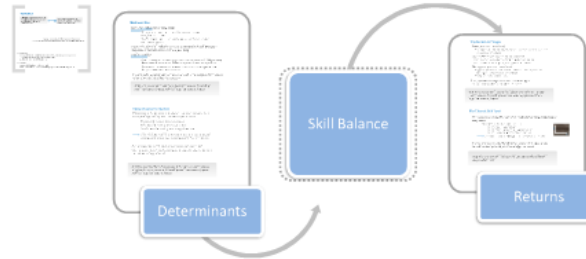


Presentation at TASKS | January 17, 2011

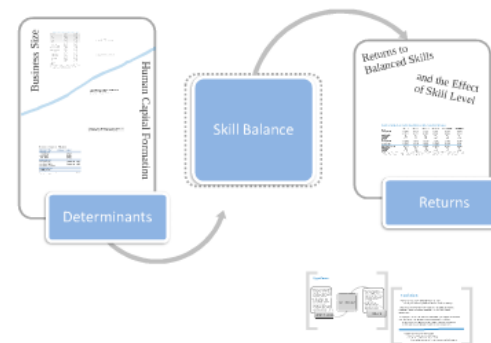
The Skill Balancing Act: Determinants of and Returns to Balanced Skills

Elisabeth Bublitz & Florian Noseleit
Friedrich Schiller University Jena University of Göttingen
Collaborative Research Center (SFB 580)



THEORY

RESULTS



FORNBERG | SCHULTE | BROSCH | KREUZER
LEHRGEBIET FÜR PERSONNELMANAGEMENT, ORGANISATION
UND PERSONALWIRTSCHAFTSINFORMATIK
VERGLEICHENDE PERSONNELMANAGEMENTSLEHRE UND -PRAKTIK

SFB 580
KOLLEKTIVE FORSCHUNGSPROJEKTE
AN DER UNIVERSITÄT GÖTTINGEN

Backup

This slide, labeled 'Backup', contains several small thumbnail images of various charts, tables, and graphs, likely representing additional data or figures from the presentation.

Presentation at TASKS | January 17, 2011

The Skill Balancing Act: Determinants of and Returns to Balanced Skills

Elisabeth Bublitz & Florian Noseleit

Friedrich Schiller University Jena

University of Groningen

Collaborative Research Center (SFB 580)



Presentation at TASKS | January 17, 2011

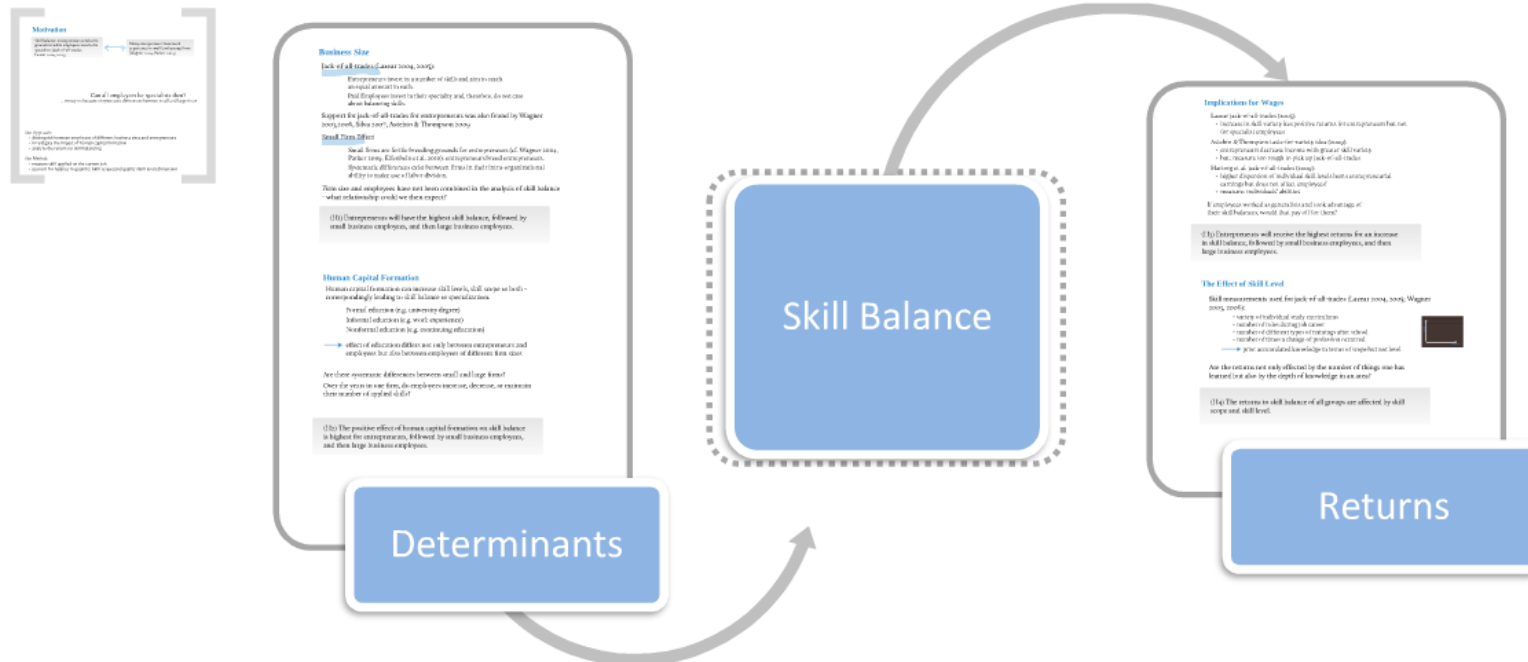
The Skill Balancing Act: Determinants of and Returns to Balanced Skills

Elisabeth Bublitz & Florian Noseleit

Friedrich Schiller University Jena

University of Groningen

Collaborative Research Center (SFB 580)



Motivation

Skill Balance: entrepreneurs tend to be generalists while employees tend to be specialists (jack-of-all-trades, Lazear 2004, 2005)



Many entrepreneurs have work experience in small (and young) firms (Wagner 2004, Parker 2009)

Can all employees be specialists then?

... we say no because of systematic differences between small and large firms

Motivation

Skill Balance: entrepreneurs tend to be generalists while employees tend to be specialists (jack-of-all-trades, Lazear 2004, 2005)



Many entrepreneurs have work experience in small (and young) firms (Wagner 2004, Parker 2009)

Can all employees be specialists then?

... we say no because of systematic differences between small and large firms

Our Approach:

- distinguish between employees of different business sizes and entrepreneurs
- investigate the impact of human capital formation
- analyze the returns to skill balancing

Our Method:

- measure skill applied on the current job
- account for balance in quantity (skill scope) and quality (skill level) dimension

Business Size

Jack-of-all-trades (Lazear 2004, 2005):

- Entrepreneurs invest in a number of skills and aim to reach an equal amount in each
- Paid Employees invest in their speciality and, therefore, do not care about balancing skills.

Support for jack-of-all-trades for entrepreneurs was also found by Wagner 2003, 2006, Silva 2007, Astebro & Thompson 2009

Small Firm Effect

- Small firms are fertile breeding grounds for entrepreneurs (cf. Wagner 2004, Parker 2009, Elfenbein et al. 2010): entrepreneurs breed entrepreneurs.
- Systematic differences exist between firms in their intra-organizational ability to make use of labor division.

Firm size and employees have not been combined in the analysis of skill balance - what relationship could we then expect?

(H1) Entrepreneurs will have the highest skill balance, followed by small business employees, and then large business employees.

Human Capital Formation

Human capital formation can increase skill levels, skill scope or both - correspondingly leading to skill balance or specialization.

- Formal education (e.g. university degree)
- Informal education (e.g. work experience)
- Nonformal education (e.g. continuing education)

→ effect of education differs not only between entrepreneurs and employees but also between employees of different firm sizes

Are there systematic differences between small and large firms?

Over the years in one firm, do employees increase, decrease, or maintain their number of applied skills?

(H2) The positive effect of human capital formation on skill balance is highest for entrepreneurs, followed by small business employees, and then large business employees.

Determinants

Skill Balance

Implications for Wages

Lazear Jack of all trades (2005):

- increase in skill variety has positive returns for entrepreneurs but not for specialist employees

Astebro & Thompson taste for variety idea (2009):

- entrepreneurs decrease income with greater skill variety
- but: measure too rough to pick up jack-of-all-trades

Hartung et al. Jack of all trades (2009):

- higher dispersion of individual skill levels hampers entrepreneurial earnings but does not affect employees'
- measure: individuals' abilities

If employees worked as generalists and took advantage of their skill balances, would that pay off for them?

(H3) Entrepreneurs will receive the highest returns for an increase in skill balance, followed by small business employees, and then large business employees.

The Effect of Skill Level

Skill measurements used for jack-of-all-trades (Lazear 2004, 2005; Wagner 2003, 2006):

- variety of individual study curriculums
 - number of roles during job career
 - number of different types of trainings after school
 - number of times a change of profession occurred
- prior accumulated knowledge in terms of scope but not level



Are the returns not only affected by the number of things one has learned but also by the depth of knowledge in an area?

(H4) The returns to skill balance of all groups are affected by skill scope and skill level.

Returns

THEORY

Business Size

Jack-of-all-trades (Lazear 2004, 2005):

Entrepreneurs invest in a number of skills and aim to reach an equal amount in each.

Paid Employees invest in their speciality and, therefore, do not care about balancing skills.

Support for jack-of-all-trades for entrepreneurs was also found by Wagner 2003, 2006, Silva 2007, Astebro & Thompson 2009

Small Firm Effect

Small firms are fertile breeding grounds for entrepreneurs (cf. Wagner 2004, Parker 2009, Elfenbein et al. 2010): entrepreneurs breed entrepreneurs.

Systematic differences exist between firms in their intra-organizational ability to make use of labor division.

Firm size and employees have not been combined in the analysis of skill balance - what relationship could we then expect?

(H1) Entrepreneurs will have the highest skill balance, followed by small business employees, and then large business employees.

small business employees, and then large business employees.

Human Capital Formation

Human capital formation can increase skill levels, skill scope or both - correspondingly leading to skill balance or specialization.

