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# Higher Education Financing and Graduate Labor-Market Outcomes: A Four-Channel Conceptual Framework

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**Abstract:** Higher education financing shapes not only the fiscal sustainability of the tertiary system but also the employment trajectories of graduates. This article offers a conceptual synthesis rather than an empirical test. It develops a four-channel mechanism model that connects four financing channels—public appropriation, cost-sharing, student loans, and industry–academia partnerships—to labor-market outcomes through four mediating mechanisms: resource allocation, field-of-study choice, completion and skill composition, and debt burden. State-led and market-oriented models interact through substitution and complementarity rather than being mutually exclusive: public financing may advance equity but weaken labor-demand responsiveness, while cost-sharing and loans may improve allocative efficiency at the cost of debt-induced distortions in occupational sorting. The paper makes three contributions: it formalizes the framework as four explicit propositions; it differentiates four labor-market outcome dimensions (starting earnings, job–skill match, occupational mobility, job satisfaction); and it derives a theory-grounded indicator set paired with candidate empirical strategies. The framework suggests that financing reform is best understood as a calibrated portfolio rather than a binary state-versus-market choice.

**Keywords:** Higher education financing; Labor-market outcomes; Human capital; Student debt; Field-of-study match; Income-contingent loans; Data-driven governance.

## 1. Introduction

Higher education is a central stage in the formation of human capital, and how universities are financed shapes the quality of instruction, students' decisions, and graduate productivity in the labor force. Financing rules affect not only who enters higher education, but also what students study, how much debt they carry, and what kinds of jobs they are willing or able to accept after graduation. Across high- and middle-income economies alike, the revenue base of universities has shifted away from near-exclusive public appropriation toward a more diversified portfolio that includes tuition fees, student loans, philanthropic and corporate funding, and contract research [1]. This diversification has eased pressure on the public purse while reshaping student incentives in ways that may propagate into the labor market.

Existing scholarship has examined several pieces of this picture in isolation. The political economy of tuition policy and equity in access is well developed [2, 3], as is the historical trajectory of public financing in developing-country contexts [4]. The design of student loan repayment has its own substantial literature [5, 6, 7, 8]. Financing typology and the fiscal-sustainability question are mapped in recent reviews [1, 9], and the institutional stratification effects of financing structures have been documented in the European context [10]. What is comparatively underdeveloped is the connecting tissue: a unified framework that explains how alternative financing arrangements may transmit through specific behavioral and institutional channels to shape graduate employment, job–skill match, occupational mobility, and job satisfaction. Studies tend to focus on one channel at a time—tuition and access, loans and repayment burden, public funding and institutional capacity—rather than on the joint transmission through which financing structure ultimately reaches the labor market.

The present paper addresses this gap by asking: Through which mediating channels do alternative higher education financing models translate into differential labor-market outcomes, and how do these channels substitute for or complement one another? Rather than testing a single causal pathway empirically, the paper synthesizes the comparative-institutional and education-economics literatures into an integrated conceptual framework, illustrated with cross-national policy episodes drawn from Germany, the United States, Australia, China, and Ghana.

The paper makes three contributions. First, it formalizes the framework as four explicit propositions that connect financing structure to labor-market outcomes through resource allocation, field-of-study choice, completion and skill composition, and debt burden, and that distinguish primary mechanisms from secondary interactions among channels. Second, it differentiates four labor-market outcome dimensions—starting earnings, job–skill match, occupational mobility, and job satisfaction—along which financing instruments are theorized to exert systematically distinct effects, thereby moving the analysis beyond a single equity-versus-efficiency axis. Third, it derives a theory-grounded indicator set, paired with candidate empirical strategies, that operationalizes each of the four channels for subsequent empirical testing and for data-driven higher-education governance.

The remainder of the paper is organized as follows. Section 2 develops the conceptual framework, anchored in human capital theory, signaling theory, and behavioral economics, and specifies the methodological approach. Section 3 sets out a four-fold typology of financing models and provides a comparative summary of country cases. Section 4 traces the four mediating channels through which these models map onto labor-market outcomes. Section 5 operationalizes the

framework as an indicator set and a set of candidate empirical strategies. Section 6 discusses the substitutability and complementarity of financing channels. Section 7 concludes with policy implications, limitations, and a research agenda.

# 2. Conceptual Framework

## 2.1. Theoretical Foundations

Three theoretical traditions in the economics of education jointly inform the analysis of how higher education financing shapes labor-market outcomes: human capital theory, signaling and screening theory, and behavioral economics.

Human capital theory. In the Becker–Mincer tradition [11, 12], education raises the productivity of labor by augmenting the knowledge, technical skill, and tacit competence embodied in workers. The financing model shapes the volume and composition of educational inputs available to students. Universities with secure public funding, or with revenue elasticity from tuition, can sustain higher faculty–student ratios, better laboratories, and richer curricula, which the theory expects to raise the post-graduation human capital stock. Long [9] frames this as an equity–efficiency–sustainability trilemma: any financing system must navigate trade-offs among the three objectives, and few real-world arrangements appear to attain all three simultaneously.

