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The impact of dual VET on the unemployment rate of young adults after the financial crisis: a comparison between Germany and the United States

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ABSTRACT

This paper examines whether dual VET enhances labour market resilience for young adults in the aftermath of the 2008 financial crisis. Using harmonised microdata from the German Socio-Economic Panel (SOEP) and the Panel Study of Income Dynamics (PSID) for the United States, linked via the Comparative Panel File (CPF), we compare unemployment among 25- to 34-year-olds whose highest attained qualification is dual VET (Germany) or a high school diploma (United States). Our weighted estimates indicate consistently lower and less volatile unemployment risk for dual VET graduates than for high school graduates, with the gap peaking during the crisis years and persisting thereafter. We interpret these patterns through the lenses of collective skill formation, school-to-work transitions, and the trade-off between specific and general skills. The findings suggest that sustaining and modernising high-quality dual VET can strengthen labour market resilience within a broader skills strategy.

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General and vocational training; VET and the labour market; dual system; unemployment; Germany; USA

1. Introduction

In political economy, vocational education and training (VET) is increasingly seen as a key instrument for securing skilled labour and facilitating labour market integration. Collectively organised systems, such as Germany's dual VET system, are regarded as effective in equipping individuals with skills relevant to the labour market and in supporting smooth transitions into employment (Adda et al. 2010; Busemeyer and Trampusch 2012). Considering growing global challenges, the question of which educational strategies best prepare young adults for the labour market is gaining importance. The OECD repeatedly criticised Germany for having insufficient numbers of individuals qualified for entry to higher education and, consequently, a relatively low proportion of university graduates (OECD 2000, 2001). According to the organisation, Germany's education system was insufficiently equipped to meet the challenges of transitioning from an industrial society towards a 'knowledge-based' service society, primarily due to its comparatively low tertiary graduation rate (Solga et al. 2014). This

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suggests a gap in human capital formation, since higher education attainment is associated with better individual employment outcomes and broader socio-economic benefits (OECD 2023). While the proportion of university graduates among 25- to 34-year-olds in Germany has steadily increased over the past two decades, it remains below international benchmarks, particularly when compared to the OECD average and countries such as the United States (OECD. n. d.-a). Consequently, the comparatively low share of university graduates in Germany is seen as a structural limitation that could negatively impact the country's long-term innovation and competitiveness (Powell and Solga 2011).

The OECD categorises educational attainment into three distinct categories: below upper secondary education, upper secondary education, and tertiary education (OECD 2023). Completion of upper secondary education is typically regarded as the minimum qualification necessary for successful labour market entry and is a prerequisite for accessing higher education. Young individuals who leave school without this qualification often face considerably poorer employment opportunities (OECD 2023). Within upper secondary education, a crucial distinction exists between general and vocational education (OECD 2023). General education provides a broad foundation of knowledge and usually facilitates entry into tertiary education, whereas vocational education emphasises practical skills and training tailored to labour market demands. These two educational pathways coexist but are associated with differing effects on labour force participation and employment outcomes (Parey 2016). Yet, empirical findings on their relative effectiveness remain inconclusive, often due to methodological limitations and data constraints (Iannelli and Raffe 2007; Ryan 2003). Against this backdrop, unemployment rates – especially among young adults – remain a key indicator for assessing the performance of education systems (Bolli, Oswald-Egg, and Rageth 2021; Ryan 2001). To better understand the implications of choosing between general and vocational education, it is insightful to compare countries with fundamentally different educational strategies. Germany and the United States exemplify these two contrasting approaches. In Germany, young people who do not pursue university education traditionally undertake apprenticeships in the dual VET system (Dummert 2021; Solga et al. 2014). Reflecting the centrality of this pathway, in 2022 roughly 45% of adults aged 25 and over reported a dual VET as their highest qualification, whereas 22% held a tertiary degree (bpb 2024). In contrast, the US primarily provides general education at the upper secondary level through high schools (Häfeli 2002; Rauner 2009).

Despite the OECD's critique of Germany's low share of university graduates, macro-economic data before and after the 2008 financial crisis suggest a different perspective. While unemployment of young adults increased across many OECD countries following the crisis, Germany's labour market remained relatively resilient (Cahuc et al. 2013; Eichhorst et al. 2015). On average, unemployment rates for individuals aged 25 to 34 rose from 6% to 10% and remained elevated for several years, declining only to around 7% by 2019 (OECD. n. d.-a).¹ Unemployment rates vary widely across OECD countries. The contrast between Germany and the United States illustrates the impact of differing educational strategies: prior to the financial crisis in 2007, Germany's unemployment rate stood at 9%, nearly double that of the US at 5% (OECD n. d.-c). However, the financial crisis had little effect on Germany, while unemployment in the US spiked to 11% and remained higher than in Germany in the following years. The macroeconomic data reveal

a notable disparity in unemployment rates at the upper secondary level, which strongly impacts the overall unemployment rate across all educational levels (OECD [n. d.-d](#)). In contrast, such differences are not evident for groups with education levels below upper secondary or those with tertiary education.

The dual VET system plays a crucial role in explaining international differences in unemployment of young adults (Habisch [2021](#); Pastore [2018](#)). Given its central function in labour market integration, this paper examines the impact of dual VET compared to general education, with a particular focus on unemployment of young adults. The contrasting approaches of Germany and the United States provide an ideal basis for analysis: Germany's dual VET system combines work-based learning with formal education, while the US emphasises general education to enable direct access to higher education. Germany's dual VET system has frequently been cited as a stabilising force during economic downturns, such as the 2008 financial crisis (Habisch [2021](#); Hoidn and Šťastný [2023](#); Pastore [2018](#)).