Formal education (e.g. university degree)

Informal education (e.g. work experience)

Nonformal education (e.g. continuing education)

→ effect of education differs not only between entrepreneurs and employees but also between employees of different firm sizes

Are there systematic differences between small and large firms?

Over the years in one firm, do employees increase, decrease, or maintain their number of applied skills?

(H2) The positive effect of human capital formation on skill balance is highest for entrepreneurs, followed by small business employees, and then large business employees.

Business Size

Jack-of-all-trades (Lazear 2004, 2005):

- Entrepreneurs invest in a number of skills and aim to reach an equal amount in each
- Paid Employees invest in their speciality and, therefore, do not care about balancing skills.

Support for jack-of-all-trades for entrepreneurs was also found by Wagner 2003, 2006, Silva 2007, Astebro & Thompson 2009

Small Firm Effect

- Small firms are fertile breeding grounds for entrepreneurs (cf. Wagner 2004, Parker 2009, Elfenbein et al. 2010): entrepreneurs breed entrepreneurs.
- Systematic differences exist between firms in their intra-organizational ability to make use of labor division.

Firm size and employees have not been combined in the analysis of skill balance - what relationship could we then expect?

(H1) Entrepreneurs will have the highest skill balance, followed by small business employees, and then large business employees.

Human Capital Formation

Human capital formation can increase skill levels, skill scope or both - correspondingly leading to skill balance or specialization.

- Formal education (e.g. university degree)
- Informal education (e.g. work experience)
- Nonformal education (e.g. continuing education)

→ effect of education differs not only between entrepreneurs and employees but also between employees of different firm sizes

Are there systematic differences between small and large firms?

Over the years in one firm, do employees increase, decrease, or maintain their number of applied skills?

(H2) The positive effect of human capital formation on skill balance is highest for entrepreneurs, followed by small business employees, and then large business employees.

Determinants

Skill Balance

Implications for Wages

Lazear Jack of all trades (2005):

- increase in skill variety has positive returns for entrepreneurs but not for specialist employees

Astebro & Thompson taste for variety idea (2009):

- entrepreneurs decrease income with greater skill variety
- but: measure too rough to pick up jack-of-all-trades

Hartung et al. Jack of all trades (2009):

- higher dispersion of individual skill levels hampers entrepreneurial earnings but does not affect employees'
- measure: individuals' abilities

If employees worked as generalists and took advantage of their skill balances, would that pay off for them?

(H3) Entrepreneurs will receive the highest returns for an increase in skill balance, followed by small business employees, and then large business employees.

The Effect of Skill Level

Skill measurements used for jack-of-all-trades (Lazear 2004, 2005; Wagner 2003, 2006):

- variety of individual study curriculums
 - number of roles during job career
 - number of different types of trainings after school
 - number of times a change of profession occurred
- prior accumulated knowledge in terms of scope but not level



Are the returns not only affected by the number of things one has learned but also by the depth of knowledge in an area?

(H4) The returns to skill balance of all groups are affected by skill scope and skill level.

Returns

THEORY



Implications for Wages

Lazear jack-of-all-trades (2005):

- increase in skill variety has positive returns for entrepreneurs but not for specialist employees

Astebro & Thompson taste-for-variety idea (2009):

- entrepreneurs decrease income with greater skill variety
- but: measure too rough to pick up jack-of-all-trades

Hartog et al. jack-of-all-trades (2009):

- higher dispersion of individual skill levels hurts entrepreneurial earnings but does not affect employees'
- measure: individuals' abilities

If employees worked as generalists and took advantage of their skill balances, would that pay off for them?

(H3) Entrepreneurs will receive the highest returns for an increase in skill balance, followed by small business employees, and then large business employees.

The Effect of Skill Level

Skill measurements used for jack-of-all-trades (Lazear 2004, 2005; Wagner 2003, 2006):

- variety of individual study curriculums
- number of roles during job career
- number of different types of trainings after school
- number of times a change of profession occurred

→ prior accumulated knowledge in terms of scope but not level



Are the returns not only effected by the number of things one has learned but also by the depth of knowledge in an area?

(H4) The returns to skill balance of all groups are affected by skill scope and skill level.

height

quantity



The Effect of Skill Level

Skill measurements used for jack-of-all-trades (Lazear 2004, 2005; Wagner 2003, 2006):

- variety of individual study curriculums
- number of roles during job career
- number of different types of trainings after school
- number of times a change of profession occurred

→ prior accumulated knowledge in terms of scope but not level



Are the returns not only effected by the number of things one has learned but also by the depth of knowledge in an area?

(H4) The returns to skill balance of all groups are affected by skill scope and skill level.

Presentation at TASKS | January 17, 2011

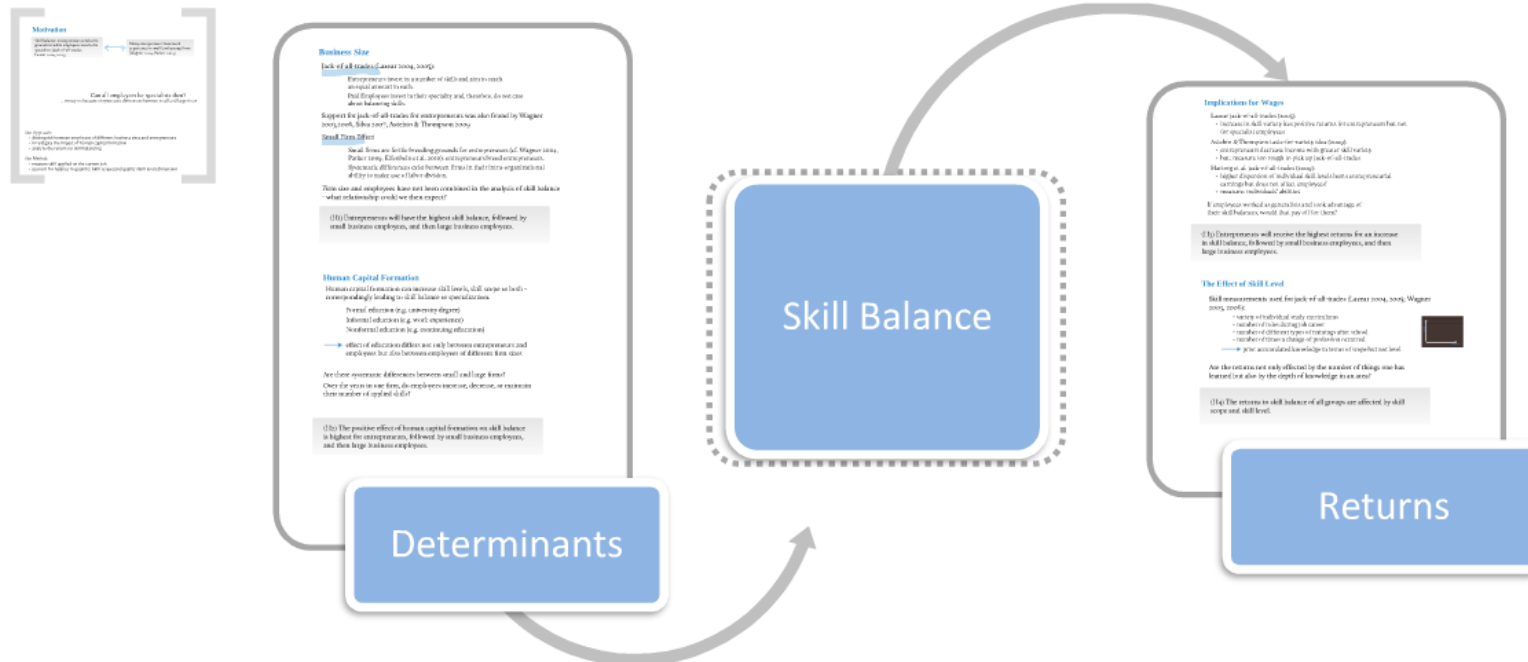
The Skill Balancing Act: Determinants of and Returns to Balanced Skills

