



PROFESSORSHIP  
HUMAN RESOURCE EDUCATION AND  
DEVELOPMENT

# Productivity effects of workplace training

Academic Immersion “Labor productivity: a challenge for the Colombian Family Compensation Funds within the framework of the post-COVID-19 reactivation”

Munich Urban Colab GmbH

Prof. Dr. Samuel Muehleemann

November 2<sup>nd</sup>, 2022



# Motivation

- Focus of my talk is on **apprenticeship training** – why?
  - > Apprentices **earn why they learn at work** (no need to accumulate student debt)
  - > Apprentices have favorable **school-to-work transition** rates, because they gain relevant work experience during training
- Biggest obstacles
  - > **Firms are not interested** in providing training (“too expensive”)
  - > **Individuals are not interested** in pursuing apprenticeship training (“second best option”)
- Compared to “**on-the-job training**”, apprenticeships have a longer training duration and thus we can expect a stronger impact on labor market outcomes
  - > Grants to finance firm-provided training had **positive effects** in Portugal, leading to increased sales, value added, employment, productivity, and exports. (Martins 2021)
    - Positive effects also found in studies for Belgium, Italy and Germany (Konings and Vanormelingen, Dauth 2020, Brunello 2012)
  - > May **lack labor market currency** in comparison to apprenticeships (Alfonsi et al. 2020)

- What about **entrepreneurship training? (Chioda et al. 2021)**
  - > Potentially also important aspect, a recent study finds that 3-week mini-MBA led to substantial earnings gains of participants, they were more likely to start profitable businesses and created new jobs in Uganda
  - > Further compelling empirical evidence is scarce.

# Outline

## 1. Framework conditions

### > *Institutions*

- Unions, works councils, employer associations, state
- Quality of training
- Certification and skills transferability
- Training duration

### > *Financing of training*

- Instruction in the workplace
- Education in vocational schools
- Apprentice pay as adjustment factor

## 2. Poaching

## 3. Apprenticeship training and the business cycle

## 4. Germany vs. Switzerland – or investment vs. production-oriented apprenticeship training

## Framework conditions: Why do we need institutions?

- Why is there underinvestment in skills? (de la Croix et al. 2018)
- Apprentices-master relationship is complex, ***contracts are incomplete***
  - > What will be taught at the workplace, how well, how fast?
  - > **Moral hazard** issues (exploit apprentices as cheap labor)
    - Apprentice may not be able to judge whether the skills taught at the workplace were of “good quality”
      - incentives for the master to shirk
      - underinvestment in training
    - Consequence is a lower dissemination of knowledge and lower economic growth
- Institutions provide capacities for...
  - > **Exchange of information** among actors
  - > **Monitoring of behavior** (Germany: chambers of commerce, trade and crafts, Switzerland: state)
  - > **Sanctioning of defection** from cooperative behavior

## Institutions in “apprenticeship countries” (Germany, Switzerland, Austria)

- **Laws** that define apprenticeship and provide for its organization and administration
  - > **Federal Vocational Training Acts** in Germany and Switzerland
- Apprenticeship is also part of the **formal education system** in German-speaking countries, but also in France, Netherlands, Ireland, and more recently in the United Kingdom

**Level of investment by firms\* in upper secondary VET programmes with a work-based component (low, medium, high) (horizontal axis) relative to the share of students (low, medium, high) enrolled in these programmes (vertical axis)**

Share of dual/part-time VET to all pupils	Importance of investment by firms		
	LOW	MEDIUM	HIGH
<b>HIGH (&gt; 30%)</b>	the Czech Republic, Denmark, Estonia	Austria	Germany, Switzerland
<b>MEDIUM (6-30%)</b>	Australia, Finland, Iceland, Norway, the Slovak Republic	France, Hungary, Luxembourg, the Netherlands, the Russian Federation, the United Kingdom	
<b>LOW (&lt; 6%)</b>	Belgium, Brazil, Canada, Chile, Greece, Ireland, Israel, Italy, Japan, Korea, Mexico, New Zealand, Poland, Portugal, Slovenia, Spain, Sweden, Turkey and the United States		

\*The importance of investment by firms is an index that reflects the time that trainees spend in the workplace, the intensity of training (weekly instruction time) at the workplace, and controls for public reimbursement of such expenditure.

Source: OECD Education at a Glance 2011.

