join hands. No one teams up, and we all remain prisoners of a stalled system.
2. Peptides & Parasites: a large profit-motivated company could spend hundreds of millions pioneering peptide research, only for their products to be subsequently sold as competitively by free rider firms (which I label parasites because they leech off of clinical trials they did not contribute to and also because I enjoy alliteration.)

Financially, a collapsed net present value of investing in necessary studies bars further clinical research. As a result, potentially transformative tools for accelerated healing are priced at hundreds of dollars per vial at niche wellness clinics across Los Angeles, Miami, Wall Street, and Silicon Valley. We're left in a strange but not entirely unique equilibrium in which seeking prices close to low manufacturing costs of high demand products also requires facing the risks of adverse selection: contamination, improper dosages, and downright counterfeit products.

Data exclusivity could help repair this market failure. Granting companies temporary rights (around five years) over clinical trial results would allow firms to recoup R&D costs without outright possession of peptide compounds. The National Institute of Health could assist this process by recognizing peptides as underinvested goods with high social returns, absorbing some of the cost of early-stage trials. Prize-based systems could further the development of peptide studies by rewarding firms for clinically proving efficacy, thereby reshaping incentives.

We could also look to modern drug development for inspiration and necessary caution. Take insulin, technically a naturally occurring peptide but produced synthetically by biotech firms as slightly modified (and therefore patentable) versions. By the same token, companies can claim ownership over their own peptide analogs, safely modified with nanotechnology to increase potency or enhance shelf life (peptides degrade rapidly if not refrigerated after reconstitution.) Exclusivity over proprietary formulas would pave the way for F.D.A. approval and scalable manufacturing.

But as we learn in microeconomics, monopoly power must never go unchecked; competitive pressure through diverse firms, formulations, and federal regulation must stave off unaffordable prices and the inaccessibility characterizing peptides to begin with. Luckily, social media platforms such as TikTok will continue to lower the barriers to entry, and if not too squeezed by tariffs on chemical imports, multiple peptide players stand a chance at fostering a dynamic and innovative market.

In many ways, peptides redefined my understanding of modern healthcare. They suggest that addressing our nation's leading cause of death entails not only managing symptoms but also bolstering the body's own capacity to heal. This shift requires not just scientific innovation but also structural adjustment: rethinking incentives, redistributing risk, and investing in therapies that don't always fit into the existing pharmaceutical model. The future of regenerative medicine will depend less on whether peptides can evidently and sustainably function and more on whether our political, economic, and medical systems are willing to let them.

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Spending the Boom

How Guyana Risks Repeating the Resource Curse

In February 2026, Georgetown hosted the Guyana Energy Conference, drawing ExxonMobil executives, heads of state, and global investors to a country of just 800,000 people. The turnout reflected a dramatic shift. Guyana now sits at the center of one of the world's most consequential energy stories. Since 2022, Guyana has averaged 47% annual GDP growth, the fastest sustained rate globally, while per capita income has roughly tripled in just three years, prompting a World Bank high-income reclassification in 2023. With an estimated 11 billion barrels of recoverable oil, the country now holds more oil per capita than Saudi Arabia or Qatar.2

The government has responded aggressively. Guyana has quadrupled its national budget over five years. Billions have been allocated to infrastructure, housing, and both energy and non-energy projects. Among the most ambitious is a major gas-to-energy pipeline, backed by an estimated 16 trillion cubic feet of natural gas reserves, aimed at dramatically lowering electricity costs and supporting industrial growth aspirations. "We are not building an energy nation," President Irfaan Ali declared in a 2024 interview. "We are building a diversified economy that is focusing on many areas of growth." Non-oil GDP grew at 14.3% last year, suggesting that this diversification may be gaining traction. However, while these trends have resulted in rapid growth, they raise a deeper question: does this growth reflect sustainable diversification or temporary spillovers of an oil boom that could harm economic stability?