Elisabeth Bublitz & Florian Noseleit

Friedrich Schiller University Jena

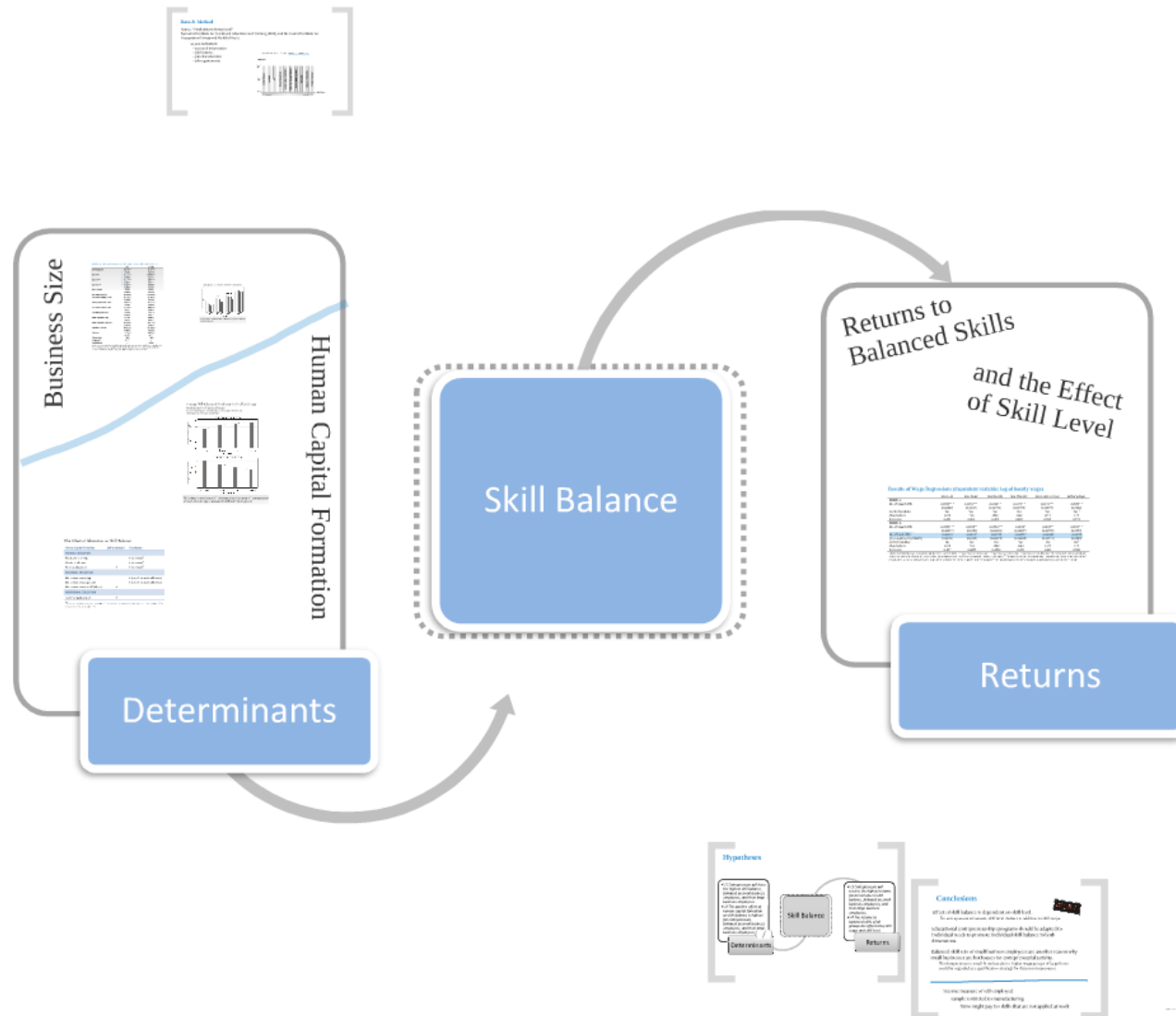
University of Groningen

Collaborative Research Center (SFB 580)



THEORY

RESULTS

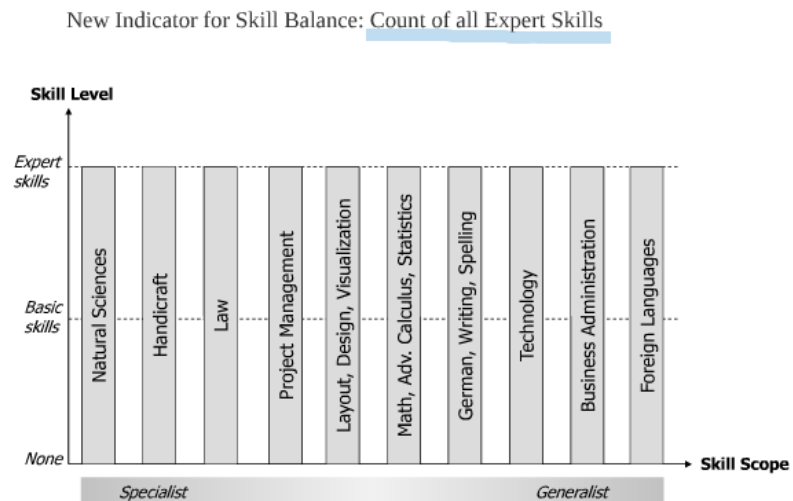


Data & Method

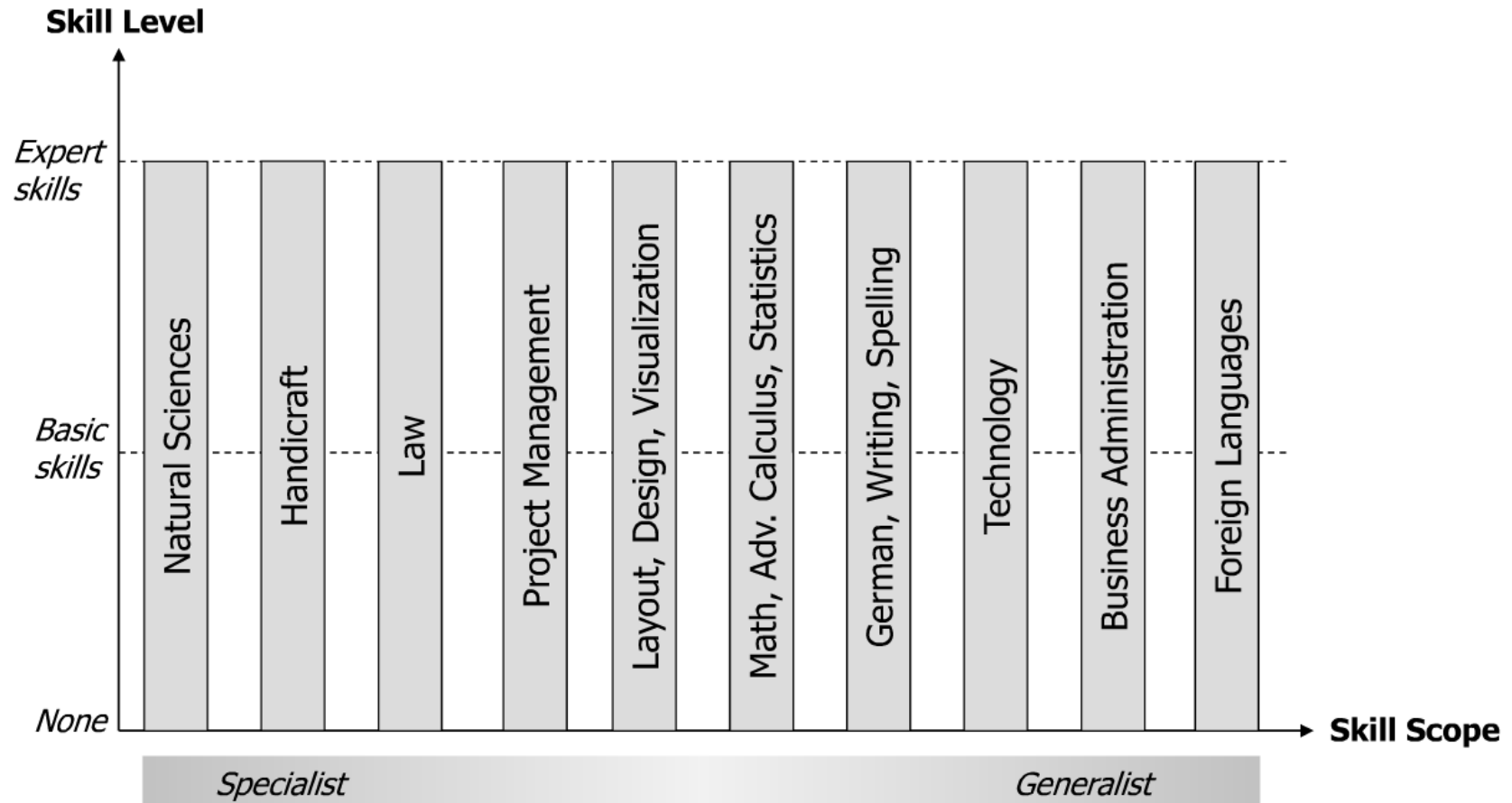
Source: "Employment Survey 2006"
by Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA)

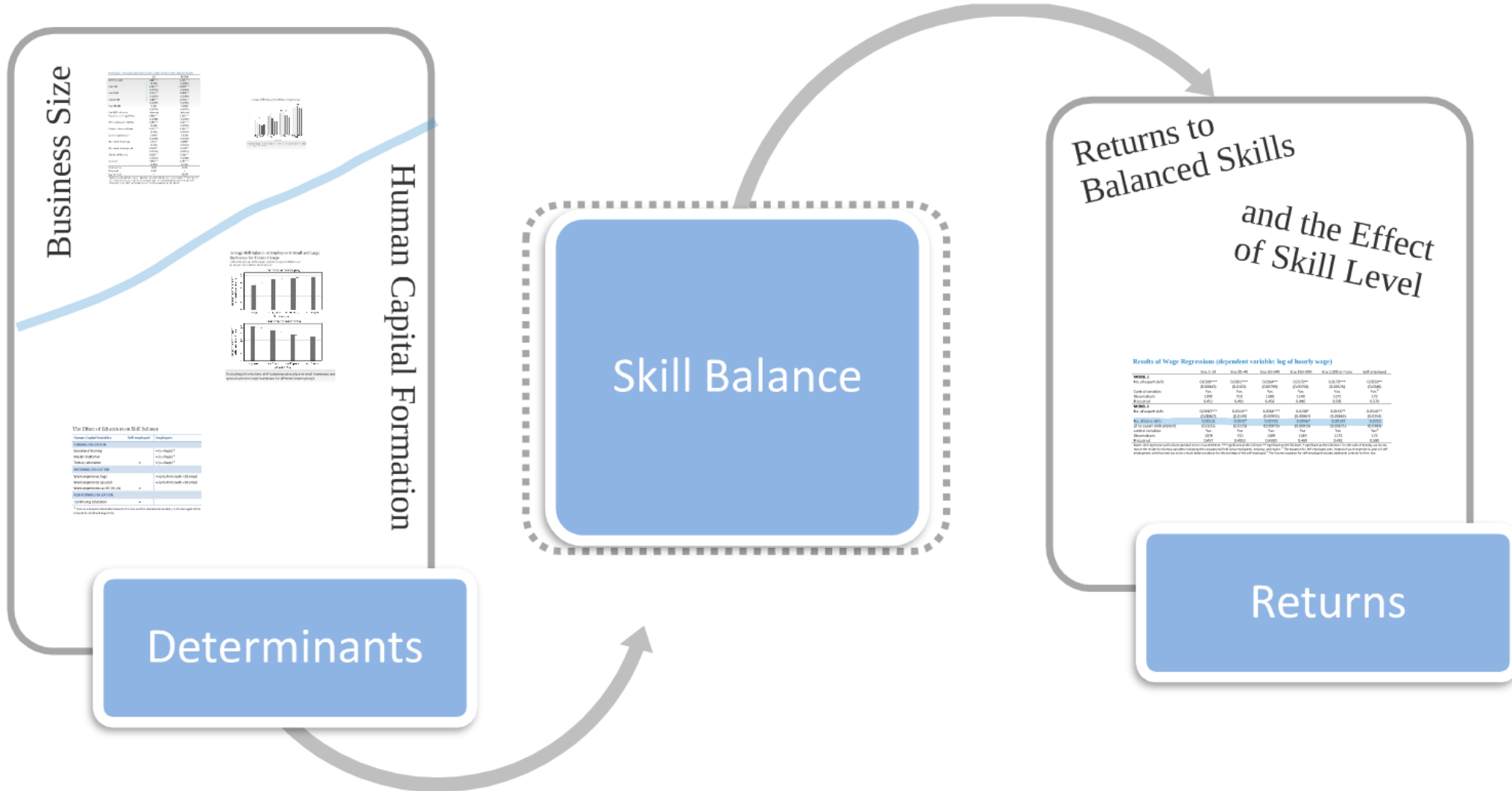
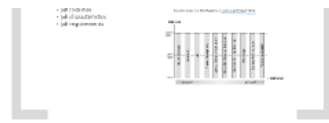
20,000 individuals