We empirically evaluate macroeconomic insights using country-specific household panel data. German data stem from the Socio-Economic Panel (SOEP), while the US counterpart is the Panel Study of Income Dynamics (PSID). Both data sets are harmonised through the Comparative Panel File (CPF), thus enabling direct comparison. We challenge the OECD's criticism of Germany's low tertiary attainment by arguing that the country's dual VET system embedded within upper secondary education serves as an effective mechanism for integrating young people into the labour market. Specifically, we hypothesise that young adults in Germany who complete dual VET after secondary school are less likely to be unemployed than their US peers with a high school diploma (HSD).² By addressing this research gap, this study aims to provide empirical evidence that Germany's dual VET system contributes to stabilising employment outcomes and lowering unemployment rates. We additionally present gender-specific patterns.

To validate this hypothesis, we first develop the conceptual foundations and situate our contribution in the literature, then describe the data, variables and analytical strategy, present descriptive statistics and findings, and conclude with a discussion of implications and limitations.

2. Conceptual framework and state of empirical research

2.1. Comparison of general and vocational education at upper secondary education: contrasting approaches in Germany and the United States

A fundamental distinction across international education systems exists in the structuring of upper secondary education, particularly in the differentiation between general and vocational education (OECD [2023](#)). While general education primarily aims to prepare students for further academic pursuits at the tertiary level, vocational education emphasises equipping students with practical skills for direct entry into the labour market (Bolli, Oswald-Egg, and Rageth [2021](#)).

This comparative analysis focuses on Germany and the United States, as they represent two markedly different approaches to structuring upper secondary education (Zimmermann et al. [2013](#)). Germany's system is characterised by its highly developed dual VET system, which offers non-academic students structured, practice-based training

to facilitate smooth transitions into skilled employment (Dummert 2021; Solga et al. 2014). In contrast, the United States primarily emphasises general education through comprehensive high schools that prepare students for post-secondary academic study (Häfeli 2002; Rauner 2009). A comparison of these divergent systems enables identification of structural differences, associated challenges, and respective strengths, offering insights into their implications for individual educational trajectories and career outcomes.

2.2. Definition of terms: VET & apprenticeships

Prior to the comparative analysis, it is essential to define key terms. VET refers broadly to programmes that equip learners with occupation-specific knowledge, practical skills, and competencies (Martínez-Izquierdo and Torres Sánchez 2022; Nilsson 2010). According to the OECD (2023) and ISCED (2015), such programmes often combine theoretical and workplace-based learning, including apprenticeships or dual-system models, and lead to qualifications recognised by the labour market. Apprenticeships constitute a specific subset of VET characterised by formal, contract-based arrangements that integrate paid employment with structured institutional education, culminating in nationally recognised qualifications (Eichhorst et al. 2015; Rauner 2009). Apprenticeships have evolved from traditional master-apprentice models towards more flexible arrangements, combining workplace-based training with institutional education, regulated by formal contracts, remunerated, and resulting in recognised certificates (Chankseliani and Anuar 2019; Fortwengel, Gospel, and Toner 2021; Markowitsch and Wittig 2022; Ryan 1998). The term dual VET specifically refers to highly institutionalised apprenticeship systems – exemplified by Germany – which combine state-regulated vocational school education with company-based training (Lassnigg 2011; Latina 2017; Remington 2018; Wolter and Ryan 2011). Dual VET systems rely on strong institutional frameworks, state regulation, employer participation, and social partnerships (Busemeyer and Trampusch 2012; Deissinger and Gonon 2021; Habisch 2021). This paper focuses on initial vocational training at the upper secondary level, as defined by the OECD, excluding lifelong learning and job-specific upskilling (OECD 2023).³

2.3. Comparison of the education systems in Germany and USA

The education systems in Germany and the United States differ fundamentally in structure and organisation, with federal responsibilities in both countries (Busemeyer and Trampusch 2012). The German education system rests on three pillars: general schooling, vocational training, and university education (Winkelmann 1996). After completing primary school, students are tracked into different school types: Hauptschule (9 years), Realschule (10 years), and Gymnasium, which culminates in the Abitur (12–13 years; general qualification for university entrance) (Friedrich 2023; Parey 2016). Upon completion of secondary education, graduates may choose to enter the labour market, pursue vocational training, or enrol in higher education (Solga et al. 2014).

The US education system emphasises equal opportunities through a ‘comprehensive school model’ (grades 1–12) (Häfeli 2002). At the secondary level, schools operate using a course-based system without fixed class groupings, offering varied curricula and

performance levels across subjects, which concludes with the high school diploma (HSD). Most US high schools offer vocational courses (grades 9-12) on a voluntary basis. In addition, there are specialised high schools (vocational high schools, technical high schools, career centres) that focus on vocational programmes (Lerman and Rauner 2012). High school curricula include mandatory core subjects and electives, allowing students to choose between academic and vocational tracks. Credits from all courses accumulate towards the HSD, with 90% of students earning it (Häfeli 2002; Rauner 2009). After graduating from high school, initial vocational training can be started at community colleges or vocational institutions (Häfeli 2002). Students can earn professional qualifications there (two-year associate's degree, four-year bachelor's degree) or certificates of competency. Training outside the formal school system mainly takes place in the workplace as on-the-job training or in conjunction with school institutions or training centres, for example as part of the apprenticeship system (Rauner 2009). Formalised apprenticeship training plays only a limited role and is largely restricted to 'registered apprenticeships' in the construction industry (e.g. electricians, carpenters, plumbers) (Eichhorst et al. 2015). Apprenticeships are more of a form of further training for adults already in employment, as the US system is hardly linked to secondary schools (Steedman 2012). Only about 20% of apprentices are under 25, with an average age of around 30 (Lerman and Rauner 2012). On-the-job training typically lasts three to four years, and apprentices earn a salary (Lerman 2012). Registered programmes are overseen by the Office of Apprenticeship or accredited state agencies, but many apprenticeships remain unregistered, making their total number uncertain (Lerman and Rauner 2012).⁴

To illustrate the structural differences in upper secondary education, Table 1 provides an overview of the main educational pathways in Germany and the United States. Although both Germany's dual VET system and the US HSD are classified at ISCED level 3, this classification distinguishes between general education, represented by the HSD, and vocational education, exemplified by dual VET.