1. International Monetary Fund (IMF), *Guyana: 2025 Article IV Consultation*, Country Report No. 25/103
2. Council on Foreign Relations, "How Guyana's Oil Boom Will Reshape Energy Security," 2024.
3. José Enrique Arrioja, "Can Guyana Beat the Resource Curse?" *Americas Quarterly*, January 23, 2024
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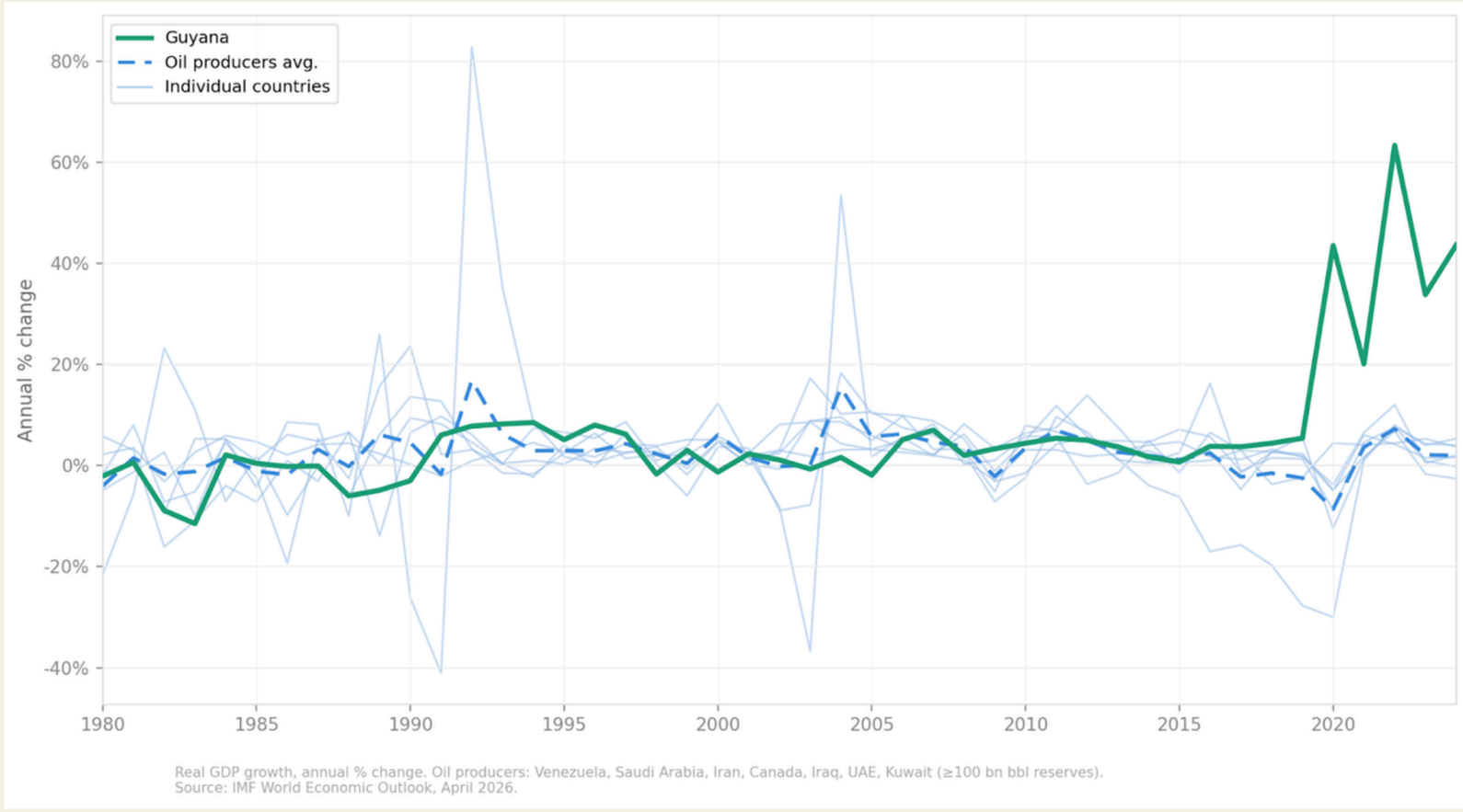


The Risk: The Resource Curse

The "resource curse," coined by economist Richard Auty in 1993, describes a paradox: countries rich in natural resources often experience weaker long-run growth than those without them. The resource curse typically operates through four main channels that can transform natural wealth into a long-term liability, including fiscal volatility, inefficient public spending, weakened institutions due to corruption, and the particularly damaging Dutch disease, where as revenues flow in, rising government spending appreciates the exchange rate and erodes the competitiveness of non-energy exports. In Guyana's case, these risks are not hypothetical, but rather increasingly relevant as oil revenues continue to surge. Since manufacturing and tradable sectors are key drivers of economy-wide productivity, hollowing them out carries severe long-run costs. Regional examples such as Trinidad and Tobago and Venezuela demonstrate how oil-driven growth can lead to economic distortions, or, in more extreme cases, macroeconomic collapse. However, it's important to note that this curse isn't inevitable; Chile, Norway, and the UAE have been able to evade these adverse effects through strong fiscal policy measures.

For Guyana, there is no clear Dutch disease yet, but (according to the IMF) the risk is high.1 The recent surge in infrastructure investment has fueled a construction boom significant enough to attract foreign labor to meet rising demand. At the same time, agriculture's declining share of GDP may reflect a reallocation of resources away from tradable sectors, consistent with early-stage Dutch disease. Part of this shift, however, is likely driven by the rapid expansion of oil output itself. The more immediate threat, however, is fiscal overheating. Rapid public spending, if poorly managed, could drive inflation and exchange-rate appreciation that undermines investment in non-oil sectors before they have a chance to materialize. Critics have warned of a trajectory of waste, pointing to the same flagship gas-to-energy power plant, now two years behind schedule with its budget swelling to roughly $2 billion.

Growth alone is not enough. The structure of that growth matters, and while Guyana has avoided clear signs of resource curse dynamics so far, its current fiscal trajectory increases that likelihood.