- personal information
- job histories
- job characteristics
- job requirements



New Indicator for Skill Balance: Count of all Expert Skills





Business Size

Human Capital Formation

Skill Balance

Returns to
Balanced Skills
and the Effect
of Skill Level

Returns

Determinants

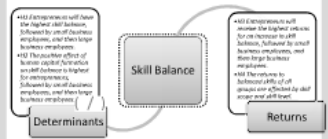
The Effect of Education on Skill Balance

Variable	Estimate	t-statistic
Constant	0.0000	0.0000
Education	0.0000	0.0000
Experience	0.0000	0.0000
Age	0.0000	0.0000
Female	0.0000	0.0000
Married	0.0000	0.0000
Health	0.0000	0.0000
Family size	0.0000	0.0000
Constant	0.0000	0.0000
Education	0.0000	0.0000
Experience	0.0000	0.0000
Age	0.0000	0.0000
Female	0.0000	0.0000
Married	0.0000	0.0000
Health	0.0000	0.0000
Family size	0.0000	0.0000

Results of Wage Regression (dependent variable: log of hourly wage)

Variable	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Constant	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Experience	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Age	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Female	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Married	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Family size	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Hypotheses



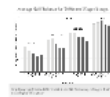
Conclusions

Effects of skill balance is dependent on skill level.
The entrepreneurial success (and) failure is not only a skill issue.
Educational (entrepreneurship) programs should be adapted to individual needs to promote individual skill balance in both dimensions.
Balanced skill sets of small business employees are another reason why small businesses are best places for entrepreneurial activity.
Much experience in small firms has been in higher wage groups of large firms could be transferred to a small business context for the future entrepreneurs.

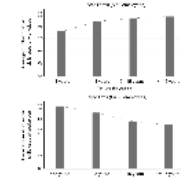
Business Size

Table 1: Mean absolute error (MAE) for different business sizes

Business Size	MAE
Small	0.15
Medium	0.12
Large	0.10



Average Skill Balance of Employees in Small and Large Businesses for Various Groups



Excluding job workers, skill balance is higher in small businesses and specialized in large businesses for different groups.

The Effect of Education on Skill Balance

Human Capital Variable	Self-employed	Employees
Formal education		
Vocational training		+ 0.18 (sig)
Master and higher		+ 0.18 (sig)
Technical education		+ 0.18 (sig)
Informal education		
Work experience (log)		+ 0.18 (sig)
Work experience (linear)		+ 0.18 (sig)
Work experience (quadratic)		+ 0.18 (sig)
Nonformal education		
Continuing education		

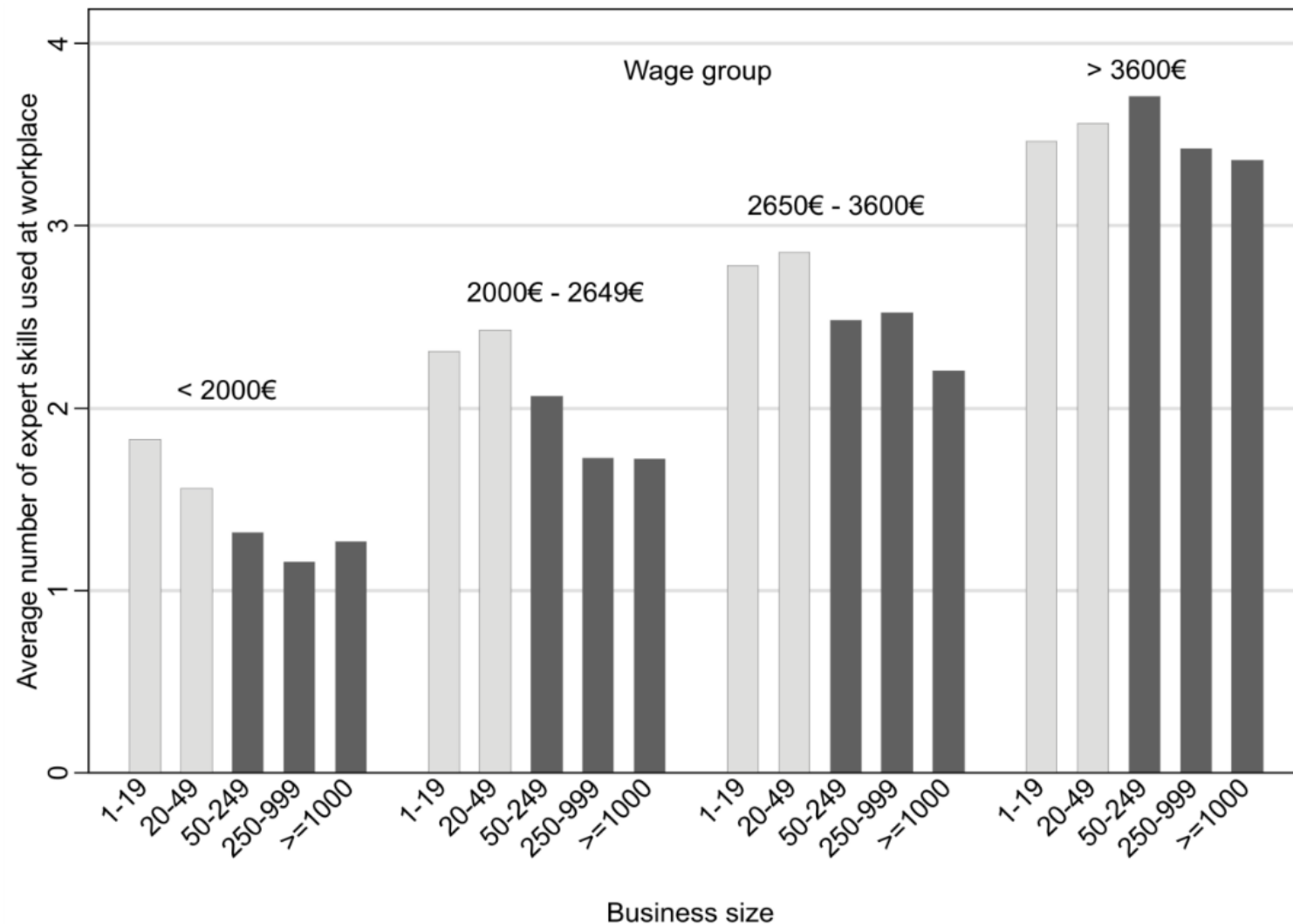
* These results are based on the results of the regression analysis. The results are based on the results of the regression analysis.

Human Capital Formation

Skill Balance

Determinants

Average Skill Balance for Different Wage Groups



Employees apply more skills at work in smaller businesses, as long as their wage is not higher than 3600€.

Skill balance - full sample (dependent variable: number of expert skills applied on the job)

	OLS	NEGBIN
Self-employed	0.847*** (0.160)	0.251*** (0.0450)
Size 1-19	0.243*** (0.0761)	0.0977*** (0.0314)
Size 20-49	0.224*** (0.0825)	0.0845** (0.0343)
Size 50-249	0.188*** (0.0687)	0.0700** (0.0281)
Size 249-999	0.110 (0.0676)	0.0404 (0.0276)
Size 1000 and more	reference	reference
Vocational training (1=Yes)	0.438*** (0.0788)	0.319*** (0.0579)
Tertiary education (1=Yes)	1.094*** (0.108)	0.552*** (0.0619)
Master craftsman (1=Yes)	1.227*** (0.112)	0.605*** (0.0625)
Continuing education	0.0466 (0.0591)	0.0239 (0.0233)
Work experience (log)	0.216* (0.126)	0.0864* (0.0523)
Work experience squared	-0.0567** (0.0266)	-0.0237** (0.0111)
Gender (1=Female)	-0.813*** (0.0601)	-0.391*** (0.0298)
Constant	2.474*** (0.476)	0.697*** (0.223)
Observations	5669	5669
R-squared	0.322	—
Loglikelihood	—	-10064

Notes: OLS and negative binomial regression. Robust standard errors in parentheses. *** significant at 1%, ** significant at 5%, * significant at the 10 % level. For brevity we do not report the results for dummy variables indicating the occupational field (employees only) and industry.

