

Swiss Leading House VPET-ECON

A Research Center on the Economics of Education, Firm Behavior and Training Policies

Curriculum Updates in the Swiss Dual VET System and Their Implications for Technology Diffusion, Innovation, and the Labor Market

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Three Key Elements for the Contribution of Dual VET to Innovation

Curriculum design process

- Systematic curriculum updates
- Creation of new occupations and removal of outdated ones
- Participation of all relevant stakeholders

Occupational skill mix

- Broad set of general and innovation-enabling skills
- Preparation for various labor market options
- Permeable education system

Connection to applied research

- Combination of vocational and applied research skills at tertiary level
- Innovation activities of Universities of Applied Sciences

Based on Backes-Gellner & Lehnert (2021; 2023a; 2023b; 2025); Backes-Gellner & Pfister, 2019

Characteristics of Dual VET Programs in Switzerland

- Typically after compulsory school at age 15-16
- About two-thirds of a cohort choose dual VET in one of about 230 occupations
- Duration of 3-4 years (depending on VET occupation)
- “Dual”: combination of
 1. apprenticeship training at a firm (about three-quarters of the time) and
 2. classroom education at a vocational school (about one-quarter of the time)

→ **Both parts follow occupation-specific curricula**
- To get an apprenticeship position, adolescents have to apply to firms (just as for regular employment positions)
- Apprentices earn an apprentice pay
- Attractive option for adolescents due to good labor market prospects and several tertiary-level educational career options after graduation

Based on FSO, 2025; SCCRE, 2023; SERI, 2026

Do VET Curriculum Updates Foster Technology Diffusion?

Empirical Study by Schultheiss & Backes-Gellner (2024)

Methodology

Historical VET curriculum texts as data to study the **implementation of three new technologies** into Swiss VET curricula in the late 1990s/early 2000s: CAD, CNC, and desktop publishing

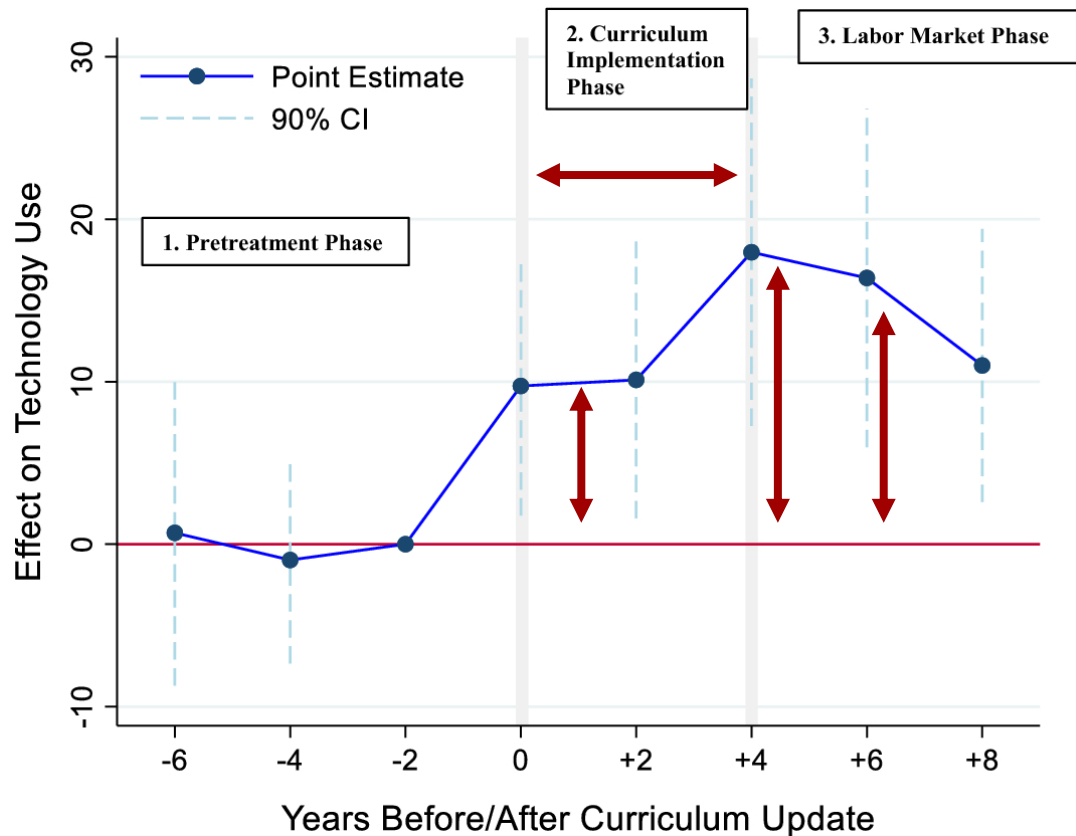
Historical job ad texts as data to measure **technology adoption by firms** (i.e., mentioning the respective technology in job ads)

Event study design to precisely assess **timing of impacts**

Patenting activities related to the respective technology to **account for general trend** in technology diffusion

Do VET Curriculum Updates Foster Technology Diffusion?