## Employer representation

- **Potential benefits** (Wolter and Ryan 2011)
  - > Ensure that **content of apprenticeship** is largely **transferable** (rather than narrow and firm specific)
  - > **Identify new tasks** (e.g., due to technological change)
  - > In Germany, chambers **organize centralized final exams** for apprentices, and decide whether a firm is suitable to take on apprentices
  - > **Foster trust** (to communicate skill requirements among firms)
  - > **Coordinate strategy choices** that lead to jointly beneficial outcomes (reduce poaching behavior)
  - > **Increase quantity and quality of training** by using attachment to the local community
- **Potential dysfunctions**
  - > Rent extraction / monopolistic competition (see also Kleiner & Krueger, 2009 on occupational licensing in the US)
  - > Conflict of interest between large and small firms (Culpepper 2007)
    - Transferable vs. narrow training content, training intensity, training quality

# Employee representation

- **Trade unions**
  - > Germany: parity of representation, collective bargaining for apprentice pay
  - > Involved in design and operation of apprenticeships
- **Works councils**
  - > Can also influence the training behavior of a company
    - Involvement in the planning/implementation of training activities.
    - Monitoring to ensure that training regulations are complied with
    - Can enforce that training personnel are replaced if tasks are not performed properly
  - > Works councils thus potentially ensure good/better training quality
    - However, no empirical evidence for German firms that works council actually improve quality! (Koch et al. 2019)



## Educational representation

### ▪ Teacher associations

- > Parity on vocational training committees for vocational schools (Germany)
- > Part on examination committees (Germany)
- > BCH-FPS (*Berufsbildung Schweiz*), part of the “organizations of the world of work”
- > Represent interests of vocational teachers

## Apprentice pay

- How could governments regulate apprentice pay?
  - > General **minimum apprentice wage** (in absolute terms), or by occupation
  - > As a **percentage of skilled worker pay** (overall or by occupation)
- **Advantages** of regulating apprentice pay
  - > **Potentially prevents exploitation** of apprentices (i.e. that apprentices receive a salary that is much lower than their productive contribution, net of a firm's training investments)
- **Disadvantages** of regulating apprentice pay
  - > **Potentially encourages (!) exploitation** of apprentices (if minimum pay is high/close to unskilled pay) because firms have little incentives to invest in (transferable) human capital
  - > May prevent adjustment in apprentice pay for heterogeneity in training quality, or local demand/supply differences (over time)

## Recent evidence for Colombia (Caicedo et al. 2022)

- Focus is on manufacturing sector
- Analyses of the effects of the 2003 apprenticeship reform
  - > Introduction of apprenticeship quotas depending on firm size
  - > Reduction of minimum wage for apprentices (75% of pre-reform minimum wage)
  - > Possibility for firms to pay “buy-out” fee to avoid having to train apprentices
- Main results
  - > ***Reform increased the number of apprenticeships by a factor of 15*** compared to pre-reform levels
  - > Some firms reduced firm size to train fewer apprentices (high-skill sector)
  - > Other firms increased firm size so that they can hire more apprentices (low-skill sector), as there is a maximum quota to limit exploitation as “cheap labor”

## Ex-ante simulations: „The Spanish experience“

- Project commissioned by the Bertelsmann Foundation (Muehleemann et al. 2017)
- Problem in Spain:
  - > high **youth unemployment** and at the same time **shortage of skilled workers**
  - > still very **few dual apprenticeships**, even though dual VET was formally introduced in 2012.
- VET is still predominantly school-based (2-year-programs)
- Goal of the project: ***Simulation of expected costs and benefits of dual VET in different training models*** (i.e. assuming different institutional regulations of the training system)

## Assumptions for the three baseline scenarios

Model 1	Model 2	Model 3
Three years of training	Two years of training	Three years of training
1,600 hours formal education in vocational schools	1,000 hours formal education in vocational school	The first two years as for Model 2
Approx. five hours per week of formal training for each apprentice (600 hours in total) + workplace experience	Approx. 600 hours of formal workplace education + workplace experience	In the third year, companies provide formal workplace training similar to a Swiss company in a comparable training occupation (approx. 200 hours on average)
Total amount of formal school and company training: approx. 2,200 hours	Total amount of formal school and company training: approx. 1,600 hours	Total amount of formal school and company training: approx. 1,800 hours

## Summary of the results by occupation

Occupation	€300			€530			HC
	M1	M2	M3	M1	M2	M3	
Laboratory technician	5,672	6,619	-285	13,952	12,139	7,995	
Plant technician (chemical in.)	-6,742	-2,483	-12,319	1,538	3,037	-4,039	
Automobile expert	32	1,492	-5,380	8,312	7,012	2,900	
Electromechanical technician	3,735	5,064	779	12,015	10,584	9,059	
Bank clerk	-370	4,112	-4,165	7,910	9,632	4,115	
Store clerk	-3,258	-332	-8,388	5,022	5,188	-108	
Retail sales expert	-2,501	-132	-7,597	5,779	5,388	683	
Technician in food industry	-5,752	-502	-9,842	2,528	5,018	-1,562	
Hotel management specialist	-7,956	-2,689	-13,047	324	2,831	-4,767	
Cook in hotels and restaurants	-2,392	871	-6,173	5,888	6,391	2,107	

Model 1 (M1): 3-year program with 1,600 in class and 600 in formal in-firm training (2,200 hours of total formal training) in addition to the time spent working.