Skill balance - full sample (dependent variable: number of expert skills applied on the job)

	OLS	NEGBIN
Self-employed	0.847*** (0.160)	0.251*** (0.0450)
Size 1-19	0.243*** (0.0761)	0.0977*** (0.0314)
Size 20-49	0.224*** (0.0825)	0.0845** (0.0343)
Size 50-249	0.188*** (0.0687)	0.0700** (0.0281)
Size 249-999	0.110 (0.0676)	0.0404 (0.0276)
Size 1000 and more	reference	reference
Vocational training (1=Yes)	0.438*** (0.0788)	0.319*** (0.0579)
Tertiary education (1=Yes)	1.094*** (0.108)	0.552*** (0.0619)
Master craftsman (1=Yes)	1.227*** (0.112)	0.605*** (0.0625)
Continuing education	0.0466 (0.0591)	0.0239 (0.0233)
Work experience (log)	0.216* (0.126)	0.0864* (0.0523)

Business Size

Table 1: Mean absolute error (MAE) for different business sizes		
Business Size	MAE	MAE (95% CI)
Small (1-9 employees)	0.012	(0.010, 0.014)
Medium (10-49 employees)	0.015	(0.013, 0.017)
Large (50-99 employees)	0.018	(0.016, 0.020)
Very Large (100-499 employees)	0.021	(0.019, 0.023)
Extremely Large (500-999 employees)	0.024	(0.022, 0.026)
Global (1000+ employees)	0.027	(0.025, 0.029)
Multi-national (1000+ employees)	0.030	(0.028, 0.032)
Government (1000+ employees)	0.033	(0.031, 0.035)
Non-profit (1000+ employees)	0.036	(0.034, 0.038)
Academic (1000+ employees)	0.039	(0.037, 0.041)
Healthcare (1000+ employees)	0.042	(0.040, 0.044)
Finance (1000+ employees)	0.045	(0.043, 0.047)
Technology (1000+ employees)	0.048	(0.046, 0.050)
Manufacturing (1000+ employees)	0.051	(0.049, 0.053)
Retail (1000+ employees)	0.054	(0.052, 0.056)
Food & Beverage (1000+ employees)	0.057	(0.055, 0.059)
Transportation (1000+ employees)	0.060	(0.058, 0.062)
Energy (1000+ employees)	0.063	(0.061, 0.065)
Media & Entertainment (1000+ employees)	0.066	(0.064, 0.068)
Real Estate (1000+ employees)	0.069	(0.067, 0.071)
Legal (1000+ employees)	0.072	(0.070, 0.074)
Consulting (1000+ employees)	0.075	(0.073, 0.077)
Advertising (1000+ employees)	0.078	(0.076, 0.080)
Insurance (1000+ employees)	0.081	(0.079, 0.083)
Telecommunications (1000+ employees)	0.084	(0.082, 0.086)
Utilities (1000+ employees)	0.087	(0.085, 0.089)
Health Services (1000+ employees)	0.090	(0.088, 0.092)
Education Services (1000+ employees)	0.093	(0.091, 0.095)
Non-governmental Organizations (1000+ employees)	0.096	(0.094, 0.098)
International Organizations (1000+ employees)	0.099	(0.097, 0.101)
Governmental Organizations (1000+ employees)	0.102	(0.100, 0.104)
Academic Institutions (1000+ employees)	0.105	(0.103, 0.107)
Healthcare Providers (1000+ employees)	0.108	(0.106, 0.110)
Financial Institutions (1000+ employees)	0.111	(0.109, 0.113)
Technology Companies (1000+ employees)	0.114	(0.112, 0.116)
Manufacturing Firms (1000+ employees)	0.117	(0.115, 0.119)
Retail Chains (1000+ employees)	0.120	(0.118, 0.122)
Food & Beverage Chains (1000+ employees)	0.123	(0.121, 0.125)
Transportation Companies (1000+ employees)	0.126	(0.124, 0.128)
Energy Companies (1000+ employees)	0.129	(0.127, 0.131)
Media & Entertainment Companies (1000+ employees)	0.132	(0.130, 0.134)
Real Estate Firms (1000+ employees)	0.135	(0.133, 0.137)
Legal Firms (1000+ employees)	0.138	(0.136, 0.140)
Consulting Firms (1000+ employees)	0.141	(0.139, 0.143)
Advertising Agencies (1000+ employees)	0.144	(0.142, 0.146)
Insurance Companies (1000+ employees)	0.147	(0.145, 0.149)
Telecommunications Companies (1000+ employees)	0.150	(0.148, 0.152)
Utilities Companies (1000+ employees)	0.153	(0.151, 0.155)
Health Services Providers (1000+ employees)	0.156	(0.154, 0.158)
Education Services Providers (1000+ employees)	0.159	(0.157, 0.161)
Non-governmental Organizations (1000+ employees)	0.162	(0.160, 0.164)
International Organizations (1000+ employees)	0.165	(0.163, 0.167)
Governmental Organizations (1000+ employees)	0.168	(0.166, 0.170)
Academic Institutions (1000+ employees)	0.171	(0.169, 0.173)
Healthcare Providers (1000+ employees)	0.174	(0.172, 0.176)
Financial Institutions (1000+ employees)	0.177	(0.175, 0.179)
Technology Companies (1000+ employees)	0.180	(0.178, 0.182)
Manufacturing Firms (1000+ employees)	0.183	(0.181, 0.185)
Retail Chains (1000+ employees)	0.186	(0.184, 0.188)
Food & Beverage Chains (1000+ employees)	0.189	(0.187, 0.191)
Transportation Companies (1000+ employees)	0.192	(0.190, 0.194)
Energy Companies (1000+ employees)	0.195	(0.193, 0.197)
Media & Entertainment Companies (1000+ employees)	0.198	(0.196, 0.200)
Real Estate Firms (1000+ employees)	0.201	(0.199, 0.203)
Legal Firms (1000+ employees)	0.204	(0.202, 0.206)
Consulting Firms (1000+ employees)	0.207	(0.205, 0.209)
Advertising Agencies (1000+ employees)	0.210	(0.208, 0.212)
Insurance Companies (1000+ employees)	0.213	(0.211, 0.215)
Telecommunications Companies (1000+ employees)	0.216	(0.214, 0.218)
Utilities Companies (1000+ employees)	0.219	(0.217, 0.221)
Health Services Providers (1000+ employees)	0.222	(0.220, 0.224)
Education Services Providers (1000+ employees)	0.225	(0.223, 0.227)
Non-governmental Organizations (1000+ employees)	0.228	(0.226, 0.230)
International Organizations (1000+ employees)	0.231	(0.229, 0.233)
Governmental Organizations (1000+ employees)	0.234	(0.232, 0.236)
Academic Institutions (1000+ employees)	0.237	(0.235, 0.239)
Healthcare Providers (1000+ employees)	0.240	(0.238, 0.242)
Financial Institutions (1000+ employees)	0.243	(0.241, 0.245)
Technology Companies (1000+ employees)	0.246	(0.244, 0.248)
Manufacturing Firms (1000+ employees)	0.249	(0.247, 0.251)
Retail Chains (1000+ employees)	0.252	(0.250, 0.254)
Food & Beverage Chains (1000+ employees)	0.255	(0.253, 0.257)
Transportation Companies (1000+ employees)	0.258	(0.256, 0.260)
Energy Companies (1000+ employees)	0.261	(0.259, 0.263)
Media & Entertainment Companies (1000+ employees)	0.264	(0.262, 0.266)
Real Estate Firms (1000+ employees)	0.267	(0.265, 0.269)
Legal Firms (1000+ employees)	0.270	(0.268, 0.272)
Consulting Firms (1000+ employees)	0.273	(0.271, 0.275)
Advertising Agencies (1000+ employees)	0.276	(0.274, 0.278)
Insurance Companies (1000+ employees)	0.279	(0.277, 0.281)
Telecommunications Companies (1000+ employees)	0.282	(0.280, 0.284)
Utilities Companies (1000+ employees)	0.285	(0.283, 0.287)
Health Services Providers (1000+ employees)	0.288	(0.286, 0.290)
Education Services Providers (1000+ employees)	0.291	(0.289, 0.293)
Non-governmental Organizations (1000+ employees)	0.294	(0.292, 0.296)
International Organizations (1000+ employees)	0.297	(0.295, 0.299)
Governmental Organizations (1000+ employees)	0.300	(0.298, 0.302)
Academic Institutions (1000+ employees)	0.303	(0.301, 0.305)
Healthcare Providers (1000+ employees)	0.306	(0.304, 0.308)
Financial Institutions (1000+ employees)	0.309	(0.307, 0.311)
Technology Companies (1000+ employees)	0.312	(0.310, 0.314)
Manufacturing Firms (1000+ employees)	0.315	(0.313, 0.317)
Retail Chains (1000+ employees)	0.318	(0.316, 0.320)
Food & Beverage Chains (1000+ employees)	0.321	(0.319, 0.323)
Transportation Companies (1000+ employees)	0.324	(0.322, 0.326)
Energy Companies (1000+ employees)	0.327	(0.325, 0.329)
Media & Entertainment Companies (1000+ employees)	0.330	(0.328, 0.332)
Real Estate Firms (1000+ employees)	0.333	(0.331, 0.335)
Legal Firms (1000+ employees)	0.336	(0.334, 0.338)
Consulting Firms (1000+ employees)	0.339	(0.337, 0.341)
Advertising Agencies (1000+ employees)	0.342	(0.340, 0.344)
Insurance Companies (1000+ employees)	0.345	(0.343, 0.347)
Telecommunications Companies (1000+ employees)	0.348	(0.346, 0.350)
Utilities Companies (1000+ employees)	0.351	(0.349, 0.353)
Health Services Providers (1000+ employees)	0.354	(0.352, 0.356)
Education Services Providers (1000+ employees)	0.357	(0.355, 0.359)
Non-governmental Organizations (1000+ employees)	0.360	(0.358, 0.362)
International Organizations (1000+ employees)	0.363	(0.361, 0.365)
Governmental Organizations (1000+ employees)	0.366	(0.364, 0.368)
Academic Institutions (1000+ employees)	0.369	(0.367, 0.371)
Healthcare Providers (1000+ employees)	0.372	(0.370, 0.374)
Financial Institutions (1000+ employees)	0.375	(0.373, 0.377)
Technology Companies (1000+ employees)	0.378	(0.376, 0.380)
Manufacturing Firms (1000+ employees)	0.381	(0.379, 0.383)
Retail Chains (1000+ employees)	0.384	(0.382, 0.386)
Food & Beverage Chains (1000+ employees)	0.387	(0.385, 0.389)
Transportation Companies (1000+ employees)	0.390	(0.388, 0.392)
Energy Companies (1000+ employees)	0.393	(0.391, 0.395)
Media & Entertainment Companies (1000+ employees)	0.396	(0.394, 0.398)
Real Estate Firms (1000+ employees)	0.399	(0.397, 0.401)
Legal Firms (1000+ employees)	0.402	(0.400, 0.404)
Consulting Firms (1000+ employees)	0.405	(0.403, 0.407)
Advertising Agencies (1000+ employees)	0.408	(0.406, 0.410)
Insurance Companies (1000+ employees)	0.411	(0.409, 0.413)
Telecommunications Companies (1000+ employees)	0.414	(0.412, 0.416)
Utilities Companies (1000+ employees)	0.417	(0.415, 0.419)
Health Services Providers (1000+ employees)	0.420	(0.418, 0.422)
Education Services Providers (1000+ employees)	0.423	(0.421, 0.425)
Non-governmental Organizations (1000+ employees)	0.426	(0.424, 0.428)
International Organizations (1000+ employees)	0.429	(0.427, 0.431)
Governmental Organizations (1000+ employees)	0.432	(0.430, 0.434)
Academic Institutions (1000+ employees)	0.435	(0.433, 0.437)
Healthcare Providers (1000+ employees)	0.438	(0.436, 0.440)
Financial Institutions (1000+ employees)	0.441	(0.439, 0.443)
Technology Companies (1000+ employees)	0.444	(0.442, 0.446)
Manufacturing Firms (1000+ employees)	0.447	(0.445, 0.449)
Retail Chains (1000+ employees)	0.450	(0.448, 0.452)
Food & Beverage Chains (1000+ employees)	0.453	(0.451, 0.455)
Transportation Companies (1000+ employees)	0.456	(0.454, 0.458)
Energy Companies (1000+ employees)	0.459	(0.457, 0.461)
Media & Entertainment Companies (1000+ employees)	0.462	(0.460, 0.464)
Real Estate Firms (1000+ employees)	0.465	(0.463, 0.467)
Legal Firms (1000+ employees)	0.468	(0.466, 0.470)
Consulting Firms (1000+ employees)	0.471	(0.469, 0.473)
Advertising Agencies (1000+ employees)	0.474	(0.472, 0.476)
Insurance Companies (1000+ employees)	0.477	(0.475, 0.479)
Telecommunications Companies (1000+ employees)	0.480	(0.478, 0.482)
Utilities Companies (1000+ employees)	0.483	(0.481, 0.485)
Health Services Providers (1000+ employees)	0.486	(0.484, 0.488)
Education Services Providers (1000+ employees)	0.489	(0.487, 0.491)
Non-governmental Organizations (1000+ employees)	0.492	(0.490, 0.494)
International Organizations (1000+ employees)	0.495	(0.493, 0.497)
Governmental Organizations (1000+ employees)	0.498	(0.496, 0.500)
Academic Institutions (1000+ employees)	0.501	(0.499, 0.503)
Healthcare Providers (1000+ employees)	0.504	(0.502, 0.506)
Financial Institutions (1000+ employees)	0.507	(0.505, 0.509)
Technology Companies (1000+ employees)	0.510	(0.508, 0.512)
Manufacturing Firms (1000+ employees)	0.513	(0.511, 0.515)
Retail Chains (1000+ employees)	0.516	(0.514, 0.518)
Food & Beverage Chains (1000+ employees)	0.519	(0.517, 0.521)
Transportation Companies (1000+ employees)	0.522	(0.520, 0.524)
Energy Companies (1000+ employees)	0.525	(0.523, 0.527)
Media & Entertainment Companies (1000+ employees)	0.528	(0.526, 0.530)
Real Estate Firms (1000+ employees)	0.531	(0.529, 0.533)
Legal Firms (1000+ employees)	0.534	(0.532, 0.536)
Consulting Firms (1000+ employees)	0.537	(0.535, 0.539)
Advertising Agencies (1000+ employees)	0.540	(0.538, 0.542)
Insurance Companies (1000+ employees)	0.543	(0.541, 0.545)
Telecommunications Companies (1000+ employees)	0.546	(0.544, 0.548)
Utilities Companies (1000+ employees)	0.549	(0.547, 0.551)
Health Services Providers (1000+ employees)	0.552	(0.550, 0.554)
Education Services Providers (1000+ employees)	0.555	(0.553, 0.557)
Non-governmental Organizations (1000+ employees)	0.558	(0.556, 0.560)
International Organizations (1000+ employees)	0.561	(0.559, 0.563)
Governmental Organizations (1000+ employees)	0.564	(0.562, 0.566)
Academic Institutions (1000+ employees)	0.567	(0.565, 0.569)
Healthcare Providers (1000+ employees)	0.570	(0.568, 0.572)
Financial Institutions (1000+ employees)	0.573	(0.571, 0.575)
Technology Companies (1000+ employees)	0.576	(0.574, 0.578)
Manufacturing Firms (1000+ employees)	0.579	(0.577, 0.581)
Retail Chains (1000+ employees)	0.582	(0.580, 0.584)
Food & Beverage Chains (1000+ employees)	0.585	(0.583, 0.587)
Transportation Companies (1000+ employees)	0.588	(0.586, 0.590)
Energy Companies (1000+ employees)	0.591	(0.589, 0.593)
Media & Entertainment Companies (1000+ employees)	0.594	(0.592, 0.596)
Real Estate Firms (1000+ employees)	0.597	(0.595, 0.599)
Legal Firms (1000+ employees)	0.600	(0.598, 0.602)
Consulting Firms (1000+ employees)	0.603	(0.601, 0.605)
Advertising Agencies (1000+ employees)	0.606	(0.604, 0.608)
Insurance Companies (1000+ employees)	0.609	(0.607, 0.611)
Telecommunications Companies (1000+ employees)	0.612	(0.610, 0.614)
Utilities Companies (1000+ employees)	0.615	(0.613, 0.617)
Health Services Providers (1000+ employees)	0.618	(0.616, 0.620)
Education Services Providers (1000+ employees)	0.621	(0.619, 0.623)
Non-governmental Organizations (1000+ employees)	0.624	(0.622, 0.626)
International Organizations (1000+ employees)	0.627	(0.625, 0.629)
Governmental Organizations (1000+ employees)	0.630	(0.628, 0.632)
Academic Institutions (1000+ employees)	0.633	(0.631, 0.635)
Healthcare Providers (1000+ employees)	0.636	(0.634, 0.638)
Financial Institutions (1000+ employees)	0.639	(0.637, 0.641)
Technology Companies (1000+ employees)	0.642	(0.640, 0.644)
Manufacturing Firms (1000+ employees)	0.645	(0.643, 0.647)
Retail Chains (1000+ employees)	0.648	(0.646, 0.650)
Food & Beverage Chains (1000+ employees)	0.651	(0.649, 0.653)
Transportation Companies (1000+ employees)	0.654	(0.652, 0.656)
Energy Companies (1000+ employees)	0.657	(0.655, 0.659)
Media & Entertainment Companies (1000+ employees)	0.660	(0.658, 0.662)
Real Estate Firms (1000+ employees)	0.663	(0.661, 0.665)
Legal Firms (1000+ employees)	0.666	(0.664, 0.668)
Consulting Firms (1000+ employees)	0.669	(0.667, 0.671)
Advertising Agencies (1000+ employees)	0.672	(0.670, 0.674)
Insurance Companies (1000+ employees)	0.675	(0.673, 0.677)
Telecommunications Companies (1000+ employees)	0.678	(0.676, 0.680)
Utilities Companies (1000+ employees)	0.681	(0.679, 0.683)
Health Services Providers (1000+ employees)	0.684	(0.682, 0.686)
Education Services Providers (1000+ employees)	0.687	(0.685, 0.689)
Non-governmental Organizations (1000+ employees)	0.690	(0.688, 0.692)
International Organizations (1000+ employees)	0.693	(0.691, 0.695)
Governmental Organizations (1000+ employees)	0.696	(0.694, 0.698)
Academic Institutions (1000+ employees)	0.699	(0.697, 0.701)
Healthcare Providers (1000+ employees)	0.702	(0.700, 0.704)
Financial Institutions (1000+ employees)	0.705	(0.703, 0.707)
Technology Companies (1000+ employees)	0.708	(0.706, 0.710)
Manufacturing Firms (1000+ employees)	0.711	(0.709, 0.713)
Retail Chains (1000+ employees)	0.714	(0.712, 0.716)
Food & Beverage Chains (1000+ employees)	0.717	(0.715, 0.719)
Transportation Companies (1000+ employees)	0.720	(0.718, 0.722)
Energy Companies (1000+ employees)	0.723	(0.721, 0.725)
Media & Entertainment Companies (1000+ employees)	0.726	(0.724, 0.728)
Real Estate Firms (1000+ employees)	0.729	(0.727, 0.731)
Legal Firms (1000+ employees)	0.732	(0.730, 0.734)
Consulting Firms (1000+ employees)	0.735	(0.733, 0.737)
Advertising Agencies (1000+ employees)	0.738	(0.736, 0.740)
Insurance Companies (1000+ employees)	0.741	(0.739, 0.743)
Telecommunications Companies (1000+ employees)	0.744	(0.742, 0.746)
Utilities Companies (1000+ employees)	0.747	(0.745, 0.749)
Health Services Providers (1000+ employees)	0.750	(0.748, 0.752)
Education Services Providers (1000+ employees)	0.753	(0.751, 0.755)
Non-governmental Organizations (1000+ employees)	0.756	(0.754, 0.758)
International Organizations (1000+ employees)	0.759	(0.757, 0.761)
Governmental Organizations (1000+ employees)	0.762	(0.760, 0.764)
Academic Institutions (1000+ employees)	0.765	(0.763, 0.767)
Healthcare Providers (1000+ employees)	0.768	(0.766, 0.770)
Financial Institutions (1000+ employees)	0.771	(0.769, 0.773)
Technology Companies (1000+ employees)	0.774	(0.772, 0.776)
Manufacturing Firms (1000+ employees)	0.777	(0.775, 0.779)
Retail Chains (1000+ employees)	0.780	(0.778, 0.782)
Food & Beverage Chains (1000+ employees)	0.783	(0.781, 0.785)
Transportation Companies (1000+ employees)	0.786	(0.784, 0.788)
Energy Companies (1000+ employees)	0.789	(0.787, 0.791)
Media & Entertainment Companies (1000+ employees)	0.792	(0.790, 0.794)
Real Estate Firms (1000+ employees)	0.795	(0.793, 0.797)
Legal Firms (1000+ employees)	0.798	(0.796, 0.800)
Consulting Firms (1000+ employees)	0.801	(0.799, 0.803)
Advertising Agencies (1000+ employees)	0.804	(0.802, 0.806)
Insurance Companies (1000+ employees)	0.807	(0.805, 0.809)
Telecommunications Companies (1000+ employees)	0.810	(0.808, 0.812)
Utilities Companies (1000+ employees)	0.813	(0.811, 0.815)
Health Services Providers		