Table 1. Main educational pathways in upper secondary education (ISCED level 3) in Germany and the United States.

Countries	Upper secondary education (ISCED level 3)	
	General education	Vocational education
Germany	Allgemeine Hochschulreife (Abitur) Fachhochschulreife (Fachabitur)	Dual VET School-based VET
USA	High School Diploma (HSD) Advanced Placement Diploma (AP) International Baccalaureate Diploma (IB) General Educational Development (GED)	Career & Technical Education Certificate (CTE)

Source: Compilation by the authors.

2.4. Dual VET in Germany

The dual VET system represents an institutionalised cooperation between public and private actors (Habisch 2021). Training takes place both in the company, three to four days a week, and in the vocational school, one to two days a week (Deissinger and Gonon 2021; Remington 2018; Rusert and Stein 2023; Winkelmann 1996). Typically lasting three years, this system is market-oriented, formalised, and continuously adapted to labour

market demands (Eichhorst et al. 2015; Parey 2016). Companies voluntarily offer apprenticeships, assume training costs, and pay trainees' wages, provided they meet the required standards to deliver the necessary skills and knowledge (Acemoglu and Pischke 2000; Eichhorst et al. 2015). Consequently, only about 20% of firms – primarily small and medium-sized enterprises – offer apprenticeships (Hoidn and Šťastný 2023; Remington 2018). Company participation and trainee selection depend on productivity expectations negotiated individually between firms and trainees (Deissinger and Gonon 2021).⁵ While practical training is federally regulated through standardised training regulations, vocational schools follow state-level curricula emphasising theoretical knowledge and general education, with costs covered by the state (Rauner 2009; Remington 2018; Rusert and Stein 2023). Central to this framework, anchored in the Vocational Training Act (Berufsbildungsgesetz, BBiG), is a corporatist governance arrangement involving the social partners. Employer organisations and trade unions participate in defining and updating training occupations and training regulations (Eichhorst et al. 2015; Remington 2018). The chambers (e.g. IHK and HWK) are legally designated 'competent bodies' responsible for implementing and supervising training, including registering apprenticeship contracts, advising and monitoring training relationships, and organising examinations via examination committees (Acemoglu and Pischke 2000; Habisch 2021; Parey 2016).

2.5. *State of the empirical literature*

Comparing the outcomes of general versus vocational education remains challenging due to fundamental structural differences between education systems and the inherent complexities of cross-national comparisons (Schröder and Ganzeboom 2014). Empirical research on the relationship between education and labour market outcomes predominantly focuses on the probability of employment, income development, and occupational stability, particularly in the context of vocational training (Forster, Bol, and Van de Werfhorst 2016; Hoidn and Šťastný 2023; Iannelli and Raffe 2007; Solga et al. 2014). However, findings regarding the long-term impact of vocational education remain inconsistent and context-dependent, not least due to persistent data and methodological challenges (Choi, Jeong, and Kim 2019; Ryan 2003).

Short- and medium-term effects of vocational education, particularly within dual VET systems as observed in Germany, predominantly indicate superior labour market integration and reduced unemployment of young adults compared to general education tracks, while evidence on wage advantages is more mixed (Adda et al. 2010; Parey 2016; Winkelmann 1996). The positive labour market outcomes are often explained by the occupation-specific training content and the institutionalised linkage between curricula and labour market needs, which promote smoother school-to-work transitions (Dummett 2021; Dustmann and Schönberg 2012; Eichhorst et al. 2015; Ryan 2001). While vocational education often enhances employment prospects compared to general education in many countries, this advantage tends to be weaker or even absent in systems like that of the United States (Shavit and Müller 2000). Hanushek et al. (2017) provide strong evidence that vocational education facilitates early labour market entry, yet this initial advantage tends to decline over the life course as skills acquired through vocational training depreciate faster than general skills. Comparative studies highlight the role of

dual systems in reducing unemployment, with Germany frequently cited as a model case due to its institutional structure and labour market relevance (Habisch 2021; Pastore 2018; Ryan 2001). By contrast, the US education system has been characterised by a pronounced mismatch between educational output and labour market demand, contributing to comparatively weaker school-to-work transitions and higher rates of youth disengagement from employment (Remington 2018). Mane (1999) finds that vocational high school coursework in the United States leads to improved short- and medium-term labour market outcomes for non-college-bound students, with higher employment rates and earnings compared to academic tracks.

Previous research shows that dual VET and HSD are comparable for analysing labour market outcomes. Bolli, Oswald-Egg, and Rageth (2021) further confirm the positive impact of dual VET on labour market integration and job quality across 36 countries, whereas school-based VET may have adverse effects, particularly when enrolment rates are high. Couch (1994) finds no statistically significant long-term earnings differences between German apprentices and American high school graduates with vocational education, while Harhoff and Kane (1997) report comparable wage trajectories and employment patterns, despite diverging investments in human capital. Based on SOEP and PSID data, Büchtemann, Schupp, and Soloff (1993) report significantly lower unemployment rates in Germany (1.9%) than in the US (8.2%) five years after leaving school, a difference largely attributed to Germany's dual system and its transferable vocational qualifications.

Despite these insights, empirical comparisons remain constrained by methodological challenges – especially the limited comparability of cross-national data – which continue to hinder definitive conclusions about the long-term advantages of vocational versus general education (Iannelli and Raffe 2007; Ryan 2003; Wolter and Ryan 2011). This study contributes to addressing these gaps by specifically examining unemployment outcomes of young adults within the contrasting contexts of Germany's dual VET system and the general education model prevalent in the United States, with a particular focus on how these systems responded to the challenges posed by the 2008 global financial crisis.