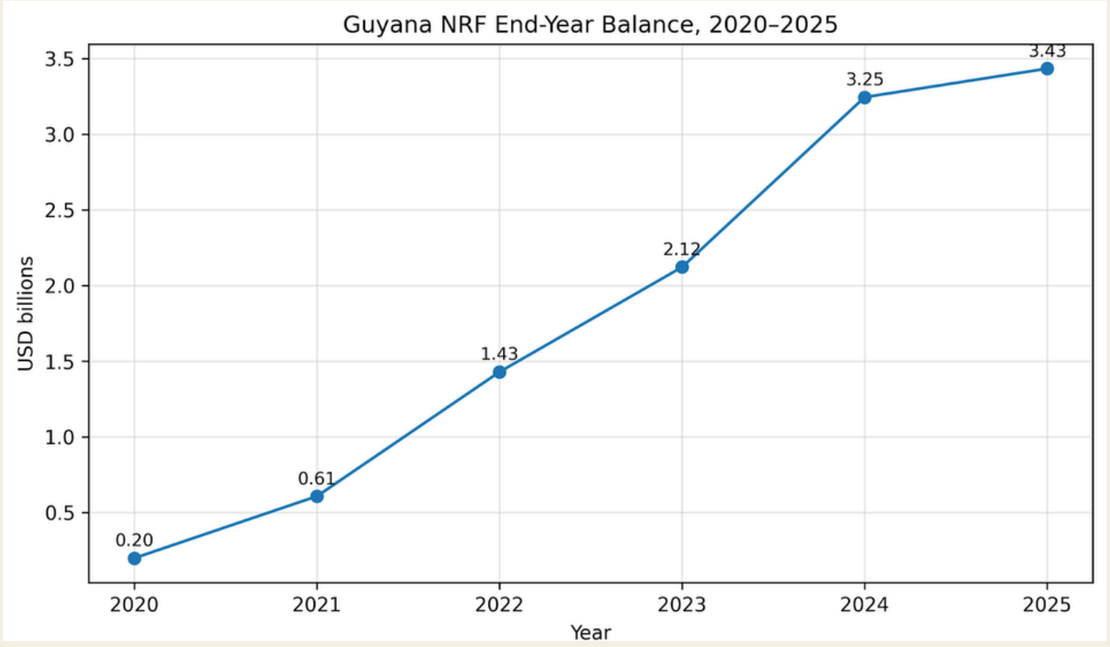
Guyana's National Resource Fund

Guyana has introduced several institutional frameworks aimed at preventing the resource curse and promoting sustainable development, including policies targeting economic diversification, environmental sustainability, and long-term fiscal stability. Among these, the Natural Resource Fund (NRF) stands as the country's primary mechanism for managing the structural risks associated with oil wealth.

The Fund was designed to serve three purposes:

1. Savings: Saving a portion of revenues for future generations.
2. Stabilization: Smoothing government revenues across volatile oil cycles
3. Control: Absorbing excess foreign exchange to limit Dutch disease

Since its first deposit of US$54.9 million in March 2020, the fund has grown to approximately US$3.4 billion - roughly 13% of Guyana's GDP - making it one of the fastest-growing sovereign wealth funds among new oil producers.



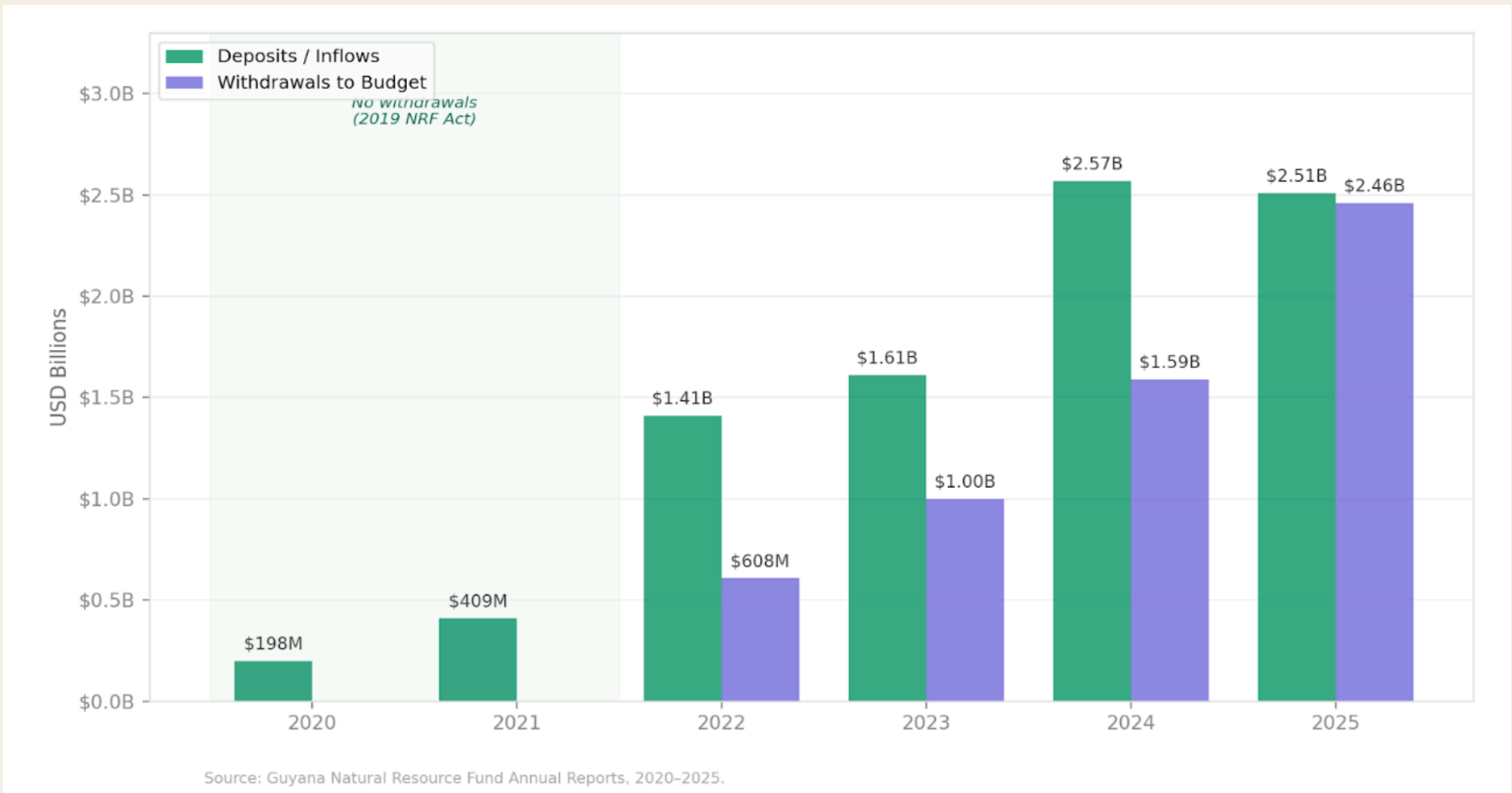
35. Natural Resource Governance Institute (NRGI), The Resource Curse, n.d.
6. Inter-American Development Bank, *The Dutch Disease Phenomenon and Lessons for Guyana: Trinidad and Tobago Experience*, n.d.
7. Bloomberg, "Cubans Rush to Guyana for Construction Jobs as Trump Pressures Havana," 2026.,
8. Bloomberg, "Guyana Plans 'Norway on Steroids' to Avoid Oil's Resource Curse," 2026.
9. Bank of Guyana. *Natural Resource Fund Quarterly Report (December 2025)*. Bank of Guyana, 2025,