Signaling and screening theory. Education does not only produce human capital; it also conveys ability information to the labor market [13]. Financing rules can influence the informational content of the credential by shaping admission thresholds, completion rates, and the prestige of institutions. High tuition without compensating financial aid may exclude high-ability, low-income applicants, compressing the ability distribution within admitted cohorts and thereby weakening the screening value of the degree.

Behavioral economics of education. Financing arrangements affect students' risk preferences, time preferences, and career expectations. Anticipated repayment obligations on student loans can induce debt aversion among risk-averse students [8], potentially distorting field-of-study choice toward high-wage but mismatched occupations and away from socially valuable but lower-paying fields such as basic research, public health, and primary education.

## 2.2. Propositions of the Four-Channel Mechanism Model

Building on these three traditions, the paper formalizes its analytical core as four propositions of the form financing model → mediating channel → labor-market outcome. Together they constitute the four-channel mechanism model represented in Figure 1.

Proposition 1 (resource channel). Financing models influence graduate labor-market outcomes indirectly through institutional resource allocation, by shaping the volume and composition of inputs available for instruction, infrastructure, and research.

Proposition 2 (choice channel). Tuition and loan structures affect field-of-study choice by changing perceived financial risk, expected returns, and debt aversion among prospective students, with consequences for the matching efficiency of the graduate labor market.

Proposition 3 (completion channel). Financing arrangements condition completion rates and skill composition through students' economic security during enrollment and through the breadth–depth balance of curricular delivery.

Proposition 4 (debt channel). Debt burden shapes early-career occupational mobility through repayment pressure, risk tolerance, and reservation wages, with downstream effects on job satisfaction and aggregate reallocation efficiency.

The four labor-market outcome dimensions tracked by these propositions are (a) starting earnings, (b) job–skill match, (c) occupational mobility, and (d) job satisfaction.

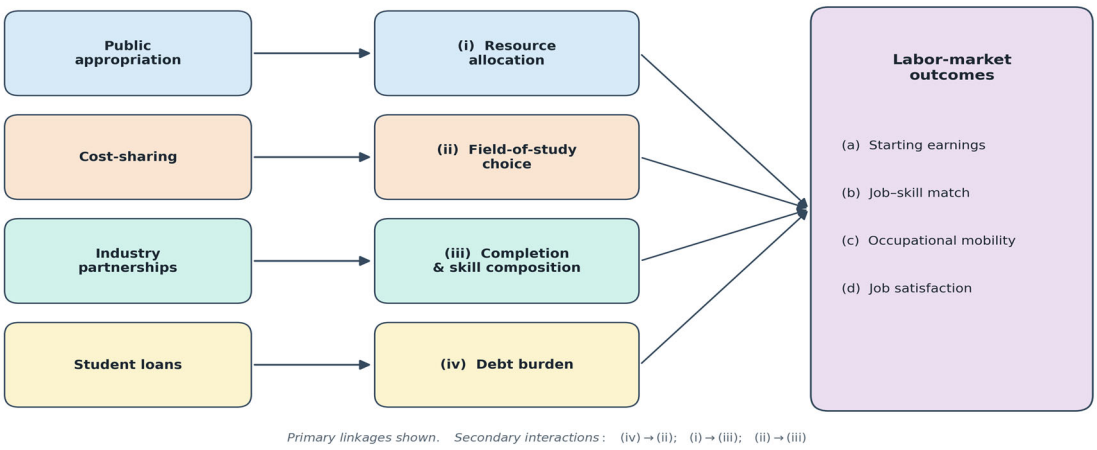


**Figure 1.** Four pathways from financing to graduate outcomes.

Each financing model (left) is depicted as primarily activating one mediating channel (center) that maps onto labor-market outcomes (right); in practice each model also affects other channels (secondary linkages) and the four channels interact with one another. Secondary interactions: (iv)→(ii); (i)→(iii); (ii)→(iii).

The four channels are analytically separable but operationally interdependent: debt burden (Proposition 4) operates in part through field-of-study choice (Proposition 2); resource allocation (Proposition 1) conditions completion and skill composition (Proposition 3); and major choice (Proposition 2) feeds forward into the skill composition with which students leave the system (Proposition 3). The one-to-one linkages shown in Figure 1 should therefore be read as primary channels, not as exclusive ones; this compound structure is taken up again in Section 6.

## 2.3. Methodological Approach

The paper adopts a conceptual synthesis approach combining narrative literature review with comparative-institutional case analysis. Rather than a systematic review or meta-analysis, it uses a structured narrative synthesis to identify recurring mechanism-level pathways across financing models and institutional contexts that can be formalized into testable propositions. Web of Science Core Collection, Scopus, and ScienceDirect served as the primary structured databases, with Google Scholar used as a supplementary tool for citation tracing and robustness checks, given the limited reproducibility of its search rankings. The search covered empirical and review studies published between 2000 and early 2026, including online-first articles assigned to 2026 issues, while foundational theoretical works (Becker, Mincer, Spence) were included regardless of publication date to anchor the framework. Search terms combined "higher education financing," "tuition policy," "student loans," "income-contingent loans," "graduate labor-market outcomes," "field-of-study choice," "educational mismatch," and "human capital" with country-specific qualifiers (e.g., "HECS Australia," "student loans China," "German dual system").