2.6. Crisis context: macroeconomic impacts of the 2008-2009 financial crisis in Germany and the United States

The global financial crisis of 2008-2009 severely disrupted output and employment worldwide, but its effects varied markedly across countries, sectors, and population groups. Young adults were among the most affected, as they were concentrated in precarious jobs, cyclically sensitive sectors, or at the point of labour market entry when the crisis hit (Cahuc et al. 2013; Eichhorst et al. 2015). Similar macroeconomic shocks can therefore generate very different unemployment trajectories, depending on national institutions and policy responses.

In macroeconomic terms, the Great Recession's impact on GDP was sizeable in both Germany and the United States. Germany experienced a particularly sharp contraction in 2009, with real GDP falling by around 5% – more than in the United States – yet recovered quickly and returned to pre-crisis levels by 2010 (OECD n. d.-e). Germany was therefore not less exposed to the shock; rather, the downturn was deeper but shorter. Adult

unemployment (25-64) rose sharply in the United States but only marginally in Germany: in the US the rate roughly doubled from about 4% to over 8% between 2007 and 2009 before gradually declining, whereas in Germany it started from a higher level of around 8% and then fell almost continuously over the 2010s (OECD [n. d-f](#)).

The sectoral transmission and adjustment mechanisms also differed: in the United States, the housing bust and financial turmoil depressed domestic demand and led to heavy job losses in construction, finance, manufacturing, and retail, whereas Germany was hit mainly through a trade shock to export-oriented manufacturing, where firms relied on internal flexibility and short-time work schemes (*Kurzarbeit*) instead of dismissals (Rinne and Zimmermann 2012). These institutional features – together with earlier labour market reforms and emerging skill shortages – underpin Germany's comparatively moderate increase in youth unemployment and provide the macroeconomic context for the cross-national analysis that follows.

3. Methodology

3.1. Data sources: PSID and SOEP

Based on theoretical considerations and the current state of research, this study presents a cross-national comparison of the dual VET system, focusing on Germany and the United States. The hypothesis, derived from macroeconomic insights on upper secondary education and unemployment, is tested empirically using a microeconomic approach. The empirical results are based on a comparative analysis of two national household panel data sets: the Panel Study of Income Dynamics (PSID) for the United States and the Socio-Economic Panel (SOEP) for Germany. The PSID, administered by the University of Michigan since 1968, is the world's longest-running longitudinal household survey (Johnson et al. 2018). Today, the PSID covers more than 11,000 households, and more than 80,000 individuals have been interviewed over the last fifty years. For single-person households, detailed questions are directed to the head of the household, while for partnered households, data are collected on both spouses or partners. The SOEP, provided by the German Institute for Economic Research (DIW Berlin), is a longitudinal study on the stability and change of living conditions with annual surveys of German households and their members (Wagner, Frick, and Schupp 2007). Since 1984, the SOEP has surveyed more than 12,000 households and 32,000 individuals annually. The questionnaires cover a wide range of individual and work-related characteristics, including employment and occupational status, education, working conditions, earnings, and job satisfaction. The integration and harmonisation of these two established international data sets were achieved using the Comparative Panel File (CPF), an ongoing open science project that harmonises the world's largest and longest-running household panel surveys across seven countries (Turek, Kalmijn, and Leopold 2021). The analysis is conducted at the individual level, rather than at the household level.

3.2. Data cleaning

In Germany, only directly interviewed individuals are included, while in the US, the reference persons and their partners are also included. As part of the harmonisation process, observations with missing values for gender and age were excluded. The sample is further restricted to individuals aged 25 to 34, consistent with the OECD's standard age grouping (OECD 2023). This age group is chosen because most individuals have completed their formal education, gained initial work experience, and are more stable in their professional lives, allowing for clearer insights into the relationship between education and labour market integration. Additionally, focusing on this group enhances international comparability and enables a more precise analysis of the long-term effects of education. The analysis uses survey waves from 2007 to 2019. Since the PSID was only conducted every two years from 1998 onwards, the corresponding German waves have also been removed from the data set.

3.3. Independent variable: HSD or dual VET

The panel data set's longitudinal structure allows for tracking individuals over time, making it possible to analyse educational qualifications at different stages of their lives. The educational variables used assume that the individual has fully completed the qualification at the reported time and does not obtain a higher qualification later. Annual surveys up to 2019 confirmed no changes in educational attainment for the analysed cases, ensuring that the education level remains constant, in line with the OECD definition of the highest qualification obtained (OECD 2023). For this analysis, a variable was created to assess the comparative impact of educational attainment on unemployment. Individuals in the US whose highest level of education is an HSD, typically completed after twelve years of schooling, form one analysis category. The other category comprises individuals who have completed a 'Realschulabschluss' or 'Hauptschulabschluss' and then completed dual VET.⁶ German participants who obtained the 'Allgemeine Hochschulreife (Abitur)' as their secondary school qualification were excluded from the analysis.⁷ This restriction ensures better comparability between the HSD in the US and the dual VET qualification in Germany.⁸

3.4. Dependent variable: unemployment

Unemployment definitions vary across national statistics. Generally, the unemployment rate is calculated as the percentage of unemployed individuals within the labour force (Renold et al. 2014). The labour force comprises both unemployed and employed individuals, while those neither employed nor unemployed are classified as non-labour force participants. In this analysis, the unemployment rate is derived from the available data set as the ratio of unemployed individuals actively seeking work to the total labour force. The calculation is based on the five-category variable (*emplst5*) harmonised by the CPF: (1) employed; (2) unemployed (active); (3) retired/disabled; (4) not active/home; (5) in education. For this calculation, the unemployment rate includes only the 'employed' and 'unemployed' categories, excluding 'retired/disabled', 'not active/home', and 'in education', as these groups are not part of the labour force. Specifically, individuals in the 'not active/home' category are excluded because they are neither actively participating in the labour market nor seeking employment and are therefore not available to the labour market.⁹

3.5. Heterogeneity

Consistent with gender-focused VET research, we analyse heterogeneity only by gender, which is observed for the full labour force (Haasler and Gottschall 2015). Sector and occupation are recorded only for the employed; unemployment by sector/occupation is therefore undefined. We also do not split ages 25-34 into 25-29 vs. 30-34 due to power and comparability concerns. Moreover, we do not stratify by additional sociodemographic or contextual characteristics (e.g. partnership, children, self-rated health, migration status) to preserve cross-country comparability.