Model 2 (M2): 2-year program with 1,000 hours in class and 600 hours in formal in-firm training (1,600 hours of total formal training) in addition to the time spent working.

Model 3 (M3): 3-year program with 1,000 hours in class and 800 hours in formal in-firm training (1,800 hours of total formal training) in addition to the time spent working.

## Ex-ante simulations or cost-benefit surveys?

- Ex-ante simulations...
  - > make sense if dual apprenticeships are **not widespread**, or **don't exist at all** in a country/industry.
  - > are **cheaper/quicker** than large-scale representative firm-level surveys
- Cost-benefit surveys...
  - > Useful when dual apprenticeships are **established**
  - > **Require random sampling**, knowledge of the population of firms (e.g. to address non-response bias)
  - > It can be a challenge to **get firms on board**, as surveys are rather extensive (if the aim is to obtain meaningful results)

## What kind of regulations do we need?

- **(Minimum) quantity of training**
  - > Limiting the time that apprentices can be used for unskilled tasks (exploitation)
- **Type of training**
  - > General, industry-specific, occupation-specific
    - E.g. more general education is required when apprenticeships start after compulsory schooling (age 15) vs. after completion of high school (age 18)
    - How broad/narrow is the definition of an occupation
  - > Transferable (useful in other firms) vs. firm-specific
    - As the share of firm-specific training increases, the outside opportunities for apprentices after graduation decrease
- **Training duration**



# Regulating the training duration

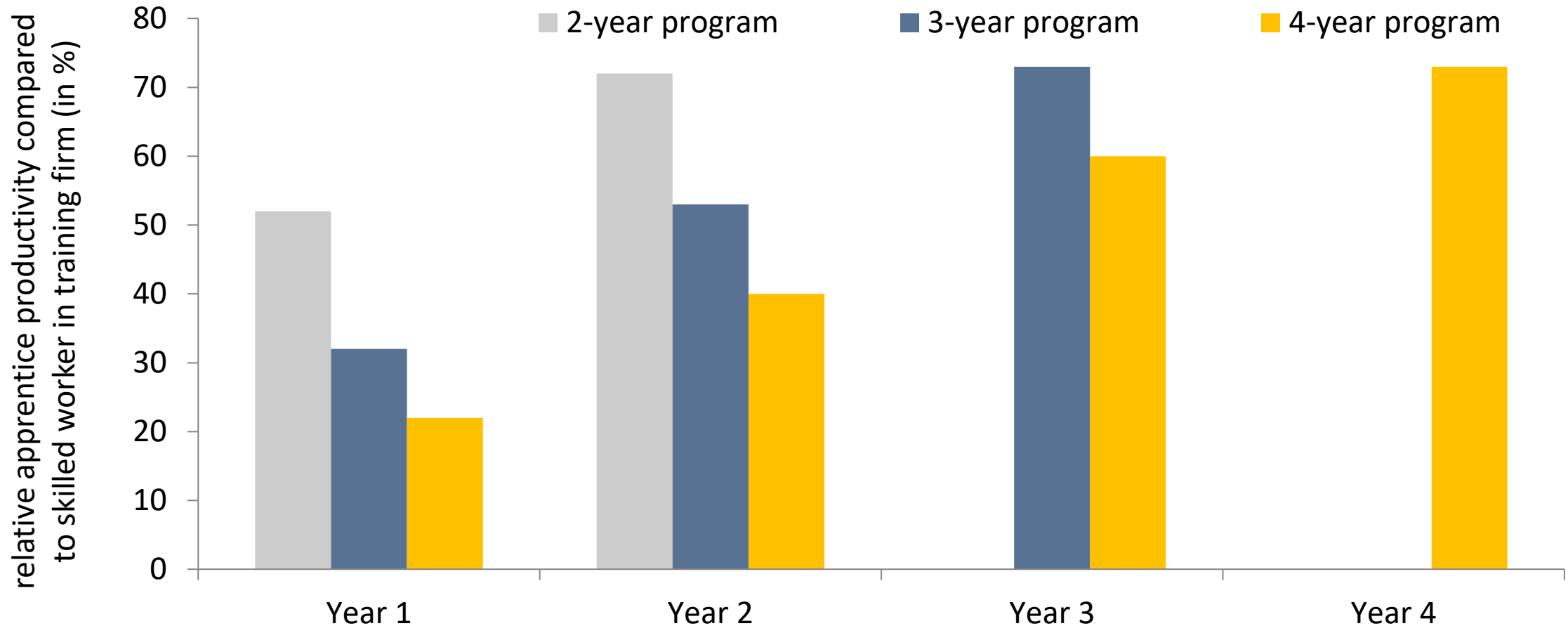
## The firm's perspective

- A firm typically makes an up-front training investment, even for the case when apprentice wages < unskilled wages
  - > A ***firm's ROI increases with the apprenticeship duration*** (ceteris paribus)
- A firm makes a larger initial training investment when the training duration increases (Malcomson et al. 2003)
  - > More time to recoup training expenses