However, Guyana's NRF has undergone three major policy changes, each shifting the balance between saving and spending. The original 2019 NRF Act, passed under the former APNU+AFC coalition government, prioritized caution. Withdrawals required parliamentary approval, and independent committees played a central role in decision-making. These included a Macroeconomic Committee and a Public Accountability and Oversight Committee drawn from civil society, academia, unions, and religious groups. As a result, no withdrawals were made in either 2020 or 2021, allowing the NRF to accumulate and better fulfill its role of balancing fiscal flexibility and long-term saving.

That approach changed in 2021. After taking office, the PPP/C government repealed and replaced the 2019 Act entirely. The multi-committee framework was replaced with a smaller, presidentially-appointed Board of Directors, drawing criticism over increased executive control. The new administration also introduced a rules-based withdrawal formula that allowed the share of the fund that could be transferred to the budget to decline as the fund's balance increased. The goal was to front-load access during the early years of the boom, when development and investment needs are greatest, signaling a shift toward greater fiscal flexibility.

In 2024, the government amended the formula again. Withdrawals became tied to the prior year's inflows rather than total savings, allowing it to access a large share of new oil revenue each year. This shift effectively further loosened spending constraints, moving the fund toward a framework that facilitates higher near-term fiscal absorption of oil revenues. The current framework allows the government to withdraw the full first US$1 billion of annual deposits, followed by 95% of the next US$1 billion, 90% of the third, 85% of the fourth, 50% of the fifth, and 10% of any amount exceeding US$5 billion.

The successive revisions have sparked concern that the NRF is shifting from a long-term savings machine to a mechanism for financing current expenditures. Former Investment Committee member and APNU parliamentary leader Terrence Campbell has repeatedly criticized the government's handling of the fund, before resigning in late 2025. He later pointed to the government's spending of 89% of oil proceeds that Guyana earned between September 2024 and September 2025 as evidence of this mismanagement. A claim that is consistent with recent data. Guyana's NRF is effectively operating on a "spend-as-it-comes" basis: 2025 transfers were US$2.46 billion against roughly US$2.6 billion in inflows. The government's emphasis on growth has increasingly come at the expense of its savings and stabilization function,



Guyana National Resource Fund (NRF): Deposits and Withdrawals, 2020–2025[15]

10. Kaieteur News, "Jagdeo Defends Clearing Out Guyana's 2023 Oil Earnings," 2024
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12. Stabroek News, "Rapacious PPP/C gov't spent 89% of oil income earned in one year – Campbell," December 27, 2025
13. Ministry of Finance, Guyana, *Mid-Year Report 2025*; Bank of Guyana, Natural Resource Fund data.
14. International Monetary Fund (IMF), Guyana: 2025 Article IV Consultation, Country Report No. 25/103.

amplifying the risk of inflationary and exchange-rate pressures with offshore production expected to expand significantly over the coming decade.

The IMF has praised the fund's accumulation while notably flagging the absence of a medium-term fiscal framework, with an explicit spending anchor. That anchor is what ultimately determines whether sovereign wealth funds deliver long-term stability.

Norway's Model: Discipline, Scale, and Trade-Offs

President Irfaan Ali invites a comparison to Norway, one of the most successful resource economies in recent history, and offers a very useful benchmark. He noted, at the Energy Conference, that Norway's position today reflects over two decades of investment in infrastructure, education, and social services, suggesting that Guyana is attempting to replicate that trajectory. Pointing to the significant investments made in terms of education and technology, he coined the country to be "Norway on Steroids".7 It is a bold claim and one that potentially overlooks the discipline that drove Norway's success.

Norway's success with oil wealth is the product of decades of constraint, not speed. Its sovereign wealth fund, now exceeding $2.1 trillion, was built under a fiscal framework designed to limit how much oil revenue enters the economy each year. Since 2001, the government has anchored transfers out of the fund annually to the fund's expected real return, estimated at around 3%, with recent budgets closer to 2.5%. These transfers, which accounted for about 20–25% of the national budget in 2024, helped finance expensive welfare initiatives, including free education, universal healthcare, and broad social protections. The result has been one of the highest standards of living globally, ranking second on the UN's global Human Development Index.

Thus, Norway's system is one where most oil income is saved rather than spent. The majority of revenues are reinvested exclusively globally, allowing the fund to compound over time while reducing pressure on the domestic economy. This discipline has helped Norway maintain stable inflation, avoid significant exchange-rate appreciation, and preserve competitiveness outside the oil sector.

Yet, even Norway's model is not without trade-offs. Some critics argue that decades of comfort have affected economic urgency, with productivity growth lagging and rising public spending raising concerns about long-term efficiency.15 At the same time, the fund's scale exposes Norway to global risks. In April 2025, it recorded its largest loss in six quarters as markets reacted to trade tensions, highlighting its dependence on global financial conditions.