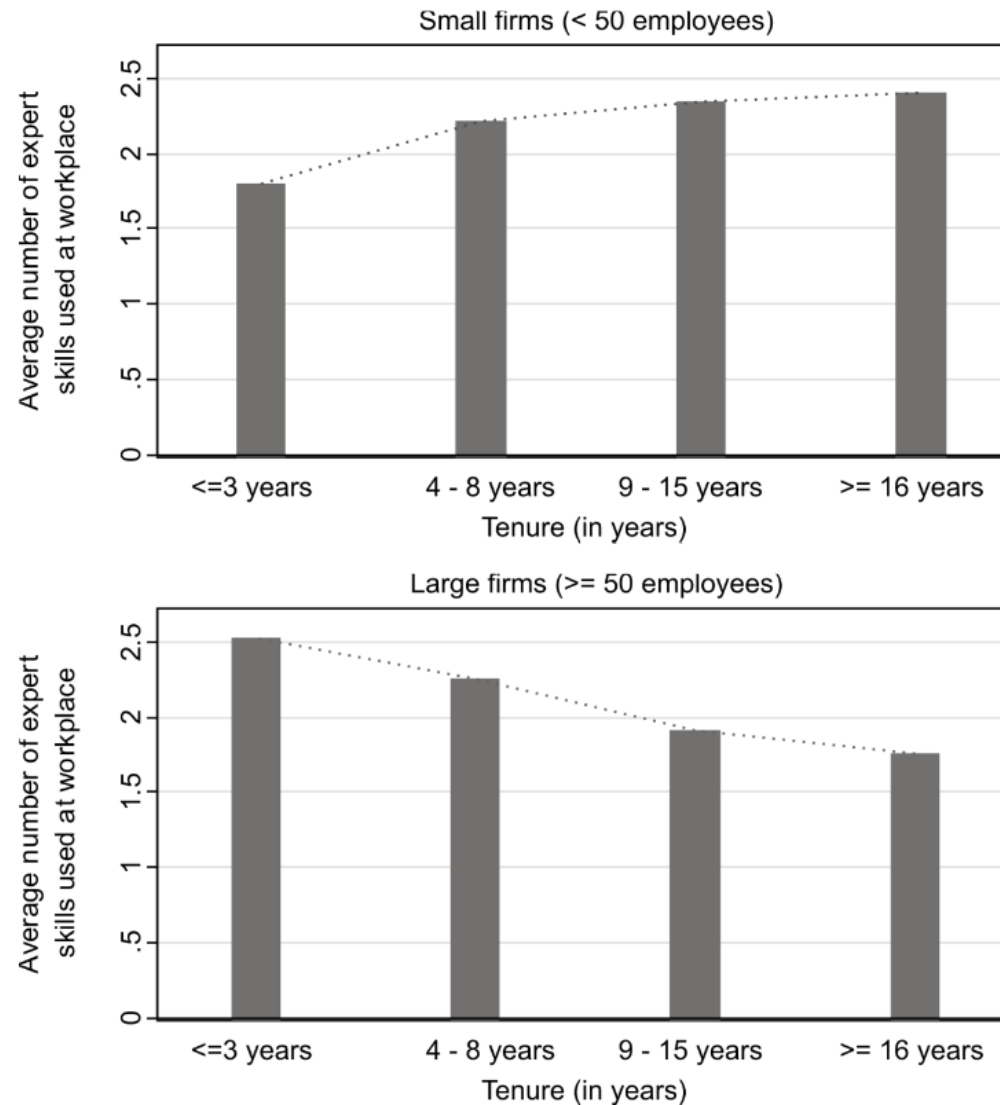
The Effect of Education on Skill Balance