## The individual's perspective

- An apprentice has an incentive to leave the training firm after having accumulated transferable skills – unless wage adjusts
- Thus, an ***apprentice's rate of return to training decreases with the apprenticeship duration*** (c.p.)
- BUT: a longer training duration may be in the interest of the apprentice, given that firms increase the overall amount of education and training provided at the workplace
  - > Results in higher post-training wages that may offset the increased opportunity costs during the training period
- **Importance of external certification at the end of the apprenticeship**
  - > Apprentice is unlikely to find skilled work in another firm without prior receipt of the certificate

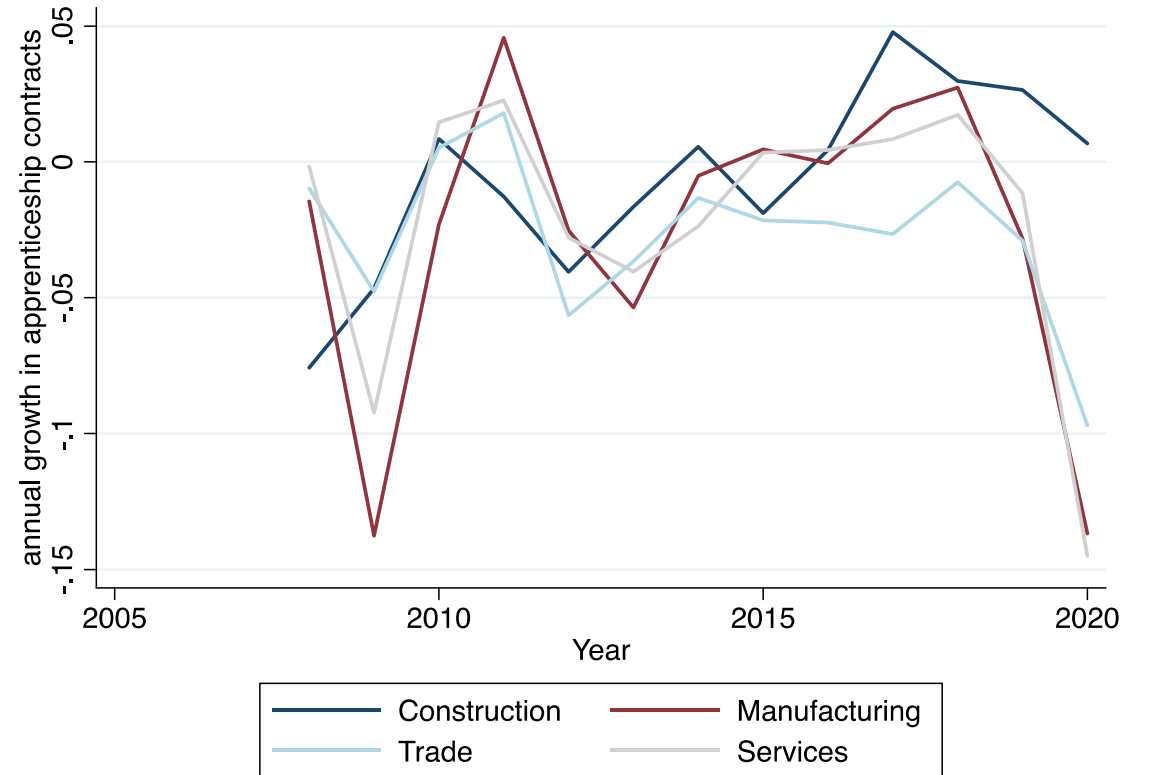
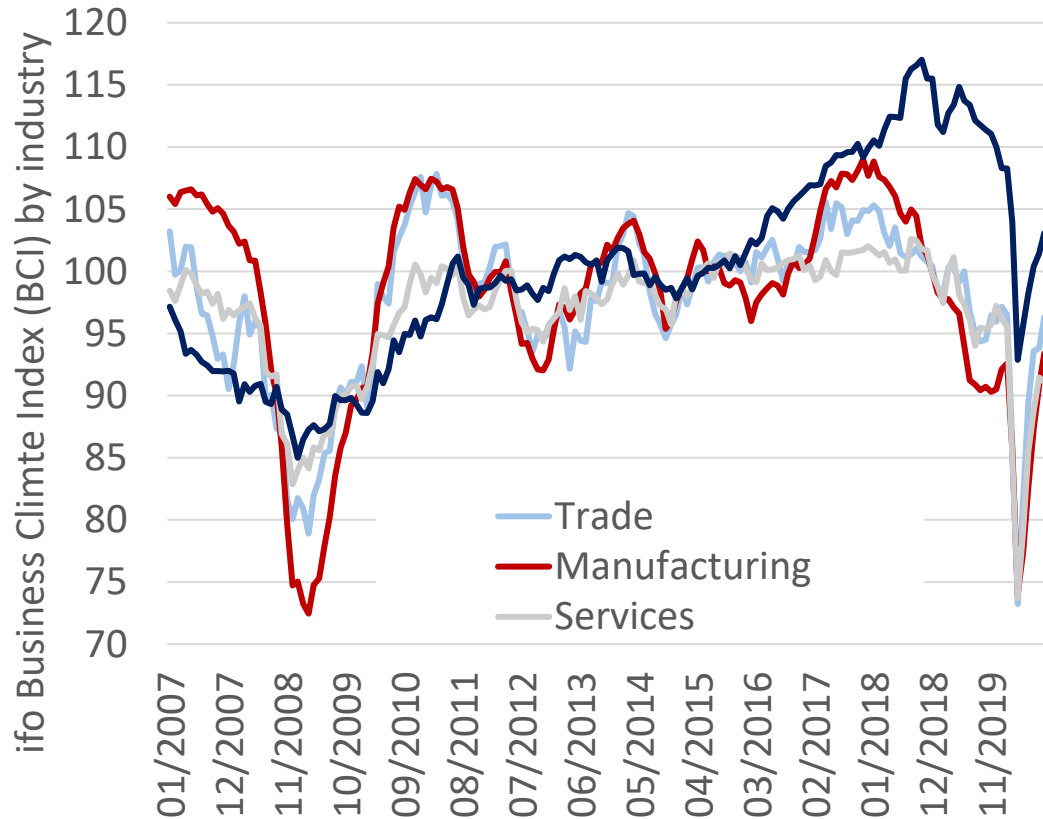
## The Swiss case: duration of apprenticeships depend on the occupational competencies