Studies were included if they were peer-reviewed work in education economics, public finance, comparative higher education, or labor-market research that explicitly connected financing instruments to institutional behavior, student choice, or graduate outcomes, and were published in English; opinion pieces and editorials without theoretical or empirical contribution, studies confined to K–12 financing, and single-institution descriptive studies without comparative or mechanism-level analysis were excluded. The structured searches returned approximately 240 records; after de-duplication and title/abstract screening against these criteria, 38 records were retained for full-text reading. Of these, 10 form the core comparative-institutional citations; five foundational theoretical works (Becker, Mincer, Spence, Rothstein & Rouse, McGuinness) anchor the framework; eleven bridging studies cover student debt and entrepreneurship/mobility, tuition and major choice, educational mismatch and well-being, industry–university partnership, and administrative-data governance; and one official policy document supports the Australian HECS/HELP threshold data—yielding a final set of 27 references.

Country cases were chosen for maximum variation on financing configuration rather than for empirical comparability. Germany represents the public-appropriation model augmented by structured industry partnerships through the dual training system [14]; the United States exemplifies tuition-driven cost-sharing under sustained fiscal austerity; Australia is the canonical case of income-contingent loan design; China represents a transitional hybrid in which public appropriation, tuition cost-sharing, mortgage-style loans, and industry partnership coexist, with a shift toward income-contingent design proposed but not yet adopted [6]; and Ghana illustrates the constraints under which public financing operates in low-income postcolonial settings. Together these cases span high-, middle-, and low-income contexts and the four prototypical configurations developed in Section 3. Two scope conditions bound the analysis: it is a theoretical synthesis rather than an empirical estimation, so causal claims are made at the level of mechanism rather than identified effect; and the four mediating channels are analytically separable but operationally interdependent, a feature made explicit in Figure 1.

# 3. A Typology of Higher Education Financing Models

## 3.1. The Public Appropriation Model

The public appropriation model finances higher education primarily through general taxation and state budgetary allocation, typically combined with low or zero tuition. Germany, France, and the Nordic countries are paradigmatic; many developing countries adopted the same structure during the early stages of tertiary expansion. A historical review of Ghana's postcolonial higher education system suggests that public financing played a major role in expanding enrollment in low-income contexts [4]. Under this model, public budgets cover faculty salaries, capital investment, research, and recurrent operating costs, while the private cost to students approaches zero.

The advantages of public financing are threefold. First, low fees may reduce family financial burdens and equalize access across income groups. Second, stable public outlays can sustain investments in basic disciplines and long-horizon research—activities with high social but low private returns that the market alone tends to under-provide. Third, public financing can be aligned with national strategic priorities by directing resources to specific regions, disciplines, or under-represented groups.

The model's limitations are also well noted. Because budgetary allocations are typically determined by historical baselines or political negotiation rather than by performance or labor-market demand, the alignment between funding flows and the skill composition required by the economy is often weak. Universities under tight fiscal discipline lack autonomy and price-based incentives to adjust their program portfolios, which can lead to ossified curricula and slow responsiveness to industrial change. Czarnecki and Sauer [10] further suggest that financing structures in European higher education are a central determinant of organizational stratification between institutions—resources do not merely scale aggregate output but reshape the hierarchical structure of the sector.

## 3.2. The Tuition-Fee and Cost-Sharing Model

In the cost-sharing model, students and their families bear a substantial share of the cost of instruction. The United States, Japan, and Australia are leading exemplars. Nations [2] documents how austerity politics drove successive tuition increases at the University of California and the City University of New York, illustrating the political-economic logic behind the marketization of public higher education. The normative justification appeals to the "benefit principle": because higher education yields substantial private returns, beneficiaries should bear a proportionate share of the cost.

Cost-sharing has two principal advantages. It diversifies and expands university revenue, and it sharpens institutional incentives to align program offerings with labor demand. The disadvantages mirror these strengths. Tuition charges may widen income-based gaps in access, particularly when financial aid is means-insensitive, and they may intensify academic and labor-market pressure on students from lower-income backgrounds. Public support for tuition reform is itself shaped by information provision and the framing of policy design, as Busemeyer and colleagues [3] suggest in a

European survey-experimental setting, indicating that the political feasibility of cost-sharing depends as much on institutional communication as on objective parameters.

### 3.3. Student Loans and Scholarships

Loan financing typically operates in conjunction with cost-sharing. Three primary instruments are deployed: subsidized loans from government or banking partners, income-contingent loans (ICLs) repaid as a proportion of post-graduation earnings (e.g., Australia's HECS), and need- or merit-based scholarships and grants. Chapman and Doan [5] survey the central design questions in this literature and argue that mechanism design—particularly the choice between mortgage-style and income-contingent repayment—is central to the equity–efficiency trade-off.