Human Capital Variables	Self-employed	Employees
FORMAL EDUCATION		
Vocational training		+ (u-shape) ¹⁾
Master craftsman		+ (u-shape) ¹⁾
Tertiary education	+	+ (u-shape) ¹⁾
INFORMAL EDUCATION		
Work experience (log)		+ (only firms with <20 empl)
Work experience squared		+ (only firms with <20 empl)
Work experiences as SE (>9 yrs)	+	
NONFORMAL EDUCATION		
Continuing education	+	

¹⁾ There is u-shaped relationship between firm size and the educational variable, i.e. the strongest effect is found for small and large firms.

Average Skill Balance of Employees in Small and Large Businesses for Tenure Groups

(without employees within upper quartile of wage distribution and employees who switched the employer)



Excluding job switchers, skill balancing takes place in small businesses and specialization in large businesses for different tenure groups.

Business Size

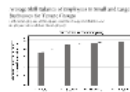
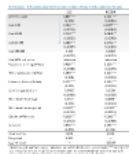


Figure 1: The effect of business size on skill balance

The Effect of Business Size on Skill Balance

Business size (small)	Highly skilled	Low skilled
Small business	0.0000***	0.0000***
Medium business	0.0000***	0.0000***
Large business	0.0000***	0.0000***
Very large business	0.0000***	0.0000***
Constant	0.0000***	0.0000***
Observations	1,000	1,000

Human Capital Formation

Skill Balance

Returns to Balanced Skills and the Effect of Skill Level

Results of Wage Regression (dependent variable: log of hourly wage)

	Small	Medium	Large	Very large	Highly skilled
Constant	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Observations	1,000	1,000	1,000	1,000	1,000
R-squared	0.0000	0.0000	0.0000	0.0000	0.0000

Determinants

Returns

Hypotheses

H1: Entrepreneurs will have higher skill balance, followed by one of business employees, and then by business employees.

H2: The business effect of human capital formation on skill balance is higher for entrepreneurs, followed by one of business employees, and then by business employees.

Skill Balance

H3: Entrepreneurs will have higher skill balance, followed by one of business employees, and then by business employees.

H4: The business effect of human capital formation on skill balance is higher for entrepreneurs, followed by one of business employees, and then by business employees.

Conclusions

Effect of skill balance is dependent on skill level. The entrepreneurial success (and) return is higher in skill level. Educational (entrepreneurship) programs should be adapted to individual needs to promote individual skill balance in both dimensions. Balanced skill sets of small business employees are another reason why small businesses are best places for entrepreneurial activity. Most experience in small businesses is in higher wage groups of large firms could be transferred to a small business owner for the future entrepreneurs.

ill Balance

Returns to Balanced Skills and the Effect of Skill Level

Results of Wage Regressions (dependent variable: log of hourly wage)

	Size 1-19	Size 20-49	Size 50-99	Size 100-499	Size 500 or more	Self-employed
MODEL 1						
No. of expert skills	0.0528*** (0.00842)	0.0291*** (0.0042)	0.0184*** (0.00296)	0.0170*** (0.00252)	0.0130*** (0.00276)	0.0109*** (0.00245)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6178	719	1880	1148	1132	172
R-squared	0.431	0.481	0.458	0.436	0.505	0.579
MODEL 2						
No. of expert skills	0.0530*** (0.00847)	0.0314*** (0.00584)	0.0204*** (0.00395)	0.0158*** (0.00367)	0.0125*** (0.00366)	0.0106*** (0.00251)
No. of basic skills (if no expert skills present)	0.00160 (0.0131)	-0.0182* (0.0071)	-0.00783 (0.00373)	-0.00567 (0.00311)	-0.00652 (0.00471)	-0.0021 (0.00301)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3178	719	1389	1149	1172	172
R-squared	0.423	0.482	0.459	0.458	0.481	0.580

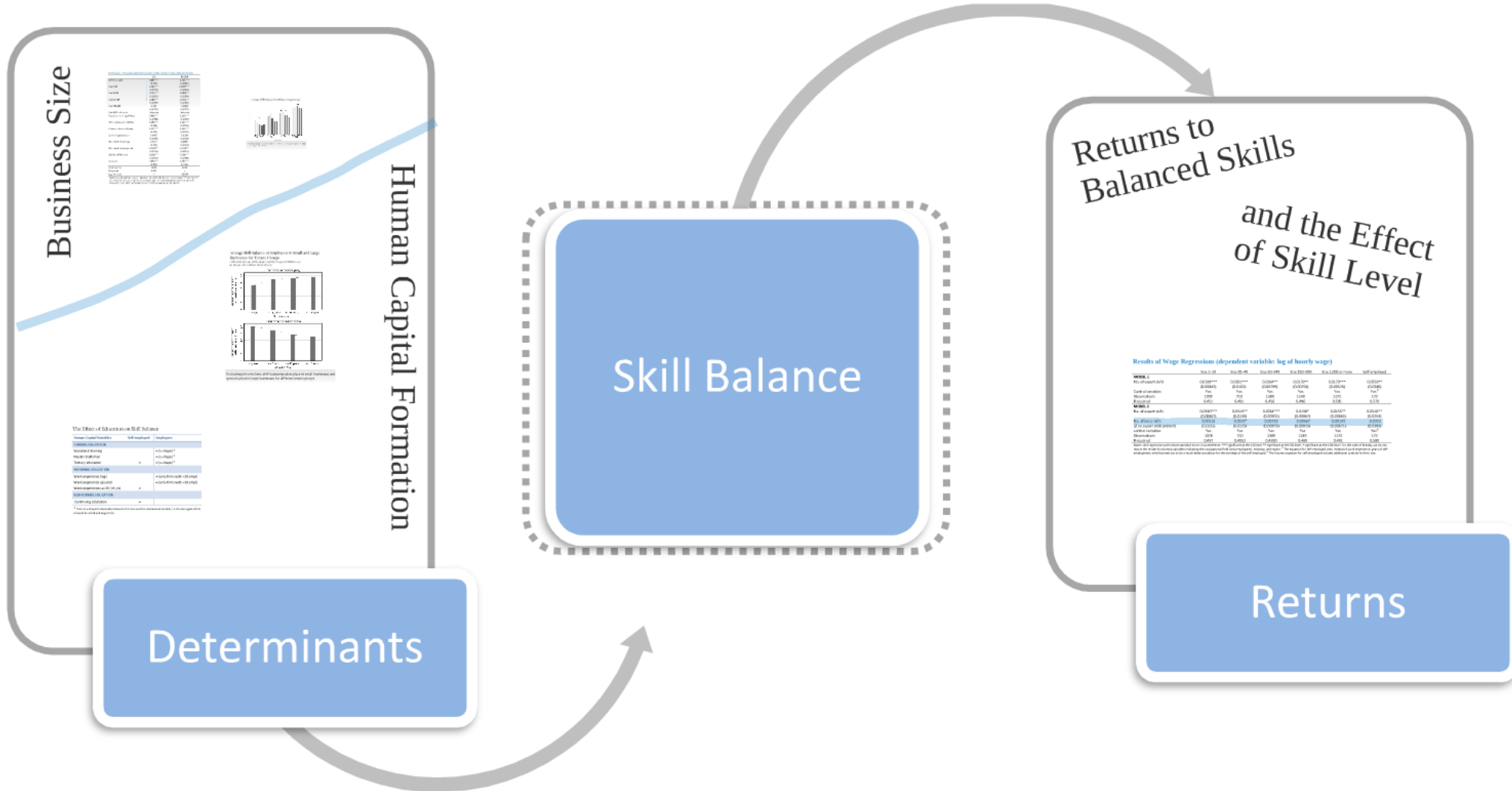
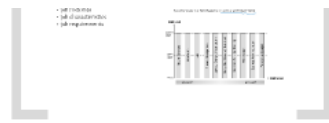
Notes: OLS regressions with robust standard errors in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. For the sake of brevity, we do not report the results for dummy variables indicating the occupational field (e.g. demand-based, creative, and routine). The coefficient for self-employment, restricted to work experience, years of self-employment, which turned out to be a weak predictor for the earnings of self-employed. The baseline equation for self-employed included a additional controls for firm size.