## Is poaching a threat to apprenticeship systems?

- Why do firms train?
  - > Alternative to recruiting skilled workers on external labor market or for short-term profit
- 2/3 of apprenticeship training programs in Switzerland are profitable
  - > And almost 2/3 of apprentices leave the training firm within 1 year after training!
- If training costs > training benefit, a firm needs to retain the apprentice to recoup training investment
  - > Problem: other firms can poach the trained apprentice
  - > Question: What is the impact of the threat of poaching on a firms' training behavior?
- The threat of poaching is only relevant for firms that have to bear positive net costs (Muehleemann and Wolter 2011)
  - > Important that training regulations allow firms to train apprentices in a cost-efficient manner.
- In Germany, large firms make significant net-investments in apprenticeship training, but they can also retain a large fraction of their trainees (80%) after completion of training

## Effect of the business cycle on a firm's demand for apprentices (Muehleemann et al. 2020)



Source: Muehleemann et al. (2020)

- **Business cycle expectations are important drivers of apprenticeship market outcomes**
  - > Weaker effects in occupational fields with lower net training costs
  - > Heterogeneity across sectors important
  - > Expectations remain relevant when accounting for unobserved time- invariant heterogeneity at the establishment level.
- Recent changes expectations due to Covid-19 can explain almost the entire drop in the demand for apprentices in 2020
  - > Unclear if subsidies (*Ausbildungsprämie*) reduce(d) business cycle effects in 2020
- **No direct subsidies to training firms in German-speaking part of Switzerland**, yet the market fully absorbed Covid-19 related economic downturn (Lüthi & Wolter 2020).
  - > Although difficult to establish causality, the weaker association between a firm's demand for apprentices and the business cycle in Switzerland is likely due to different cost-benefit structure