The core function of student loans is to relax liquidity constraints at the point of enrollment by deferring payment. A well-designed loan scheme can enable cost-sharing without compromising access. However, excessive or rigidly structured debt may induce debt aversion, particularly among risk-averse students [8], thereby potentially distorting field-of-study choice and post-graduation occupational sorting [7]. In the Chinese case, Cai, Chapman, and Wang [6] report that mortgage-style student loans appear to impose substantial repayment burdens during the early career years and recommend a transition to income-contingent design—a finding that links loan architecture to the labor-market mechanisms developed in Section 4.

### 3.4. Industry–Academia Partnership and Social Capital Financing

Financing through corporate donations, joint laboratories, sponsored chairs, and targeted talent programs has expanded rapidly in countries such as China and Germany. Firms supply funding, equipment, or training placements in exchange for preferential recruitment or co-designed curricula. As Fang and Liu [15] argue in a retrospective and prospective review of higher education financing in China, the diversification of revenue sources—including industry partnerships—is a defining direction of the next phase of reform. The wider literature on university–industry collaboration similarly identifies both opportunities and tensions in this hybrid mode of financing [16].

The principal advantage of this model is its proximity to labor demand: training content can be calibrated to specific industrial needs, narrowing the school-to-work transition gap. The principal risk is over-specialization. When corporate sponsors heavily influence curricular emphasis, general education and theoretical breadth can be crowded out, leaving graduates well-fitted to current jobs but potentially ill-equipped for technological transitions and lifelong adaptation.

### 3.5. A Comparative Summary of Country Cases

Table 1 summarizes how the country cases referenced in this paper map onto the typology. The cases are selected for theoretical variation rather than statistical comparability; they serve to illustrate how different financing configurations activate different mediating channels, not to estimate country-level effects. The "theorized implication" column reports patterns derived from the propositions of the framework rather than empirical estimates.

**Table 1.** Comparative summary of country cases (illustrative, not estimative).

| Country | Financing configuration | Primary channel(s) activated | Theorized labor-market implication | Main limitation |
|---|---|---|---|---|
| Germany | Public appropriation + structured industry partnership (dual training) [14] | Resource allocation; skill composition | Theorized: relatively smooth school-to-work transition; emphasis on applied skills | Stratification across academic and dual-study tracks |
| United States | Tuition-driven cost-sharing + mortgage-style loans | Debt burden; field-of-study choice | Theorized: horizontal mismatch and debt-induced lock-in pressures | Access inequality; elevated default risk |
| Australia | Cost-sharing + income-contingent loans (HECS) | Debt burden (attenuated) | Theorized: attenuated debt-driven sorting; sustained entry into public-interest fields | Sensitivity to repayment-threshold parameters |
| China | Hybrid: public + tuition + mortgage-style loan + industry partnership | Multiple channels; mortgage-style loan design | Theorized: persistent debt-driven sorting under mortgage design; reform-sensitive | ICL proposed as reform option, not yet adopted |
| Ghana | Public appropriation under fiscal stress | Resource allocation (binding constraint) | Theorized: constrained human-capital formation | Chronic budgetary pressure |

## 4. Mediating Channels from Financing to Labor-Market Outcomes

### 4.1. Resource Allocation and Human Capital Accumulation (Proposition 1)

The financing model first shapes the volume and composition of resources at the disposal of universities. Stable revenue—whether from public appropriation, tuition, or industry partnerships—supports faculty recruitment, physical and digital infrastructure, instructional delivery, and research activity, all of which can shape the human capital that students accumulate [11, 12].

The structure of investment matters as much as its level. Financing systems that concentrate resources in research-intensive universities at the expense of applied-technology colleges may generate skill shortages and structural unemployment, even while producing high per-graduate

research output. Conversely, financing systems oriented exclusively toward short-cycle vocational training may raise first-job placement rates while leaving graduates with thin foundations in critical thinking and learning capacity—deficits that can depress long-run wage growth and adaptability.

Where public funding is insufficient and tuition cannot expand, universities may resort to large class sizes, aging laboratory equipment, and heavy reliance on part-time instructors, with likely consequences for skill formation. The framework predicts that the labor-market signature of such resource shortfalls is slower on-the-job learning, longer firm-side training, and weaker early-career wage trajectories.

## 4.2. Field-of-Study Choice and Matching Efficiency (Proposition 2)

Financing arrangements shape institutional and field-of-study choice, and thereby the matching efficiency of the graduate labor market. As Hassani Nezhad and colleagues [17] suggest, financing structures are associated with the educational aspirations of adolescents and their parents, which in turn shape field-of-study decisions. Information experiments on belief updating about expected earnings [18] and structural estimates of how expected returns and ability beliefs jointly determine major choice [19, 20] reinforce this transmission.