3.6. Refreshment samples and weighting

Refreshment samples are essential in longitudinal studies to maintain representativeness by adding underrepresented population groups. While enhancing external validity, they require weighting adjustments to address biases and account for sample design (Goebel et al. 2008). Additionally, Couch's (1994) methodology supports the proper application of weights. This analysis calculates the average unemployment rate across multiple periods without examining temporal changes. Therefore, cross-sectional weighting is applied for each period to compute a weighted average across all time periods. Individual weights, rather than family weights, are used. For the SOEP sample, the cross-sectional variable 'w11105' is utilised, which includes all subsamples and ensures representative weighting at the individual level for a specific point in time (Grabka 2024). The PSID uses the 'Cross-Sectional Individual Weight' ($w_indDcross$) for individual-level weighting in cross-sectional analyses (Chang et al. 2021). After the 2017 inclusion of a baseline cohort of post-1997 immigrant families, the cross-sectional weighting became less consistent compared to the SOEP. To prevent overrepresentation or distortions, the cross-sectional weights for the 2017 and 2019 survey years were removed, ensuring a uniform analytical basis across survey periods.

3.7. Harmonisation and equivalence checks

The equivalence of the educational qualifications HSD and dual VET is analysed within the framework of the specifically generated sample in the empirical study. To achieve this, various indicators for both qualifications are systematically compared to establish a robust basis for comparison and to identify equivalences or differences. Both Germany's dual VET and the US HSD are coded as ISCED level 3 in the CPF, providing a shared comparison base (harmonisation improves but does not ensure full equivalence). The samples are closely matched in age (US mean 29.44; Germany 30.02) and show similar years of education for HSD and dual VET holders, supporting functional comparability. Among 25- to 34-year-olds, upper secondary is the most common highest attainment in our data.

3.8. Unemployment rate among young adults (25- to 34-year-olds) since the financial crisis in our own sample (PSID and SOEP)

Having examined unemployment of young adults at the macro-level using OECD data, we now analyse it in our own sample under the same restrictions – ages 25-34 and irrespective of educational attainment (Table 2 and Figure 1).

Table 2. Average unemployment rate, age: 25-34; 2007-2019.

Year	USA	GER
2007	4.85 (3120)	12.30 (2704)
2009	10.60 (3335)	9.84 (2580)
2011	9.18 (3500)	11.23 (4429)
2013	8.83 (3606)	11.36 (4813)
2015	6.86 (3454)	10.70 (4016)
2017	9.06 (3722)	11.03 (5343)
2019	7.91 (3471)	9.46 (4179)

Source: PSID and SOEP, calculations by the authors.

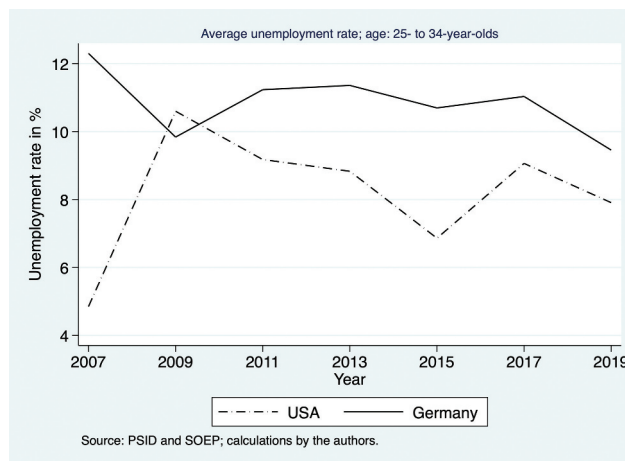


Figure 1. Unemployment rate among young adults (25- to 34-year-olds) since the financial crisis in our own sample (PSID and SOEP).

The trend of the unemployment rate of young adults in the PSID and SOEP microdata diverges from the trend observed in macroeconomic OECD statistics. In the US, unemployment among young adults more than doubled following the financial crisis, then declined steadily in the subsequent years. In contrast, Germany did not experience a sharp rise in unemployment of young adults during the crisis, and the rate continued to fall. However, from 2011 onwards, the unemployment rate of young adults in Germany exceeds that of the US in the sample – contrary to macroeconomic trends. Various factors may account for these discrepancies between the macro-level OECD data and the micro-level findings based on PSID and SOEP samples.

4. Results

The sample of young adults observed in the linked data set of the PSID and SOEP was introduced in the previous chapter and verified through a validation to assess the suitability of educational qualifications in the sample for comparative analysis. This section presents descriptive results on how different country-specific vocational qualifications affect the labour market situation of young adults. First, we provide general descriptive statistics on the personal characteristics of young adults by country-education category (US: HSD; Germany: dual VET) in the period 2007-2019.