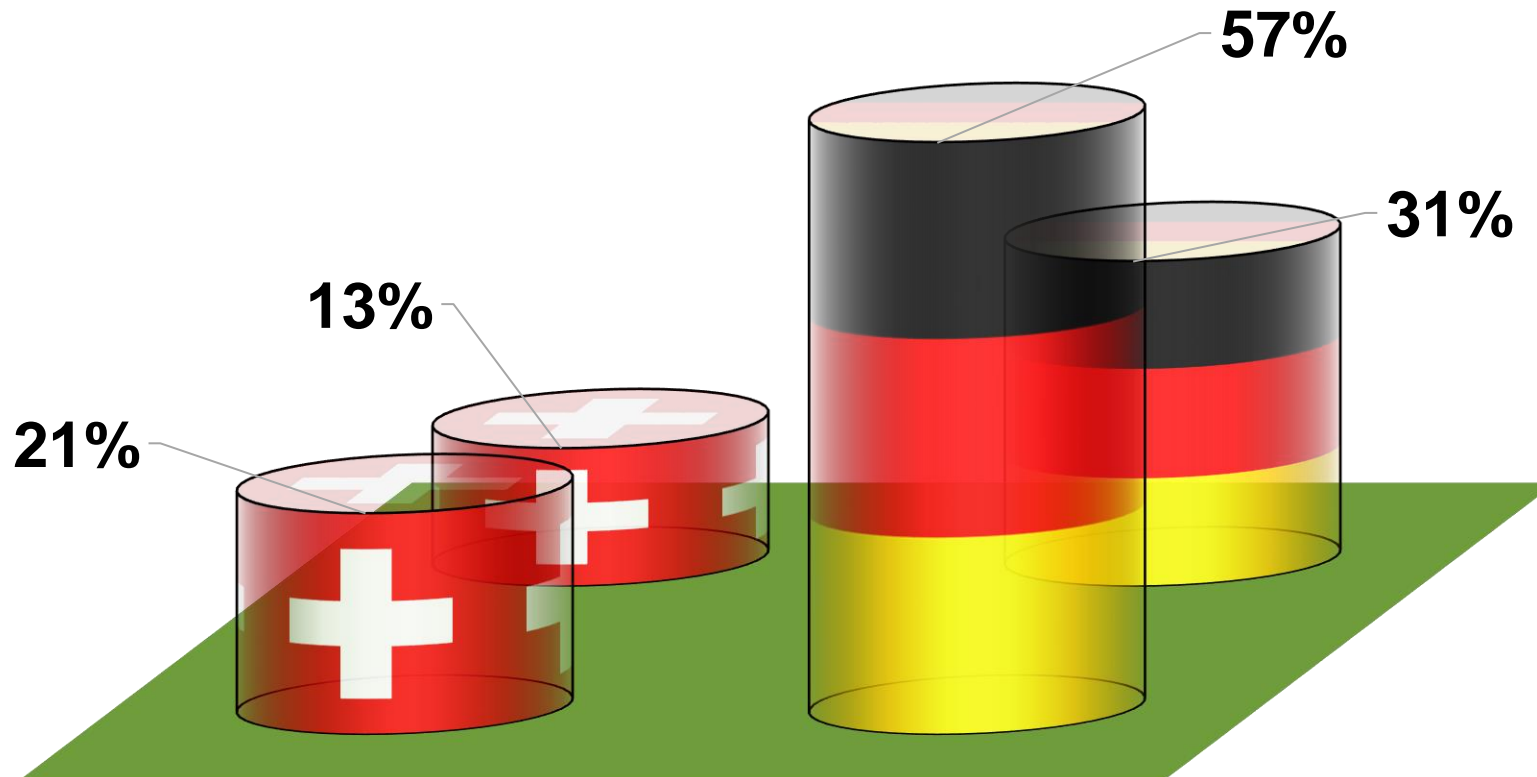
## Benefit-cost ratio in Germany, Switzerland, Austria (Muehleemann 2016)

Country	1st year	2nd year	3rd year	4th year	Total
<b>Austria</b>	0.87	0.86	0.83	0.76	0.83
<b>Germany (3 year programs)</b>	0.68	0.78	0.89		0.79
<b>Germany (3.5 year programs)</b>	0.35	0.49	0.64	0.60	0.51
<b>Switzerland (3 year programs)</b>	0.99	1.12	1.18		1.10
<b>Switzerland (4 year programs)</b>	0.79	0.95	1.13	1.35	1.07

Source: Adapted from Strupler and Wolter (2012), Jansen et al. (2015a), Schlögl & Mayerl (2016).