Drawing on the labor-economics literature on educational mismatch [21], three forms of mismatch are useful to distinguish. Vertical mismatch occurs when graduates' attained level of education exceeds or falls short of the level required by the jobs they occupy; horizontal mismatch occurs when the field of study and the content of the job are misaligned, even at the correct level; and preference mismatch occurs when graduates accept jobs that match their training but conflict with their preferences and interests because alternative careers are foreclosed by financial constraint. Financing structure can affect all three.

High tuition reframes higher education as an investment decision, drawing student attention toward expected pecuniary returns. A plausible consequence is a stronger concentration of student demand in business, finance, and computing fields and weaker uptake of the humanities, basic sciences, and teacher education. Market-driven sorting of this kind can generate horizontal mismatch: oversupply in some fields and undersupply in others (notably nursing, early-childhood education, and basic research) relative to social need.

Where public financing dominates and tuition is low, family-income constraints exert weaker pressure on major choice, and student distribution across fields tends to be more dispersed. The corresponding risk is the absence of price signals to discipline program portfolios at the university level, so that obsolete majors may persist long after labor demand has shifted, generating horizontal or skill mismatch of a different kind—graduates trained for occupations no longer in demand are pushed into unrelated work.

Loan financing introduces preference mismatch. Debt-averse students may avoid lower-paying fields with high social value (social work, primary education, charitable sectors) in favor of higher-paying occupations that are poorly matched to their preferences and aptitudes [7, 8]. The medium-run consequences may include reduced job satisfaction, higher turnover, and depressed productivity—linkages documented in the literature on educational mismatch and worker well-being [22, 23].

## 4.3. Completion Rates, Skill Composition, and Employability (Proposition 3)

Financing channels shape students' economic security during enrollment, the time they can allocate to study, and consequently their completion rates and the breadth of skills with which they leave. Under regimes of high tuition combined with thin scholarship provision, financially constrained students may substitute paid work for study time, depressing academic performance and raising the probability of non-completion [20]. The labor-market penalty for non-completion is non-trivial: even where dropouts have acquired some marketable skills, employers may interpret completion itself as a signal of persistence and reliability [13].

Well-designed scholarship and work-study programs can convert students' financial need into structured early-career experience—on-campus research assistance, professionally relevant part-time placements, internships—thereby building both human capital and professional networks. Germany's dual-study tertiary system offers an institutional template in which university study and structured firm-based employment are integrated, producing graduates with industry-validated competencies and pre-existing employer relationships [14].

Financing structure also conditions the breadth–depth balance in curricula. Industry-partnered programs tend toward depth in immediately deployable skills; publicly financed programs more readily accommodate general education and interdisciplinary breadth. The labor-market trade-off mirrors this distinction: depth-oriented graduates may capture higher initial wages, whereas breadth-oriented graduates may exhibit greater resilience to occupational change and technological displacement.

## 4.4. Debt Burden, Reservation Wages, and Occupational Mobility (Proposition 4)

The level and repayment structure of student debt is among the more consequential channels linking financing to labor-market behavior, operating through three distinct mechanisms summarized in Table 2.

**Table 2.** Debt mechanisms and labor-market consequences.

| Debt mechanism | Behavioral response | Labor-market consequence |
|---|---|---|
| High repayment pressure | Higher reservation wage | High-wage occupational sorting |
| Early-career debt burden | Lower risk tolerance | Reduced entrepreneurship and mobility |
| Income uncertainty | Debt aversion at field-of-study choice | Avoidance of public-interest careers |

First, starting wages. Indebted graduates may raise their reservation wages to meet repayment obligations, accepting higher-paid jobs even when these are poorly matched to their training or offer limited career development. The aggregate effect, if widespread, may be to compress the apparent wage discount for lower-paid but socially valued occupations, potentially distorting the price signals that ordinarily allocate

labor across sectors.

Second, occupational mobility. High debt may suppress risk-bearing in the early career. Indebted graduates appear less likely to enter entrepreneurship, freelance work, or small-firm employment, and less likely to undertake unpaid internships, graduate study, or career-switching transitions—even when these choices would raise long-run productivity. This can be understood as a debt-induced lock-in effect, originally documented in U.S. evidence linking student debt to constrained early-career occupational choice [7], and further documented for entrepreneurship [24] and household-formation decisions [25], with parallel experimental evidence from elite professional programs [8]. The aggregate consequence may be a reduction in both individual welfare and reallocation efficiency.

Third, expectations and satisfaction. The presence of debt raises wage expectations for the first post-graduation job. When realized earnings fall short of these expectations, indebted graduates may report lower job satisfaction and well-being than otherwise comparable non-indebted peers [22, 23], with downstream consequences for absenteeism, turnover, and productivity.