4.1. Analysis of individual data from the PSID and SOEP

The data reveal significant differences as well as some similarities between the US and Germany for the 25-34 age group. On average, respondents in Germany are slightly older (30.02 years) than those in the US (29.44 years). The gender distribution is balanced. Individuals in the US report an average of 12 years of education, compared to 11 years in Germany, for those holding a US HSD or a German dual VET. The share of individuals living with a partner is higher in Germany (69%) than in the United States (66%). Both the average number of children aged under 17 and the average household size are higher in the US. Approximately 12% to 14% of individuals in both countries work in the public sector. The number of years of labour market experience differs by more than a year (5.98 to 7.16 years) between the countries.¹⁰ Self-rated health status, measured on a five-point scale, averages 2.39 in the US and 2.33 in Germany. Three categorical variables should also be explained: 54% of individuals in the USA are married and 11% are cohabiting. In Germany, 45% of the persons are married, but the percentage of those living with their partner is higher, at 24%. The percentage of singles is the same in both countries, at 27%. The proportion of full-time employees is the same in both countries at 60%. In the US, however, almost 30% work part-time, compared to only 18% in Germany. In both countries, most people work in companies with fewer than 20 employees. In Germany, more than 20% of people work in companies with more than 2,000 employees, compared to 5% in the US. The ISCED level (here four levels) of the father is somewhat lower in Germany than in the USA, the ISCED level of the mother is significantly higher in Germany than in the USA, and on average, the fathers have a higher level of education than the mothers do.

Overall, the data show both differences in socioeconomic and family aspects and similarities that reflect country-specific structures as well as labour market conditions. Country-specific differences in terms of years of education and work experience are particularly striking. While individuals in the US complete more years of education on average, their German counterparts have more work experience. These differences reflect the structural peculiarities of the respective education systems, in particular the dual VET system in Germany and the longer general schooling in the US (Table 3).

Table 3. Desc. stat. mean (US: HSD; Germany: dual VET); age: 25-34; 2007-2019.

	High-School	Dual VET
	mean	mean
Age	29.44	30.02
Gender (female)	0.50	0.52
Education (years)	12.00	11.15
Living together with partner	0.66	0.69
Number Of Children in HH aged 0-17	1.56	1.06
Number of People in HH	3.30	3.08
Public sector	0.14	0.12
labour market experience (years)	5.98	7.16
Self-rated health (five-point scale)	2.39	2.33
Disability (any)	0.05	0.03
Father's education (4 levels)	2.86	2.75
Mother's education (4 levels)	1.94	2.63
Partnership living-Status		
Married/registered, with P	54.34%	45.19%
Cohabiting (Not married, Living with P)	11.18%	24.08%
Single, No P	27.61%	27.42%
Widowed, No P	0.12%	0.14%
Divorced, No P	3.43%	1.53%
Separated, No P	3.32%	1.64%
Employment Level (35 h/week)		
Full-time	57.50%	59.47%
Part-time/irregular	29.17%	18.46%
Not empl/other	13.32%	22.07%
Size of organisation		
<20	38.57%	32.44%
20-199	36.42%	27.96%
200-1999	20.02%	18.26%
>2000	4.99%	21.34%

Source: PSID and SOEP, calculations by the authors.

4.2. Results: unemployment rates among young adults (US: HSD; Germany: dual VET)

The Table 4 and Figure 2 show the trend in unemployment rates among young adults in the US and Germany over several years, focusing on individuals with dual VET and HSD. The figure visualises these trends, highlighting the differences in unemployment rates between the two countries. The US curve (dash-dotted) shows a sharp increase of 140% between 2007 and 2011, which corresponds to more than a doubling of unemployment of young adults. From 2011 onwards, it declines steadily but remains higher than the

Table 4. Average unemployment rate HSD and dual VET, age: 25-34; 2007-2019.

Year	High-School	Dual VET
2007	6.37 (711)	10.93 (835)
2009	14.07 (705)	10.50 (744)
2011	15.29 (728)	10.50 (1386)
2013	11.79 (720)	11.33 (1276)
2015	10.59 (737)	10.13 (822)
2017	11.08 (787)	9.77 (755)
2019	11.57 (798)	5.12 (547)

Source: PSID and SOEP, calculations by the authors.

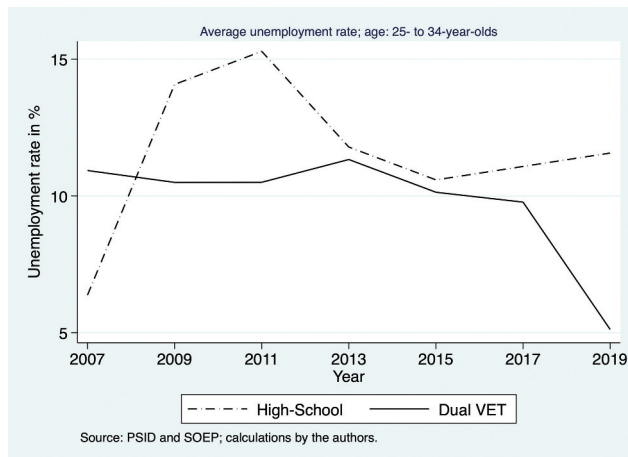


Figure 2. Unemployment rates among young adults (US: HSD; Germany: dual VET).

German rate (solid). In contrast, Germany is comparatively stable, with a steady decline in unemployment rates. The sample sizes are comparable between the two countries (Table 4).

4.3. Results: gender heterogeneity

The Table 5 and Figure 3 and 4 track unemployment among 25-34-year-olds by gender and qualification. For men, the HSD series spikes around the crisis and remains consistently above the dual VET series, which is lower and smoother throughout. For women, patterns are mixed early on, but later the dual VET series declines and ends below the high-school series. Female series show somewhat more year-to-year variation. Sample sizes are comparable across groups and years (Table 5).

Table 5. Average unemployment rate HSD and dual VET by gender, age: 25-34; 2007-2019.