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Main findings

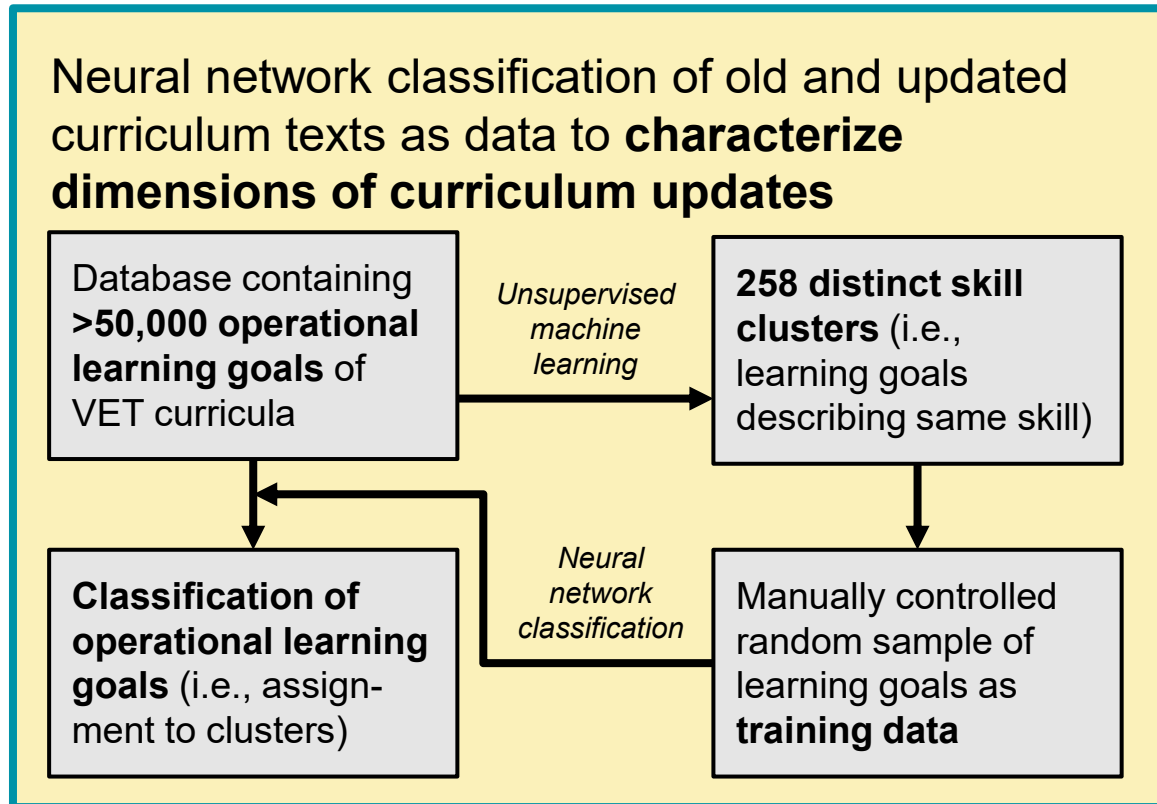
- Curriculum updates accelerate technology adoption compared to the general trend
- Effect sets in immediately after implementation, i.e., before first graduates enter the labor market
- Substantial part of effect comes from mainstream firms (SMEs without R&D)
- Findings are consistent with prior empirical evidence (e.g., Backes-Gellner, 1996; Rupiotta & Backes-Gellner, 2019)

Source: Schultheiss & Backes-Gellner (2024), p. 209; arrows added for visualization

How Do VET Curriculum Updates Relate to Graduates' Wages?

Empirical Study by Buehler, Lehnert, & Backes-Gellner (2024)

Methodology



Application to example occupation:
 Mechanical engineer

Skill	Control Technology	Chemistry	Micro-/ Nano-technology	Skills 5-40	Sum
Old curriculum	8.3%	7.8%	0.0%	...	100%
Updated curriculum	7.7%	0.0%	2.7%	...	100%
Novelty rate	0.0%	0.0%	2.7%	...	14.0%
Removal rate	0.0%	7.8%	0.0%	...	17.3%

Table: Based on Buehler et al. (2024), p. 464
 Figure: Based on Buehler et al. (2024), p. 477