Loan architecture mediates the severity of these effects. Australia's Higher Education Contribution Scheme (HECS/HELP) illustrates how income-contingent design can attenuate debt-induced distortions. Under the 2024–25 HELP schedule, compulsory repayments began once repayment income reached AUD 54,435, with progressive rates applied to total income. From 2025–26, Australia raised the minimum threshold to AUD 67,000 and moved to a marginal design in which repayments are calculated only on income above the threshold [26]. The implicit insurance against weak labor-market outcomes embedded in income-contingent repayment may reduce debt aversion at the point of field-of-study choice and weaken the lock-in effect after graduation. From a design-theoretic perspective, ICL schemes are expected to weaken debt-driven sorting away from low-wage public-interest occupations by insuring graduates against low early-career earnings—a logic developed in the design discussion of Chapman and Doan [5] and applied to the Chinese context by Cai, Chapman, and Wang [6].

# 5. Operationalizing the Framework for Empirical Testing

A central contribution of the paper is to translate the four propositions of Section 2.2 into an indicator architecture that can support empirical testing and policy monitoring. Table 3 maps each channel to its underlying concept, candidate indicators, plausible data sources, the labor-market outcome dimension theorized to be tracked by the channel, and the candidate empirical strategy. The indicators and strategies are intended as guidance for empirical operationalization rather than as exhaustive lists; for any given research question, additional measures (e.g., regional financing variation, institutional autonomy indices, sectoral wage differentials) and identification designs may be appropriate.

**Table 3.** Operational indicators and candidate empirical strategies for the four-channel framework.

| Channel | Underlying concept | Indicator(s) | Candidate data source | Expected outcome | Possible empirical strategy |
|---|---|---|---|---|---|
| (i) Resource allocation (P1) | Investment intensity in human-capital formation | Per-student public appropriation; faculty-to-student ratio; instructional expenditure per FTE | National HE statistics; OECD Education at a Glance; UNESCO UIS | Starting earnings; job–skill match | Panel fixed-effects estimation; funding-shock or event-study design |
| (ii) Field-of-study choice (P2) | Sensitivity of major composition to financial structure | Field-level enrollment elasticity to tuition / aid; major distribution by SES and financial-aid status | National admissions records; cohort enrollment surveys | Horizontal mismatch; occupational sorting | Tuition / aid elasticity model; cohort-level discrete-choice estimation |
| (iii) Completion & skill composition (P3) | Persistence and breadth–depth balance of acquired skills | Completion rates by financial-aid status; longitudinal skill-composition profiles; share of work-study participation | Graduate-tracking systems; longitudinal student records; employer skill audits | Job–skill match; occupational mobility | Longitudinal student fixed-effects models; aid-status comparison; survival analysis of dropout |
| (iv) Debt burden (P4) | Debt and repayment exposure of graduates | Debt-to-income ratios; ICL participation rates; repayment-burden distribution; default rates | Loan-administration data; tax-linked income records; HILDA, NLSY97, CFPS / CGSS | Occupational mobility; job satisfaction | Income-linked administrative-data analysis; repayment-threshold RDD / regression-kink design (depending on repayment-rule structure) |

The indicator architecture has three practical uses. First, it supplies a common measurement vocabulary that allows comparative-institutional studies to test the same propositions across financing regimes. Second, it identifies the administrative-data infrastructure required to move from input-based to outcome-based financing governance, including the linkage of admissions records, financial-aid data, completion data, loan-administration data, and tax-linked income data into a graduate-trajectory data system [27]. Third, the pairing of indicators with candidate empirical strategies makes the framework readily testable: each proposition is paired with at least one identification design that can credibly recover its core mechanism, providing a roadmap for follow-up empirical work.

## 6. Substitutability and Complementarity across Financing Channels

The four financing models are best understood not as mutually exclusive alternatives but as components of a portfolio whose elements substitute for and complement one another along the four mediating channels. Table 4 summarizes their comparative strengths, risks, policy uses, and the key conditions or moderators under which these effects are likely to obtain.

**Table 4.** Comparative effects of financing channels.

| Financing model | Main strength | Main risk | Best policy use | Conditions / moderators |
|---|---|---|---|---|
| Public appropriation | Equity and broad human capital | Weak labor-market responsiveness | Basic disciplines and disadvantaged students | Governance capacity; budget stability; institutional autonomy |
| Cost-sharing | Revenue diversification and demand response | Access inequality | Programs with high private returns | Aid generosity; income-contingent safety net; price elasticity |
| Student loans | Liquidity support | Debt-induced sorting | Income-contingent repayment | Loan architecture (mortgage vs. ICL); collection capacity |
| Industry partnership | School-to-work alignment | Over-specialization | Applied and technical fields | Curricular sovereignty; industry concentration; general-education buffer |

Public appropriation is the primary channel for advancing equity in access and sustaining socially valuable but privately unrewarded activities (basic research, teacher education, public-interest occupations). Its weakness lies in dynamic responsiveness: budgetary allocation tends to be sluggish in tracking labor demand and provides weak incentives for curricular reform.

Cost-sharing is the primary channel for aligning program portfolios with labor demand and for diversifying institutional revenue, but it tends to propagate income-based access gaps and politicizes tuition policy, as the U.S. experience [2] and European public-opinion evidence [3] both suggest.