Year	High-School female	Dual VET female	High-School male	Dual VET male
2007	5.28 (352)	16.70 (395)	7.11 (359)	7.38 (440)
2009	8.49 (333)	8.97 (351)	17.78 (372)	11.61 (393)
2011	14.00 (355)	13.27 (805)	16.24 (373)	8.54 (581)
2013	11.69 (352)	14.86 (708)	11.86 (368)	8.70 (568)
2015	10.66 (367)	14.47 (425)	10.54 (370)	7.29 (397)
2017	10.83 (405)	10.45 (364)	11.29 (382)	9.34 (391)
2019	10.75 (409)	6.99 (257)	12.23 (389)	3.89 (290)

Source: PSID and SOEP, calculations by the authors.

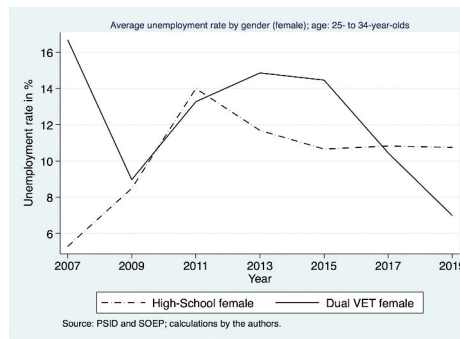


Figure 3. Unemployment rates among young adults by gender (female; US: HSD; Germany: dual VET).

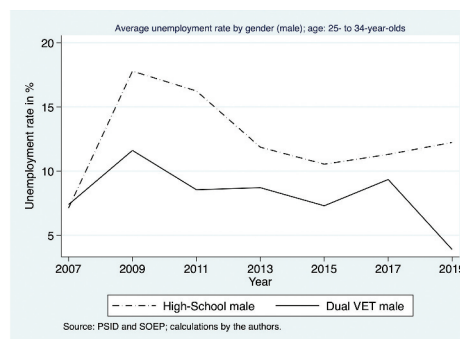


Figure 4. Unemployment rates among young adults by gender (male; US: HSD; Germany: dual VET).

5. Discussion & limitations

5.1. Discussion

This study addresses the OECD's critique regarding Germany's relatively low proportion of university graduates by highlighting the strengths and labour market relevance of the country's dual VET system. The analysis demonstrates that the integration of dual VET within upper secondary education in Germany significantly enhances labour market outcomes for young adults, particularly in terms of employment stability. Specifically, the analysis shows that German youths who complete dual VET after secondary school exhibit a lower risk of unemployment than their American counterparts who hold an HSD.

Young adults were among the demographic groups most affected by the 2008 financial crisis, with unemployment rates doubling relative to adults in many countries (Eichhorst et al. 2015). Germany, however, maintained lower unemployment of young adults due to its strong institutional frameworks (Habisch 2021; Pastore 2018). OECD macroeconomic data highlight an association between unemployment of young adults and the upper secondary level in Germany and the United States, which motivates this study. Completing upper secondary education – whether general or vocational – is essential for better labour market entry, as individuals without this qualification face higher unemployment rates and lower earnings (OECD 2023). Based on the

macroeconomic findings, it can be inferred that differences in educational systems between Germany and the US significantly impact unemployment rates.

Our data and visualisation illustrate that completing dual VET in Germany tends to result in lower unemployment rates compared with holders of an HSD in the US. Following Parey (2016), all individuals holding a degree from the college-bound educational track (Abitur) are excluded to focus on non-college-bound youth. While the unemployment rate in the US increased significantly during the financial crisis, no observable impact occurred for young adults with dual VET in Germany. Because the unemployment rates are lower and more stable, the dual VET system in Germany appears to better prepare young adults for the labour market. The reduced fluctuations in Germany, combined with its overall lower rates compared to the US, suggest that the dual system facilitates the transition to employment and helps mitigate unemployment. The results suggest that vocational education is a viable alternative to general education and that the use of apprenticeships combined with institutional learning tends to be more effective than school-based education at upper secondary level. The stronger and more persistent advantage for men suggests that dual VET aligns closely with male-dominated sectors and occupations hit by the shock, whereas patterns among women are more balanced and turn favourable only in the later recovery.

Germany's dual VET system is particularly characterised by the close connection between educational institutions and employers, which promotes a smooth transition from training to the labour market (Bolli, Oswald-Egg, and Rageth 2021; Dummert 2021; Dustmann and Schönberg 2012; Harhoff and Kane 1997; Ryan 2001). This link ensures that the qualifications of graduates are optimally aligned with the requirements of a technologically advanced economy (Remington 2018). Particularly during economic crises, such as the financial crisis of 2008, the dual VET system proved its resilience by keeping unemployment of young adults low and contributing to economic stability (Deissinger and Gonon 2021). The system's success also depends on employer engagement, innovative small and medium-sized enterprises, and continuous adaptation of training to emerging technologies and labour market needs (Hoidn and Šťastný 2023). As a result, dual VET participants benefit from practical experience, industry-specific skills, and strong employer connections, facilitating a seamless entry into the workforce and significantly reducing transition-related frictions such as information asymmetry and search costs. Nevertheless, challenges remain, especially for low-skilled young people who have difficulties accessing training programmes.

The findings have important implications for education policy and workforce planning. They suggest that a one-size-fits-all expansion of tertiary education may not be the most effective strategy – particularly in countries like Germany, where the dual VET system consistently yields strong labour market outcomes. Rather than replacing vocational pathways with academic ones, policymakers should invest in the modernisation and adaptability of dual VET. For employers and management, the results highlight the value of sustained engagement in training partnerships and sector-specific skill development, especially amid technological change. Maintaining and strengthening the dual VET system helps preserve a diversified qualification structure that supports both individual career paths and broader economic resilience. Policies that create targeted incentives for employers and apprentices are therefore essential to ensure the attractiveness and effectiveness of the dual system in the long term.