Different Economies, Different Constraints

While the two sovereign wealth funds operate in very different economic contexts, the comparison remains useful. Norway's framework was designed for a mature, high-income economy seeking to manage excess wealth, rather than build it. Guyana faces a different reality: significant infrastructure gaps, a developing private sector, and a need for capital to drive growth. Regardless, Norway spent three decades building its buffer while Guyana is making different choices much earlier in the process, when the risks are highest. The challenge is not to replicate Norway's model directly, but to adapt its underlying principle of discipline to an economy still in the process of evolving.

The Path Ahead

On one hand, Guyana faces urgent development needs. Infrastructure gaps, energy costs, and public services all require significant investment, and delaying spending could slow broader economic progress. On the other hand, rapid spending increases the risk of overheating, inflation, and long-term instability.

While it has the resources and institutional frameworks to avoid the mistakes of past oil economies, Guyana's current trajectory is a risky one. As President Ali claimed, Guyana is pursuing multiple avenues of growth, but without greater fiscal discipline and a clearer spending framework, this current path will lead to the very resource curse dynamics it seeks to avoid.

Moving forward, the challenge will not be whether to spend, but how to pace and structure that spending. Strengthening fiscal rules and prioritizing investments that expand productive capacity over short-term demand could help Guyana balance its development ambitions with long-term macroeconomic stability. Ultimately, the success of Guyana's oil era will depend less on the scale of its resources and more on the discipline with which they are managed.

15. Bank of Guyana – Natural Resource Fund Annual Reports and Quarterly Reports (2020–2025)
16. Bloomberg, "Norway's Sovereign Wealth Fund: How It Works and How It's Changing," 2025.
17. United Nations Development Programme, "Human Development Index (HDI) Rankings," accessed April 2026
18. Top1000Funds, "Norges Bank Investment Management," n.d.
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Global Cities Under Pressure

How international uncertainty shocks are amplified among connected populations

The creation of the metropolis has allowed humanity to reap enormous benefits, including greater productivity from shared infrastructure, faster labor market matching, and knowledge spillovers. These mechanisms have aided humanity in improving its living conditions—adapting the environment to the wants and needs of citizens. However, agglomeration entails substantial risks: a tighter system is more vulnerable to logistic shocks, infrastructure failure, and uncertainty shocks. And it is this last kind of risk that is hardest to grasp, which, often, economists do not deal with due to its abstract nature. Furthermore, the internet has expanded the flow of information to the point where geographical distance is no longer a limiting factor in communication, and more channels allow for clearer tracking of such data. More precisely, the nodes transmitting information worldwide have become denser, data is flowing faster, and cities are at the core of this phenomenon. As the world becomes increasingly agglomerated, it becomes more informative to describe countries through their cities and network connections.

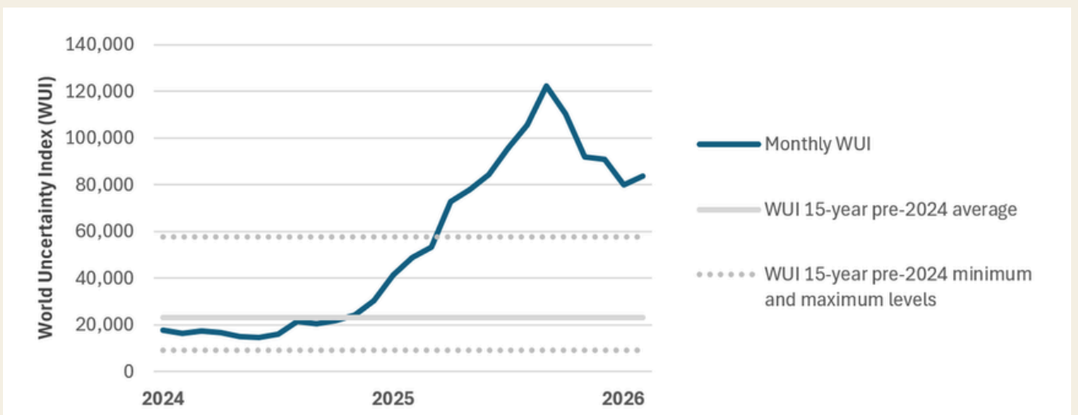
Current trends of global uncertainty and urbanization

There are two fundamental metrics that can be highlighted as relevant to how uncertainty-led systemic risk and urbanization internationally stand as of today.

Firstly, the World Uncertainty Index, maintained by academics, is a single-sourced, standardized measure that tracks the frequency of the word “uncertainty” and its variants in the Economist Intelligence Unit’s quarterly country reports.

As of March 2026, the average yearly level of the World Uncertainty Index is 4 times greater than the previous year and the latest 15-year average. Academics agree that a combination of recent geopolitical conflicts, instability among financial institutions, and trade shocks—a polycrisis—has raised this index to historic highs.