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Methodology

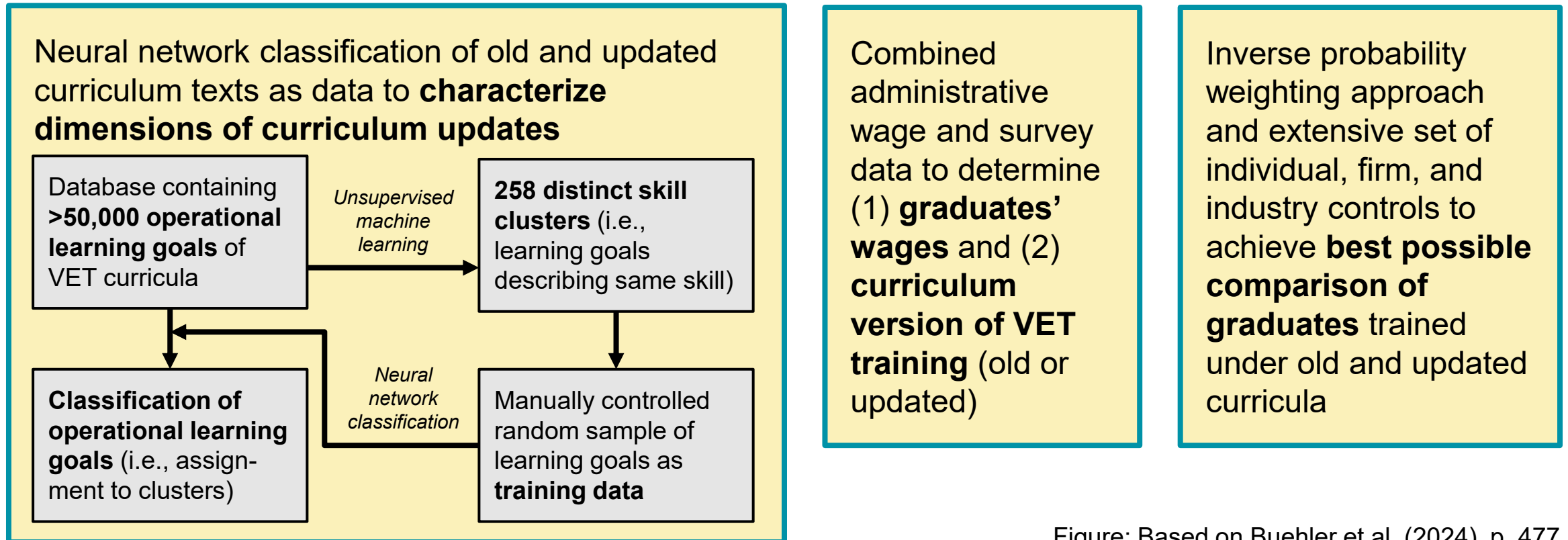
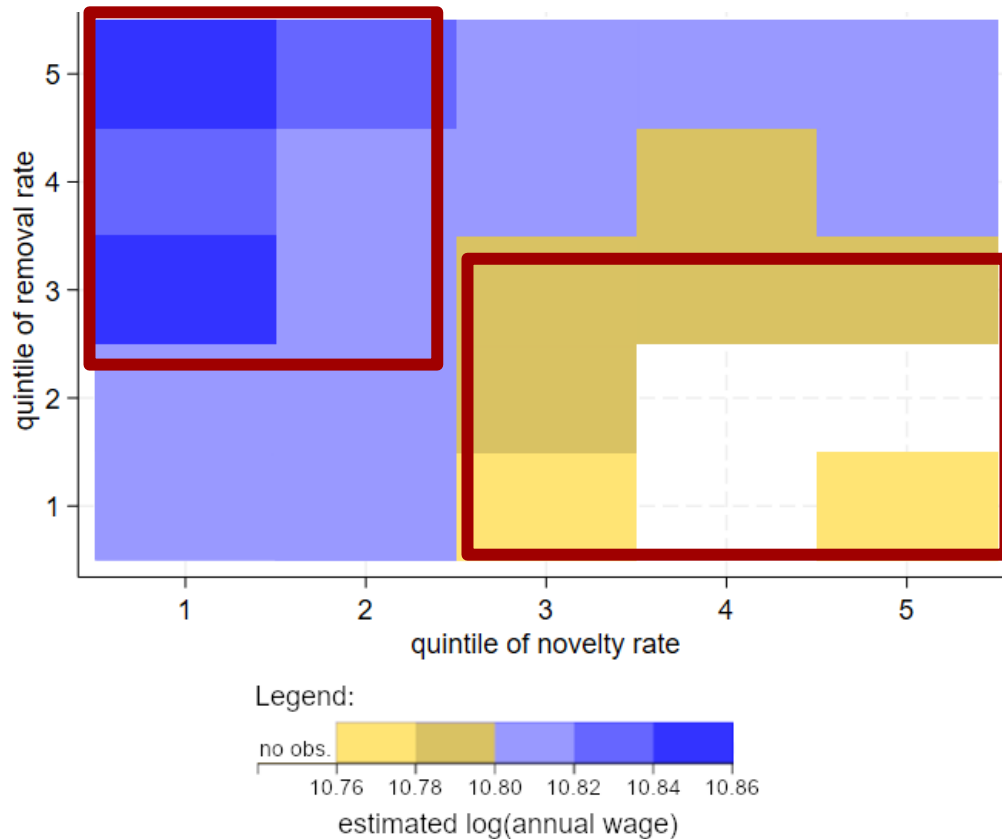