Student loans are the primary channel for relaxing liquidity constraints, but their downstream effects on field-of-study choice and occupational mobility are sensitive to architecture: mortgage-style designs appear to produce sharper distortions than income-contingent designs [5, 6, 7, 8].

Industry partnerships are the primary channel for school-to-work alignment, but they tend to narrow the skill base and place curricular sovereignty partly outside the university [15, 16].

The four channels also interact, as Figure 1 indicates. Debt burden (Proposition 4) operates partly through field-of-study choice (Proposition 2); resource allocation (Proposition 1) shapes completion and skill composition (Proposition 3); and major choice (Proposition 2) recursively conditions the skill composition that graduates eventually carry into the labor market. The framework therefore identifies four analytically separable transmission paths whose empirical effects are likely to compound rather than add.

A balanced portfolio internalizes these trade-offs. Public financing can anchor the system, particularly for basic disciplines and equitable access; tuition can be calibrated to capture private benefits where they accrue; income-contingent loans can extend access without imposing rigid debt obligations; and industry partnerships can be deployed selectively in applied fields without displacing general education.

## 7. Conclusion, Limitations, and Policy Implications

Higher education financing is not merely a fiscal question; it is a key institutional condition shaping human-capital production, student behavior, and labor-market performance. This paper has advanced three claims. First, financing models transmit to labor-market outcomes through four identifiable channels—formalized as Propositions 1–4—and shape starting earnings, job–skill match, occupational mobility, and job satisfaction along these channels. Second, the four prototypical financing models stand in a relationship of substitutability and complementarity rather than strict opposition: public appropriation tends to strengthen equity and to support general-purpose human capital but may weaken market responsiveness; cost-sharing and loans tend to strengthen efficiency and private investment but risk access inequities and debt-driven sorting; and industry partnerships tend to strengthen school-to-work alignment but may narrow skill breadth. Third, higher education financing reform should move beyond the state-versus-market dichotomy toward a diversified, channel-balanced portfolio, from which three operational principles follow.

The first principle is that public funding should protect access and basic disciplines. Public appropriation can be reserved for activities with high social but low private returns—basic research, teacher education, and public-interest occupations—and for safeguarding access for students from disadvantaged backgrounds. Withdrawing public funding from these activities on the assumption that tuition or industry partnership can substitute for it is likely to systematically under-produce socially valuable human capital. The second principle is that tuition and loan instruments should be tied to graduate income risk, because loan architecture appears to matter as much as loan availability. Income-contingent designs that index repayment to realized earnings, with progressive marginal rates above a statutory threshold, are expected to attenuate the debt-induced distortions on field-of-study choice, occupational mobility, and job satisfaction that mortgage-style designs may amplify; reform of student-loan systems in middle-income

economies—China most prominently [6]—could center on the migration from mortgage-style to income-contingent design. The third principle is that industry partnerships should be balanced by general education: industry funding can substantially improve school-to-work alignment in applied fields, but its scope should not be allowed to crowd out general education, theoretical breadth, or basic-research training. The German dual-study tertiary model offers an institutional template in which industry funding is structurally embedded but does not dictate the academic core curriculum [14].

Beyond these principles, the indicator architecture of Section 5 provides a basis for data-driven higher-education governance, linking upstream financing decisions to downstream employment outcomes and supporting the transition from input-based to outcome-based financing oversight. As university systems increasingly invest in administrative-data infrastructure and longitudinal student records [27], the four-channel framework offers a theory-grounded organizing principle for what such systems should measure and why.

This framework has several limitations. It is based on a structured narrative synthesis rather than a systematic review or meta-analysis. The country cases are illustrative rather than causally identified comparisons; English-language coverage limits the inclusion of relevant non-English work; and effect sizes from the empirical literature are cited illustratively rather than pooled. Future research can test the propositions using longitudinal graduate-level data—HILDA in Australia, NLSY97 in the United States, CFPS or CGSS in China—and exploit policy variation in tuition, financial aid, and repayment rules to identify channel-specific mechanisms. Such evidence will provide more targeted guidance for higher-education financing reform in both high- and middle-income economies.

# References


[1] Dmitrienko, A. (2023). Review of higher education financing models: Funding mechanisms and the role of the state. Public Administration Issues, (2), 146-171. https://doi.org/10.17323/1999-5431-2023-0-2-146-171

[2] Nations, J. M. (2021). How austerity politics led to tuition charges at the University of California and City University of New York. History of Education Quarterly, 61(3), 273-296. https://doi.org/10.1017/HEQ.2021.4

[3] Busemeyer, M. R., Schönhage, L. N., & Schwerdt, G. (2026). Who supports tuition fees? How information provision and policy design shapes public preferences for higher education financing. Journal of European Social Policy, 36(1), 67-83. https://doi.org/10.1177/09589287251345917