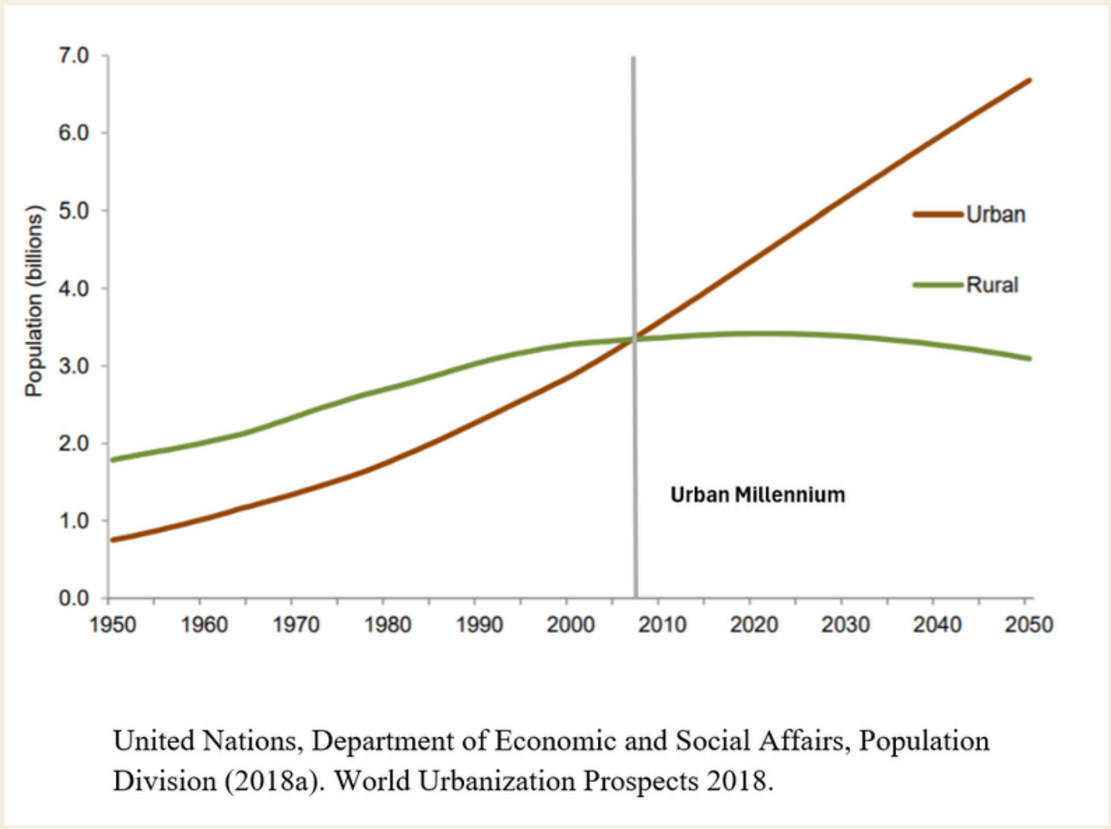
These levels suggest that countries worldwide are being affected by a ubiquitous and unprecedented wave of economic shocks which encompasses a disposition towards higher uncertainty. This is particularly concerning, as spikes in the different measures of uncertainty have historically been proven to influence reductions in foreign direct investment inflows, disproportionately placing developing countries at risk due to a greater dependence upon external financing.[1] Moreover, its association with increased unemployment—which raises the cost of labor reallocation, and predictive value in general declines in economic activity make this observation all the more grave.[2]



Ahir, H., Bloom, N., & Furceri, D. (2026). World Uncertainty Index.

Secondly, the global urban population, which serves as a proxy for worldwide industrialization and aggregate agglomeration trends. Since 2006, the world's urban population surpassed the rural population, thus, the global economy entered into a new socioeconomic phase (often referred as the Urban Millennium) where an overwhelming majority of the global GDP became dependent upon urban-based economic activities. 20 years later in 2026, the drift has persisted, with global urban population levels reaching 57.55% (see next graph), with many Western economies in North America and Europe at urbanization rates over 75%. As a byproduct of these changes, the world has brought forth global cities, that is, highly-urbanized, sector-diverse metropolises that are disproportionally integrated in the international economic, financial and informational networks.[3]

1. This relationship is supported with the Economic Policy Uncertainty Index in Nguyen, C. P., & Lee, G. S. (2021), which shares highly correlated fluctuations as the WUI but only covers developed economies.
2. With B Schaal, E. (2017) exploring volatility shocks dominating unemployment measures and Baker, S. R., Bloom, N., & Davis, S. J. (2016) linking innovations in policy uncertainty (with the use of text-based indices) with declines in economic activity.
3. The term, “Global cities”, was initially introduced by Dutch sociologist Saskia Sassen, originally: New York, London and Tokyo.



United Nations, Department of Economic and Social Affairs, Population Division (2018a). World Urbanization Prospects 2018.

External vulnerability and concentration risk

Behind the current all-time-high uncertainty, we have an obvious enabling factor, the open economy. While opening an economy yields major benefits in growth, access to capital, and technological innovation, there is a trade-off. According to Rodrik's hypothesis, higher openness implies higher exposure to external volatility. Therefore, trade and uncertainty shocks abroad can significantly affect terms of trade, commodity prices, and financial sectors—placing small open economies at notably higher risk. At the urban level (using national data as proxies for city data), city-states such as Singapore that are forced to specialize and absorb international shocks are especially vulnerable. In contrast, economic capitals like New York or London experience similar openness with the privilege of being embedded in large economies, thus benefiting from a partial economic cushion (fiscal transfers, monetary policy, and labor market pooling) from neighboring regions.

On the other hand, one implication of the Urban Millenia is that, on average, it is becoming more prevalent that "cities become the countries". The industries that populate the metropolis acquire the greatest mass nationally, becoming more competitive but incentivizing developed-economy cities to become asset-specific and trade-dependent—worsening concentration risk. Exceptionally, some export and commodity dependent developing economies show a different trend, where large firm profits volatility is observed while keeping urbanization rates relatively stable. This has been the case for Mongolia, where unilateral specialization in mining allowed firm losses and high inflation during the COVID-19 crisis from 2020 to 2021.

The bottom line is that, although some countries are resource-locked on exporting commodities and stay rural, on average, countries are becoming more city-centric and are building their economy around their city-industries. If non-tradables volume is not sufficient to satisfy internal demand due to country-specific labor, land or capital allocations, then agglomeration carries significant risks. This is paramount to our discussion due to the fact that uncertainty shocks are only as relevant as the maximum economic impact they can have. Economies that are not significantly affected by some specific economic shocks will not be bothered with uncertainty shocks if they are not to worry about any corresponding negative future outcomes.