Returns

Results of Wage Regressions (dependent variable: log of hourly wage)

	Size 1–19	Size 20–49	Size 50–249	Size 250–999	Size 1,000 or more	Self-employed
MODEL 1						
No. of expert skills	0.0328*** (0.00842)	0.0291*** (0.0102)	0.0194** (0.00799)	0.0179** (0.00753)	0.0170*** (0.00576)	0.0559** (0.0240)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes ^B
Observations	1078	710	1389	1149	1172	172
R-squared	0.451	0.491	0.456	0.486	0.505	0.579
MODEL 2						
No. of expert skills	0.0330*** (0.00867)	0.0313** (0.0130)	0.0234*** (0.00901)	0.0158* (0.00867)	0.0155** (0.00636)	0.0516** (0.0253)
No. of basic skills (if no expert skills present)	0.00116 (0.0131)	-0.0192* (0.0115)	0.00733 (0.00873)	-0.00567 (0.00815)	-0.00142 (0.00671)	-0.0223 (0.0383)
control variables	Yes	Yes	Yes	Yes	Yes	Yes ^B
Observations	1078	710	1389	1149	1172	172
R-squared	0.437	0.4052	0.4390	0.469	0.491	0.580

Notes: OLS regression with robust standard errors in parentheses. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. For the sake of brevity, we do not report the results for dummy variables indicating the occupational field (only employees), industry, and region. ^A The equation for self-employed uses, instead of work experience, years of self-employment, which turned out to be a much better predictor for the earnings of the self-employed. ^B The income equation for self-employed includes additional controls for firm size.



Business Size

Human Capital Formation

Skill Balance

Returns to
Balanced Skills
and the Effect
of Skill Level

Returns

Determinants

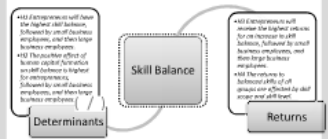
The Effect of Education on Skill Balance

Variable	Estimate	t-statistic
Constant	0.0000	0.0000
Education	0.0000	0.0000
Experience	0.0000	0.0000
Age	0.0000	0.0000
Gender	0.0000	0.0000
Married	0.0000	0.0000
Health	0.0000	0.0000
Family	0.0000	0.0000
Religion	0.0000	0.0000
Region	0.0000	0.0000
Constant	0.0000	0.0000

Results of Wage Regression (dependent variable: log of hourly wage)

Variable	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Constant	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Education	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Experience	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Age	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Gender	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Married	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Health	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Family	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Religion	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Region	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

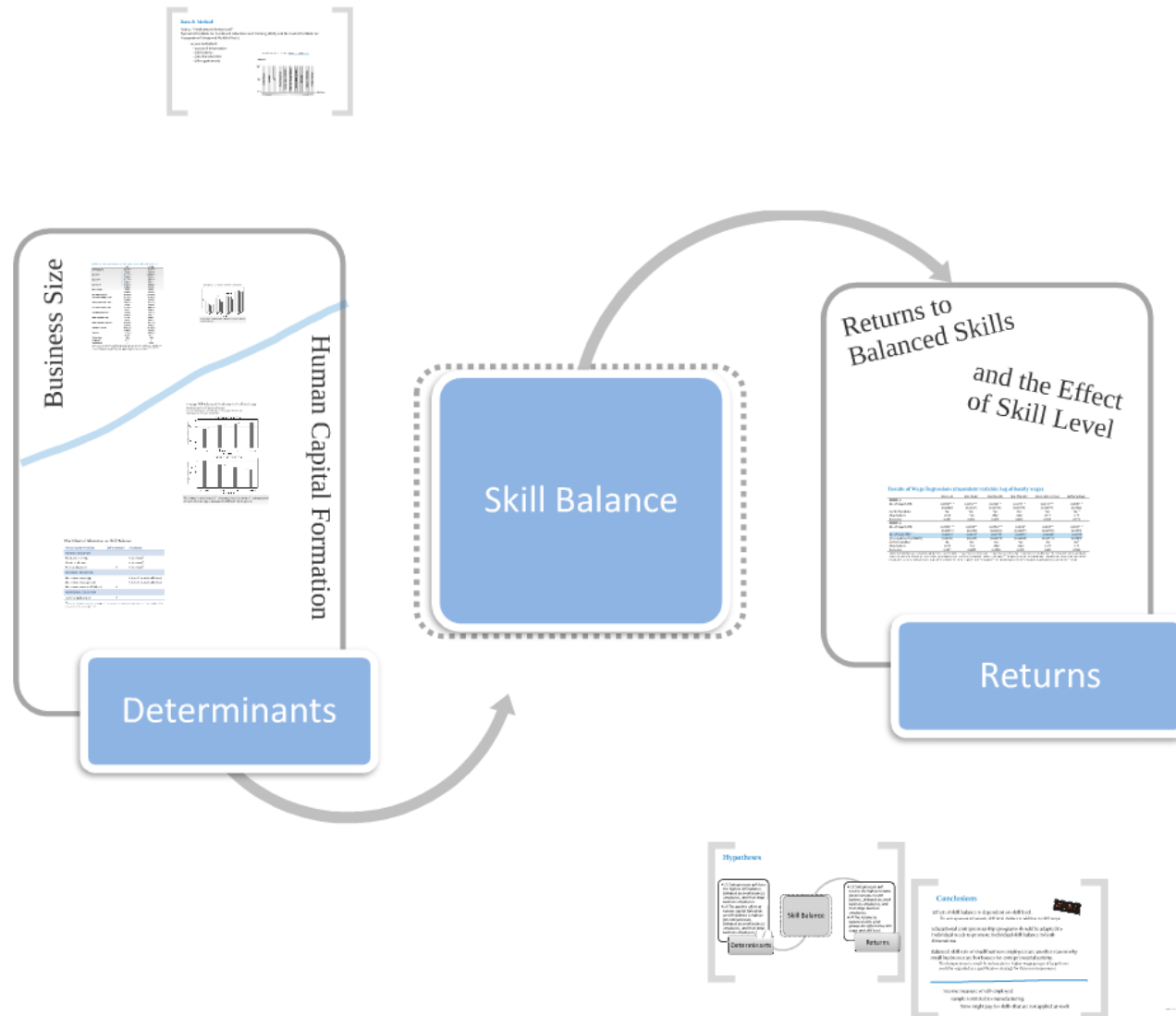
Hypotheses



Conclusions

Effect of skill balance is dependent on skill level.
The entrepreneurial success (and) failure is dependent on skill level.
Educational (entrepreneurship) programs should be designed to individual needs to promote individual skill balance in both dimensions.
Balanced skill sets of small business employees are another reason why small businesses are best places for entrepreneurial activity.
Most experience in small firms is in the high wage group of large firms could be transferred to a small business owner for the future entrepreneurs.

RESULTS



Hypotheses

- H1 Entrepreneurs will have the highest skill balance, followed by small business employees, and then large business employees. ✓
- H2 The positive effect of human capital formation on skill balance is highest for entrepreneurs, followed by small business employees, and then large business employees. (✓/✗)

Determinants

Skill Balance

- H3 Entrepreneurs will receive the highest returns for an increase in skill balance, followed by small business employees, and then large business employees. ✓
- H4 The returns to balanced skills of all groups are affected by skill scope and skill level. ✓

Returns

Conclusions



Effect of skill balance is dependent on skill level.

For entrepreneurial success, skill level matters in addition to skill scope.

Educational (entrepreneurship) programs should be adapted to individual needs to promote individual skill balance in both dimensions.

Balanced skill sets of small business employees are another reason why small businesses are hothouses for entrepreneurial activity.

Work experience in small firms but also in higher wage groups of large firms could be regarded as a qualification strategy for future entrepreneurs.

Conclusions



Effect of skill balance is dependent on skill level.

For entrepreneurial success, skill level matters in addition to skill scope.

Educational (entrepreneurship) programs should be adapted to individual needs to promote individual skill balance in both dimensions.

Balanced skill sets of small business employees are another reason why small businesses are hothouses for entrepreneurial activity.

Work experience in small firms but also in higher wage groups of large firms could be regarded as a qualification strategy for future entrepreneurs.

income measure of self-employed



sample restricted to manufacturing

firms might pay for skills that are not applied at work

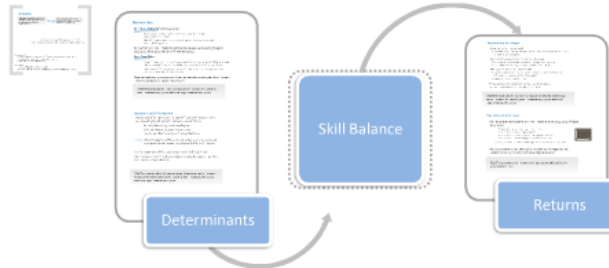
Thank you for your attention!



Presentation at TASKS | January 17, 2011

The Skill Balancing Act: Determinants of and Returns to Balanced Skills

Elisabeth Bublitz & Florian Noseleit
Friedrich Schiller University Jena
Collaborative Research Center (SFB 580)



THEORY

RESULTS