In summary, this analysis contributes to the broader discourse on VET by providing empirical evidence of the dual VET system's effectiveness relative to general upper secondary education – particularly for individuals who do not pursue tertiary degrees. This study confirms the hypothesis that young adults in Germany who complete dual VET after secondary school face a significantly lower risk of unemployment than their US peers with only an HSD. These findings align with previous research highlighting the short- and medium-term advantages of dual VET (Adda et al. 2010; Bolli, Oswald-Egg, and Rageth 2021; Couch 1994; Harhoff and Kane 1997; Parey 2016). While cross-national comparisons remain methodologically challenging due to structural differences between education systems, this study offers context-sensitive evidence – particularly in the aftermath of the 2008 global financial crisis – of how institutional features of dual VET systems contribute to labour market resilience (Iannelli and Raffe 2007; Schröder and Ganzeboom 2014). Ultimately, the dual VET model emerges as a robust mechanism for reducing unemployment risks and enhancing workforce preparedness, suggesting its potential applicability and value in broader international contexts.

5.2. Limitations

When interpreting the findings of this study, several limitations should be considered, as they may affect the interpretation and transferability of the results. In what follows, we highlight four key limitations with respect to macroeconomic influences, additional indicators, methodological challenges and comparability of educational attainment levels.

One notable factor affecting the unemployment rate is the incomplete recording of complex macroeconomic influences. While education has been the primary focus of this study, other variables, such as overall economic development and work experience, also play significant roles. High unemployment and other macrostructural labour market imbalances reduce expectations and, in turn, the perceived value of education (Evans 1999). In Germany, individuals completing dual VET gain substantial labour market experience early in their careers. By entering the labour force sooner – after nine or ten years of schooling – they gain practical work experience faster in comparison with the US, where students typically graduate after twelve years of school. This earlier exposure may contribute to a lower unemployment rate for individuals with dual VET.

While the unemployment rate is a key indicator for measuring youth labour market integration, it has limitations in scope. It includes only individuals actively seeking employment, thus excluding important groups such as students and young individuals who are neither employed nor in education or training. Additional indicators, such as the NEET rate, the long-term unemployment rate, the employment rate, and the duration between school completion and first stable employment, provide a more comprehensive perspective on youth labour market dynamics and transitions (Bolli, Oswald-Egg, and Rageth 2021; Hoidn and Šťastný 2023).

In addition, methodological challenges must also be considered. Cross-country data harmonisation and weighting, as well as variations in question design, pose significant hurdles to consistent analysis and may introduce biases. Furthermore, self-selection bias could affect the findings: participants in vocational training programmes may differ from non-participants in terms of their motivation or abilities, which could lead to an

overestimation of programme effects. Prior research has shown that uncontrolled differences in individual motivation or abilities can systematically distort outcomes (Eichhorst et al. 2015; O'Higgins 2001). To address this issue, methods such as instrumental variable approaches or propensity score matching could be used. Future research should include regression analyses to specifically examine these effects and enable a more robust analysis of the impacts.

Finally, this study is limited by the comparability of educational attainment levels, especially when comparing US high school diplomas with Germany's dual VET system. The reasons for the nonetheless given justification of comparison have been elaborated in detail. However, many students complete further education after high school that has not been considered in this analysis, and which future research might take a closer look at. Similarly, this study does not explore post-vocational training pathways, such as obtaining master craftsman certifications, transitioning to higher education, or the role of workplace-based training. Future analyses could utilise the CPF harmonisation data code to include additional countries, hence broadening the comparative scope and providing deeper insights into the effects of different education systems.

Notes

1. In line with the OECD, this paper focuses on ages 25-34.
2. Individuals with a school-leaving certificate entitling them to enter university in Germany (Abitur) are deliberately excluded from the analyses.
3. In this paper, we use VET as an overarching term, whereas other studies often use initial VET (IVET) (Hoidn and Štašný 2023).
4. The classification of these programmes within the ISCED framework depends on their specific structure and educational content but is typically classified at ISCED levels 4 or 5 (ISCED 2015).
5. The link between school-leaving certificates and VET can be explained by signalling theory and queuing theory, where firms rank applicants by employability, placing the most suitable at the front (Friedrich 2023).
6. In the SOEP, dual VET in Germany is recorded and labelled as an 'apprenticeship' to denote the traditional and widely established role in the country's vocational education system.
7. This follows the OECD's repeated criticism around the turn of the millennium that too few people in Germany obtain a higher education entrance qualification and too few complete a university degree (OECD 2000, 2001). Parey (2016) also did this. Harhoff and Kane (1997) also note that the typical pathway to a dual VET qualification in Germany consists of nine to ten years of school-based education followed by two to three and a half years of company-based training. In Germany, qualifications from 'Realschule' or 'Hauptschule' corresponds to ISCED level 2, whereas in the US, HSD aligns with ISCED level 3.
8. The objective is to illustrate that obtaining the 'Allgemeine Hochschulreife (Abitur)' is not the primary driver of lower unemployment rates.
9. This corresponds to the international definitions used by organisations such as the International Labour Organization (ILO).
10. This is methodically due to the variable, since in the USA the question of work experience is asked from the age of 18 and in the German data set this variable is created by combining monthly information on the employment status from the calendar data set. This difference may also have a systemic background. In the German dual VET system, work experience is acquired during the training at the workplace.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data sources

- **PSID:** Panel Study of Income Dynamics, public use data set. Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI (2023). Acknowledgement: The collection of data used in this study was partly supported by the National Institutes of Health under grant number R01 HD069609 and R01 AG040213, and the National Science Foundation under award numbers SES 1157698 and 1623684.
- **SOEP:** Wagner, Frick, and Schupp (2007); doi:10.5684/soep.core.v36o.
- **CPF:** Turek, Kalmijn, and Leopold (2021); Comparative Panel File (CPF) version 1.5 available at www.cpfdata.com; The project was supported by the NORFACE Joint Research Programme on the Dynamics of Inequality Across the Life-course. doi:10.17605/OSF.IO/H3YXQ.

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