The components and cycles of uncertainty

Uncertainty shocks are the widening of the scope of possibilities in future expected economic conditions, it cannot be tangibly observed beyond the agents' reaction to it. Such phenomena can have different representations depending on its origin (stock market volatility, text-based indices, total factor productivity variation…). To give shape to such a concept, it is vital to taxonomize uncertainty, in this case, drawing on Bloom (2009) and Bikchandani-Hirshleifer-Welch (1992) as a theoretical basis. With these tools, we can decompose uncertainty and interpret its cycles. An instructive example to convey these ideas as we go is the Sino-British negotiations in Hong Kong in 1982.

In 1981, the British Nationality Act was passed, limiting the definition of British Nationality for overseas territories. Starting the next year, British birthright citizenship would require at least one (isle) British parent or a parent settled in the United Kingdom. This news, along with the approaching end of the British 99-year lease over Hong Kong, raised concerns in the Asian trade capital. These concerns fully materialized when, in September of the same year, lease negotiations (the source of uncertainty) between the United Kingdom and the People's Republic of China began. The press, broadcast media, word-of-mouth, and financial markets (transmission channel) signaled uncertainty in the future of the local government (signal content). Due to the spike in risk across the entire territory (pervasiveness), investor confidence plummeted (response), and international investors temporarily halted investment. Under this wait-and-see scenario, the local currency plunged, and the city experienced an all-time high in capital flight.

Thus, we observe that as the news of the negotiation arrived (uncertainty shock), the cost of risk exposure increased (real option value increases)[4], and thus firms reduced investment and hiring (wait-and-see), leading to sharp contractions in output and employment (rapid drop). The uncertainty event partially resolved in 1983 with the peg to the US dollar and the concurrence of the "One Country, Two Systems" accord in 1984. After such realizations, a recovery in output was observed (rebound), and a strong growth in output in the years following 1985 (overshoot). Finally, with stable currency and promising economic prospects Hong Kong preserved its status as the financial capital of Asia.

At the country level, this is a useful mechanism to give meaning to something that would otherwise be hard to describe. However, this framework can be contested by current empirical evidence of the US stock market's resilient response to the protectionist and later unpredictable trade reform formally announced in April 2025, "Liberation Day", which, according to this framework, should have induced a drop in FDI and stock prices. These empirical observations are justified with the Oi-Hartman-Abel effect, that is, if firms have convex profit functions and costless capital adjustment, uncertainty can increase equilibrium investment.[5] This effect is not superseded by Bloom's framework, as sectoral separation, the concept that the effect of systemic uncertainty shocks is heterogeneous between sectors, allows for both effects to hold true.

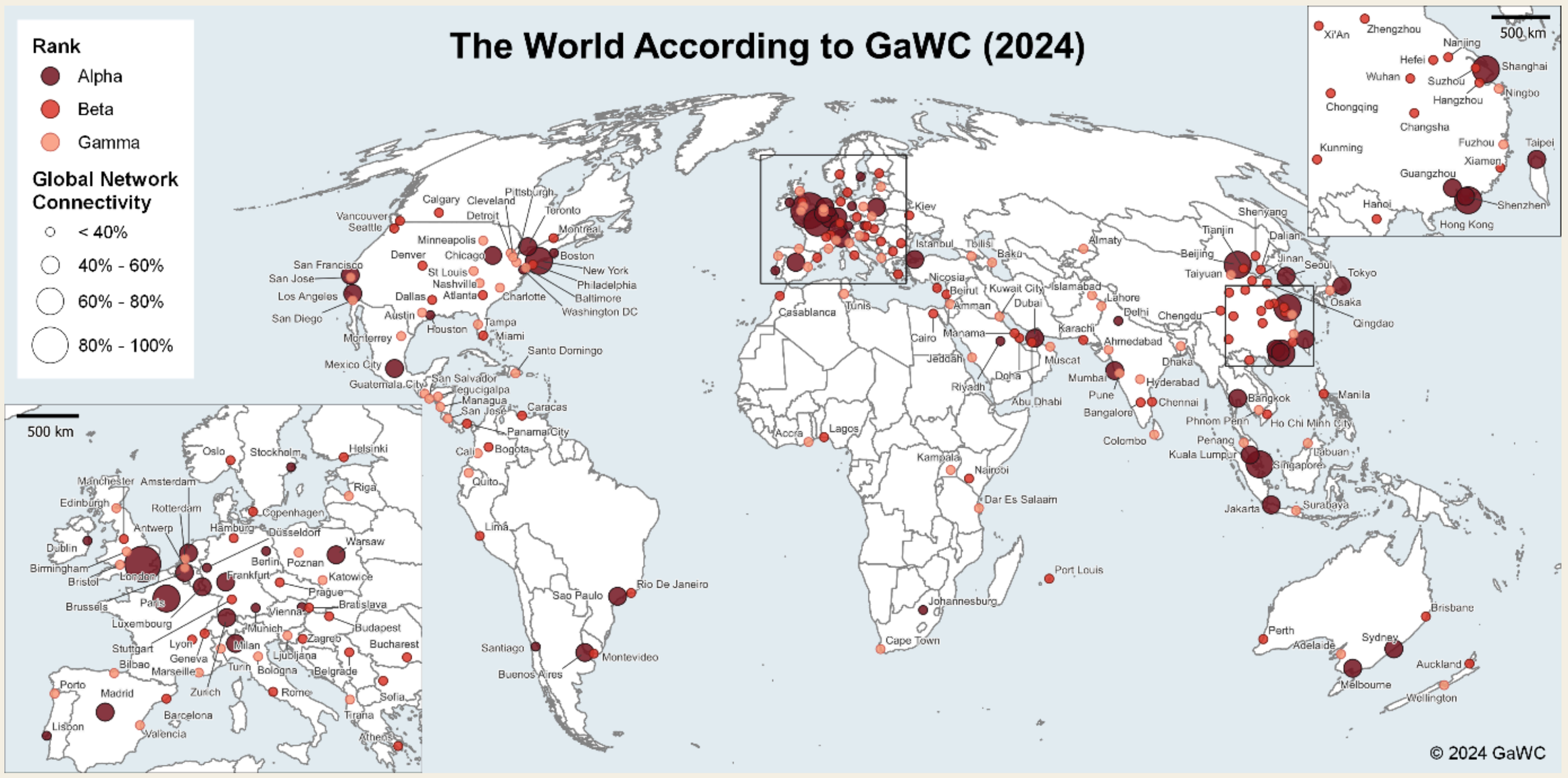
Although not all-applicable, this framework is critical to understand the general effects of uncertainty shocks, which incentivize the risk-insuring behavior temporarily, thus becoming a particularly valuable model for business cycles containing this phenomena.