Figure: Based on Buehler et al. (2024), p. 477

How Do VET Curriculum Updates Relate to Graduates' Wages?

Empirical Study by Buehler, Lehnert, & Backes-Gellner (2024)



Main findings

- Updates with high removal rate and low novelty rate associated with higher wages
- Updates with low removal rate and high novelty rate associated with lower wages
- Updates that rigorously remove outdated skills and add only relevant skills are more beneficial
- Potential implications for innovation effect of VET curriculum updates

Source: Buehler et al. (2024), p. 468; rectangles added for visualization

Necessary Preconditions for Impacts of VET Curriculum Updates

1 VET curricula must be nationally defined and binding

- ✓ Ensures that all firms (independent of size and own innovation activities) teach the same skills and that all students possess the same skills upon graduation
- ✓ Frontier training firms can thus integrate VET students into modern work processes while mainstream firms are obliged to acquire those processes
- ✓ In Switzerland, VET is regulated in federal laws and student assessments are organized by organizations of work

Based on Backes-Gellner & Pfister (2019)

Necessary Preconditions for Impacts of VET Curriculum Updates

2 VET curricula must be systematically updated

- ✓ Ensures that recent technological developments become part of VET programs and thus spread among all firms, with benefits for both firms and individuals (e.g., Buehler et al., 2024; Rupietta & Backes-Gellner, 2019; Rupietta et al., 2021)
- ✓ Updates may include:
 - Adding novel and removing outdated contents in existing occupations
 - merging occupations that have become similar due to technological developments
 - creating new occupations
- ✓ Mandatory reviews of VET curricula at least every five years to initiate updates

Five phases of curriculum updating process

- 1) Analyzing qualification profiles and learning goals under consideration of current developments
- 2) Developing/revising qualification profile and learning goals based on phase 1
- 3) Checking consistency of new/revised curricula
- 4) Incorporating feedback from VET partners
- 5) Implementing new/updated curricula

Based on Backes-Gellner & Pfister (2019)

Necessary Preconditions for Impacts of VET Curriculum Updates

3 All relevant stakeholders must be involved

- ✓ Stakeholders include training firms, industry experts, worker representatives, organizations of work, government, and vocational teachers
- ✓ Ensures that VET skills are relevant for production and innovation, effectively teachable, and oriented towards the labor market (Backes-Gellner, 2017; Backes-Gellner & Pfister, 2019; Bolli et al., 2018; Busemeyer & Trampusch, 2012)
- ✓ Involvement of innovative training firms and industry experts is crucial (Backes-Gellner & Pfister, 2019)

VET partnership in Switzerland		
Federal government <ul style="list-style-type: none"> • Legal regulation of VET to ensure nationally uniform programs • Issuing VET ordinances • Monitoring the VET system for quality assurance and further development • State Secretariat for Education, Research and Innovation (SERI) as representative actor 	Cantonal offices <ul style="list-style-type: none"> • Implementing VET regulations • Granting training permits to firms • Approving apprenticeship contracts between firms and individuals • Supervising vocational schools • Supervising interim and final exams • Providing career counseling 	Organizations of the world of work (occupational, industry, employer, employee assoc., training providers, companies) <ul style="list-style-type: none"> • Dealing with respective sectors and occupations • Creating and updating curricula (i.e., defining contents) • Initiating curriculum updates and creations of new occupations • Running training centers for intercompany courses • Designing and implementing interim and final exams

Based on Backes-Gellner & Pfister (2019)

Summary

Updates of dual VET curricula can increase innovation, foster technology diffusion, and provide beneficial labor market outcomes for individuals *if*:

1. VET curricula are nationally defined and binding
 - Nationally uniform programs for every VET occupation
2. VET curricula are systematically updated
 - Timely reflection of current technological developments in VET curricula
3. All relevant stakeholders are involved in the updating process
 - Innovation- and labor market-oriented VET skills to ensure benefits for all stakeholders

Thank you for your attention!

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