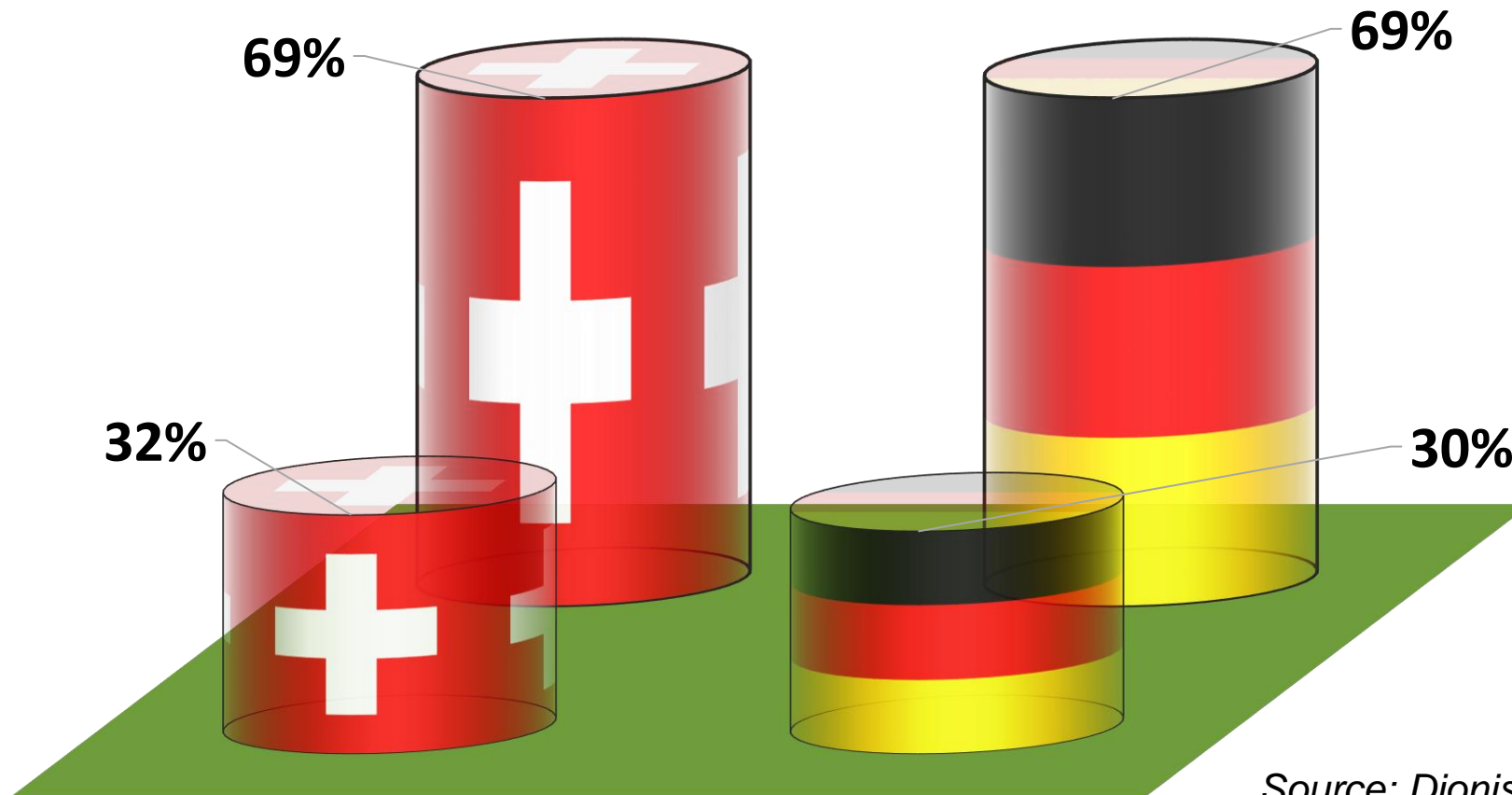
## Why so different? (Dionisius et al. 2009)

Share of tasks with no direct value to the company (1st vs 3rd year)



Source: Dionisius et al. (2009)

## Productivity of an apprentice relative to that of a skilled employee in the same occupation (1st vs 3rd year)



Source: Dionisius et al. (2009)



## Recent trends in Germany and Switzerland

- Share of **grammar school students increased strongly** in recent years (individuals with access to higher education at the tertiary level)
  - > However, share of apprentices with a high school qualification increased too
- Moreover, **dual studies** are becoming more popular
  - > Combines apprenticeship training with higher education (university of applied sciences)
  - > Double degree (apprenticeship AND bachelor level degree) in a relatively short time
- In Switzerland, >50% of the adult population age 25-34 has a tertiary education degree
  - > But about 2/3 of a cohort started out with an apprenticeship!

## Summing up: Is the lack of training due to demand or supply side factors?

### Demand side:

- ***What skills do firms need***, and why are they currently unwilling to provide such skills?
  - > Financial constraints?
  - > Poor supply of interested applicants?
- More flexible ***apprentice pay*** may increase willingness of firms to offer training by decreasing net training costs
  - > Alternative: apprentices wage subsidies
  - > Are firms aware of training benefits, or do they only see training costs (cost-benefit studies?)
- ***(Local) cooperation with firms*** regarding the ***content of the training curriculum***
  - > Relevant to current/future skill needs of industry

### Supply side:

- Ensure that training content has labor market currency, including ***certification of skills***
- Implement ***monitoring/sanctioning*** to ensure sufficiently high training quality
- ***Recognition of prior learning*** may be helpful to increase incentives for individuals with experience in the informal sector to join apprenticeship programs
- ***Permeability of educational tracks***
  - > Potential combination with general education (bachelor programs)
  - > Important that apprenticeship training is not a “dead end”