Uncertainty in the world city network

In the international economic context of 2026, we find small open urban economies (e.g., Singapore, Hong Kong), countries facing concentration risk due to asset-specific investments and specialization (e.g. Saudi Arabia, Taiwan). Trade diversifiers (e.g. Germany, United States) and closed economies (e.g., North Korea, Iran). In this highly heterogeneous setting with an average worldwide trade openness level of 57.77% in 2023, some city-states and large cities stand-out significantly as international economic hubs.

These global cities intensively concentrate international trade, financial networks, communication, media and policy influence. What occurs within these cities is spread throughout the world either through greater service value firm linkages, worldwide media coverage and through financial markets.

The most connected cities worldwide, London, New York, Hong Kong (measured by service value linkages[6]), encompass a substantial portion of global uncertainty flows.[7] This could raise concern as to the level of uncertainty received domestically by these, however, these cities often possess market absorption mechanisms that smooth worldwide economic shocks.



Globalization and World Cities (2024).[8]

4. Real option value refers to the relative value that firms attribute to waiting (not making investment decisions) during an uncertain period.
5. More specifically, it is theorized that AI and Tech companies currently being traded in the US stock markets possess these characteristics. Thus, they attract sufficient investment such that the FDI does not drop significantly as Bloom would otherwise predict.
6. Connectivity is measured through the Interlocking Network Model based on service value firm linkages from Globalization and World Cities 2024.
7. The Interlocking Network Model ranks the top 10 most connected cities worldwide as: London, New York, Hong Kong, Beijing, Singapore, Shanghai, Paris, Dubai, Tokyo and Sydney.
8. The nodes highlighted in red classify cities as Alpha: Global Hubs, Beta: Regional Anchors, or Gamma: Small centers.

These mechanisms may include fiscal transfers from neighboring regions, monetary sovereignty or economic unions. This directly implies that the risk arises for open city-states when such mechanisms are not present or not sufficient, which was the case for instance with some city-states worldwide affected by US trade policy uncertainty in 2025.

The previous suggests that within this model, we may have net transmitters: disproportionally generating international uncertainty; neutral nodes: receiving and re-emitting uncertainty without any particular amplification effect; and net receivers: experiencing the greatest effects of foreign uncertainty. Within the world city network, uncertainty spreads in proportion to the directional connectivity of one city to others.

Countries like the United Kingdom or the United States are considered worlds' greatest net transmitters, with their network connectivity concentrated in London and New York. Where uncertainty spillovers (especially in financial markets and international trade) significantly affect small open economies (net receivers) with low economic shock absorption capabilities.

Empirical evidence extends to continental uncertainty spread cases in Asia, where the response of mainland China to shocks in Hong Kong is more intensified than the reverse, defining Hong Kong as a net-transmitter.

Continuing with our examples in Asia, where within the international financial market, net transmitters (e.g., Singapore) spread uncertainty to neutral nodes (e.g. Seoul) and net receivers (e.g. Tokyo). This is caused by the fact that financial markets are commonly centralized in capitals, and the mapping of net creditors to net debtors in terms of Net International Investment Positions. Coming back to Rodrik's Hypothesis, higher involvement and dependence upon international markets will allow for greater volatility flows.

Consequently, under this framework, the world uncertainty presents a downward contagion of uncertainty, where hyper-connected economies and those with large-mass disproportionately spread uncertainty downwards.

Applying this idea to the current spike in world uncertainty (at the country-level), we can refer to such phenomena as Knightian uncertainty—a generalized non-quantifiable risk sparked by geopolitical tensions and trade wars. The tug-of-war between geopolitically active countries that are net transmitters of uncertainty (e.g., Russia, United States), may have caused uncertainty to spill over to other countries following a downward cascading effect.

Conclusion

Everything presented in this paper converges to one structural observation: the world's urbanization and globalization occur simultaneously, and uncertainty follows the architecture defined by cities. These global cities, concentrating international trade, financial markets, and information transmission, became the central nodes where uncertainty flows most frequently. While cities embedded in a large economy are protected by multiple buffers smoothing foreign shocks, city-states and small open economies without such mechanisms are more fragile to international uncertainty. The current polycrisis presents spikes in the WUI, which are diagnoses of these shocks, are worsening expectations for future economic indicators globally. In this way, understanding how uncertainty spreads becomes vital to understanding the resilience of economies in the upcoming years.

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