[4] Anderson, B. A. E. (2025). From the Garden of Eden to the bachelor's cemetery: A historical overview of higher education financing in postcolonial Ghana. Third World Quarterly, 46(7), 813-832. https://doi.org/10.1080/01436597.2025.2500578

[5] Chapman, B., & Doan, D. (2019). Introduction to the special issue "higher education financing: Student loans." Economics of Education Review, 71, 1-6. https://doi.org/10.1016/j.econedurev.2019.04.001

[6] Cai, Y., Chapman, B., & Wang, Q. (2019). Repayment burdens of mortgage-style student loans in China and steps toward income-contingent loans. Economics of Education Review, 71, 95-108. https://doi.org/10.1016/j.econedurev.2018.10.006

[7] Rothstein, J., & Rouse, C. E. (2011). Constrained after college: Student loans and early-career occupational choices. Journal of Public Economics, 95(1-2), 149-163. https://doi.org/10.1016/j.jpubeco.2010.09.015

[8] Field, E. (2009). Educational debt burden and career choice: Evidence from a financial aid experiment at NYU Law School. American Economic Journal: Applied Economics, 1(1), 1-21. https://doi.org/10.1257/app.1.1.1

[9] Long, V. N. (2019). Financing higher education in an imperfect world. Economics of Education Review, 71, 23-31. https://doi.org/10.1016/j.econedurev.2018.06.004

[10] Czarnecki, K., & Sauer, P. (2025). The financial dimension of organizational stratification in European higher education. International Journal of Comparative Sociology, 66(1), 3-24. https://doi.org/10.1177/00207152241233476

[11] Becker, G. S. (1964). Human capital: A theoretical and empirical analysis, with special reference to education. National Bureau of Economic Research/Columbia University Press.

[12] Mincer, J. (1974). Schooling, experience, and earnings. National Bureau of Economic Research/Columbia University Press.

[13] Spence, M. (1973). Job market signaling. Quarterly Journal of Economics, 87(3), 355-374. https://doi.org/10.2307/1882010

[14] Graf, L. (2013). The hybridization of vocational training and higher education in Austria, Germany, and Switzerland. Budrich UniPress. https://doi.org/10.3224/86388043

[15] Fang, F., & Liu, Z. (2023). Higher education financing in China: Retrospect and prospect. Taylor and Francis. https://doi.org/10.4324/9781003406815

[16] Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university–industry relations. Research Policy, 42(2), 423-442. https://doi.org/10.1016/j.respol.2012.09.007

[17] Hassani Nezhad, L., Anderberg, D., Chevalier, A., Lührmann, M., & Pavan, R. (2021). Higher education financing and the educational aspirations of teenagers and their parents. Economics of Education Review, 85, 102175. https://doi.org/10.1016/j.econedurev.2021.102175

[18] Wiswall, M., & Zafar, B. (2015). Determinants of college major choice: Identification using an information experiment. Review of Economic Studies, 82(2), 791-824. https://doi.org/10.1093/restud/rdu044

[19] Beffy, M., Fougère, D., & Maurel, A. (2012). Choosing the field of study in postsecondary education: Do expected earnings matter? Review of Economics and Statistics, 94(1), 334-347. https://doi.org/10.1162/REST_a_00212

[20] Stinebrickner, R., & Stinebrickner, T. R. (2014). A major in science? Initial beliefs and final outcomes for college major and dropout. Review of Economic Studies, 81(1), 426-472. https://doi.org/10.1093/restud/rdt025

[21] McGuinness, S. (2006). Overeducation in the labour market. Journal of Economic Surveys, 20(3), 387-418. https://doi.org/10.1111/j.0950-0804.2006.00284.x

[22] Allen, J., & Van der Velden, R. (2001). Educational mismatches versus skill mismatches: Effects on wages, job satisfaction, and on-the-job search. Oxford Economic Papers, 53(3), 434-452. https://doi.org/10.1093/oep/53.3.434

[23] Verhaest, D., & Omey, E. (2009). Objective over-education and worker well-being: A shadow price approach. Journal of Economic Psychology, 30(3), 469-481. https://doi.org/10.1016/j.joep.2008.06.003

[24] Krishnan, K., & Wang, P. (2019). The cost of financing education: Can student debt hinder entrepreneurship? Management Science, 65(10), 4522-4554. https://doi.org/10.1287/mnsc.2017.2995

[25] Mezza, A. A., Ringo, D. R., Sherlund, S. M., & Sommer, K. (2020). Student loans and homeownership. Journal of Labor Economics, 38(1), 215-260. https://doi.org/10.1086/704609

[26] Australian Taxation Office. (2025). Study and training support loans: Compulsory repayment thresholds and rates, 2024–25 and 2025–26. Australian Government. Retrieved June 3, 2026, from https://www.ato.gov.au/individuals-and-families/study-and-training-support-loans

[27] Connelly, R., Playford, C. J., Gayle, V., & Dibben, C. (2016). The role of administrative data in the big data revolution in social science research. Social Science Research, 59, 1-12. https://doi.org/10.1016/j.ssresearch.2016.04.015