## Bibliography (1/2)

- Alfonsi, L., Bandiera, O., Bassi, V., Burgess, R., Rasul, I., Sulaiman, M., & Vitali, A. (2020). Tackling youth unemployment: Evidence from a labor market experiment in Uganda. *Econometrica*, 88(6), 2369-2414.
- Barrera-Osorio, F., Kugler, A. D., & Silliman, M. I. (2020). *Hard and soft skills in vocational training: Experimental evidence from Colombia* (No. w27548). National Bureau of Economic Research.
- Brunello, G., Comi, S. L., & Sonedda, D. (2012). Training subsidies and the wage returns to continuing vocational training: Evidence from Italian regions. *Labour Economics*, 19(3), 361-372.
- Caicedo, S., Espinosa, M., & Seibold, A. (2022). Unwilling to Train?—Firm Responses to the Colombian Apprenticeship Regulation. *Econometrica*, 90(2), 507-550.
- Chioda, L., Contreras-Loya, D., Gertler, P., & Carney, D. (2021). Making Entrepreneurs: Returns to Training Youth in Hard Versus Soft Business Skills (No. w28845). National Bureau of Economic Research.
- Dauth, C. (2020). Regional discontinuities and the effectiveness of further training subsidies for low-skilled employees. *ILR Review*, 73(5), 1147-1184.
- De la Croix, D., Doepke, M., & Mokyr, J. (2018). Clans, Guilds, and Markets: Apprenticeship Institutions and Growth in the Preindustrial Economy. *The Quarterly Journal of Economics*, 133(1), 1-70.
- Dionisius, R., Muehlemann, S., Pfeifer, H., Walden, G., Wenzelmann, F., & Wolter, S. C. (2009). Costs and Benefits of Apprenticeship Training. A Comparison of Germany and Switzerland. *Applied Economics Quarterly*, 55(1).
- Koch, B., S. Muehlemann and H. Pfeifer (2019), Do works councils improve the quality of apprenticeship training? Evidence from German workplace data. *Journal of Participation and Employee Ownership* 2(1), 47-59
- Konings, J. & S. Vanormelingen (2015). The impact of training on productivity and wages: firmlevel evidence. *The Review of Economics and Statistics*, 97(2): 485-497.

## Bibliography (2/2)

- Kriechel, B., S. Muehlemann, H. Pfeifer & M. Schuette (2014). Works councils, collective bargaining and apprenticeship training. *Industrial Relations* 53(2), 199-222.
- Martins, P. S. (2021). Employee training and firm performance: Evidence from ESF grant applications. *Labour Economics*, 72, 102056.
- McKenzie, D. (2017). DP11923 How Effective Are Active Labor Market Policies in Developing Countries? A Critical Review of Recent Evidence. *Labour Economics*, 83(J62), C93.
- Muehlemann, S. & S. C. Wolter (2020). *The Economics of Vocational Training*. In: Bradley, S., Green, C. (eds.). *Economics of Education*. 2nd Edition. Academic Press.
- Muehlemann, S. (2016). The cost and benefits of work-based learning. OECD Education Working Papers No. 143. OECD Publishing, Paris.
- Muehlemann, S., Pfeifer, H., & Wittek, B. H. (2020). The effect of business cycle expectations on the German apprenticeship market: Estimating the impact of Covid-19. *Empirical Research in Vocational Education and Training*, 12(1), 1-30.
- Muehlemann, S. & Wolter, S. C. (2017). Can Spanish firms offer dual apprenticeships without making a net investment? Empirical evidence based on ex-ante simulations of different training scenarios. *Evidence-based HRM: a global forum for empirical scholarship*, 5(1) 107-118.
- Muehlemann, S. & S. C. Wolter (2020). *The Economics of Vocational Training*. In: Bradley, S., Green, C. (eds.). *Economics of Education*. 2nd Edition. Academic Press.
- Muehlemann, S. and S. C. Wolter (2021). Business Cycles and Apprenticeships. *Oxford Research Encyclopedia of Economics and Finance*, 1-28.
- Muehlemann, S. & S.C. Wolter (2011). Firm-sponsored training and poaching externalities in regional labor markets. *Regional Science and Urban Economics* 41(6), 560-570.
- Muehlemann, S., Wolter, S., & Joho, E. (2018). Apprenticeship training in Italy: a cost-effective model for firms? *News Skills at Work* J.P. Morgan, Fondazione Giacomo Brodolini, Bertelsmann Stiftung.
- Wolter, S.C. & P. Ryan (2011). *Apprenticeship*. *Handbook of Economics of Education*, Vol. 3, ed. by R. Hanushek, S. Machin, L. Wössmann. Amsterdam: Elsevier North-Holland, 521-576.