

# Manufacturing Skill Gaps and the American Skill Production System: An Assessment

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Atlantic Council/UMD Workforce Development Meeting

December 6, 2013

(joint with Paul Osterman)



# What are the Issues?

- Background
  - High and persistent unemployment
  - Firms complain they can't find skilled workers
- Questions
  - Does mismatch/gap exist between employer demands and the supply of skills in the marketplace?
  - If so, is it a simple/mechanical result of inadequate worker skills, or are other more complex factors to blame (cyclical demand, corporate strategy, communication among economic actors, etc.)?

# Relevance/Impact

- Policymakers need to understand this issue in order to foster economic growth and improve economic outcomes for workers
  - If problem is just structural/skills gap: long-term ed. attainment and worker behavior
  - If other factors matter, other interventions may be necessary
    - Exhortations to increase STEM education may not solve the problem
    - Institutional approaches may be required: making connections with local labor market intermediaries, solving coordination/communication failures, etc.

# Presentation Goals

- Set boundaries on incidence of skill gaps
- Demonstrate simple skill mismatch story is inadequate
- Point to importance of intermediaries and institutions in addressing challenges in skill supplies

# Shortcomings of Existing Research

- Takes place at very abstract level without direct measurement
- Unemployment-vacancy indices (Sahin et al. 2012; Canon, Chen and Marifian 2013)
  - Are sensitive to changes in firm strategy (recruitment, wages)
  - Are sensitive to cyclicality
  - Vague measure: hides mechanism (geography? skills?)
  - Only measure inter-industry mismatch (Modestino 2010; Lazear and Spletzer 2012)
- Supply-Demand indices (Estevau and Tsounta 2011; Rothwell 2012)
  - Use education as proxy
    - Distorts demand measurement: college-educated barista
    - Ignores within-education variation in skills
    - Proxy on both sides: any regional or intra-industry variation generates mismatch

# Approach

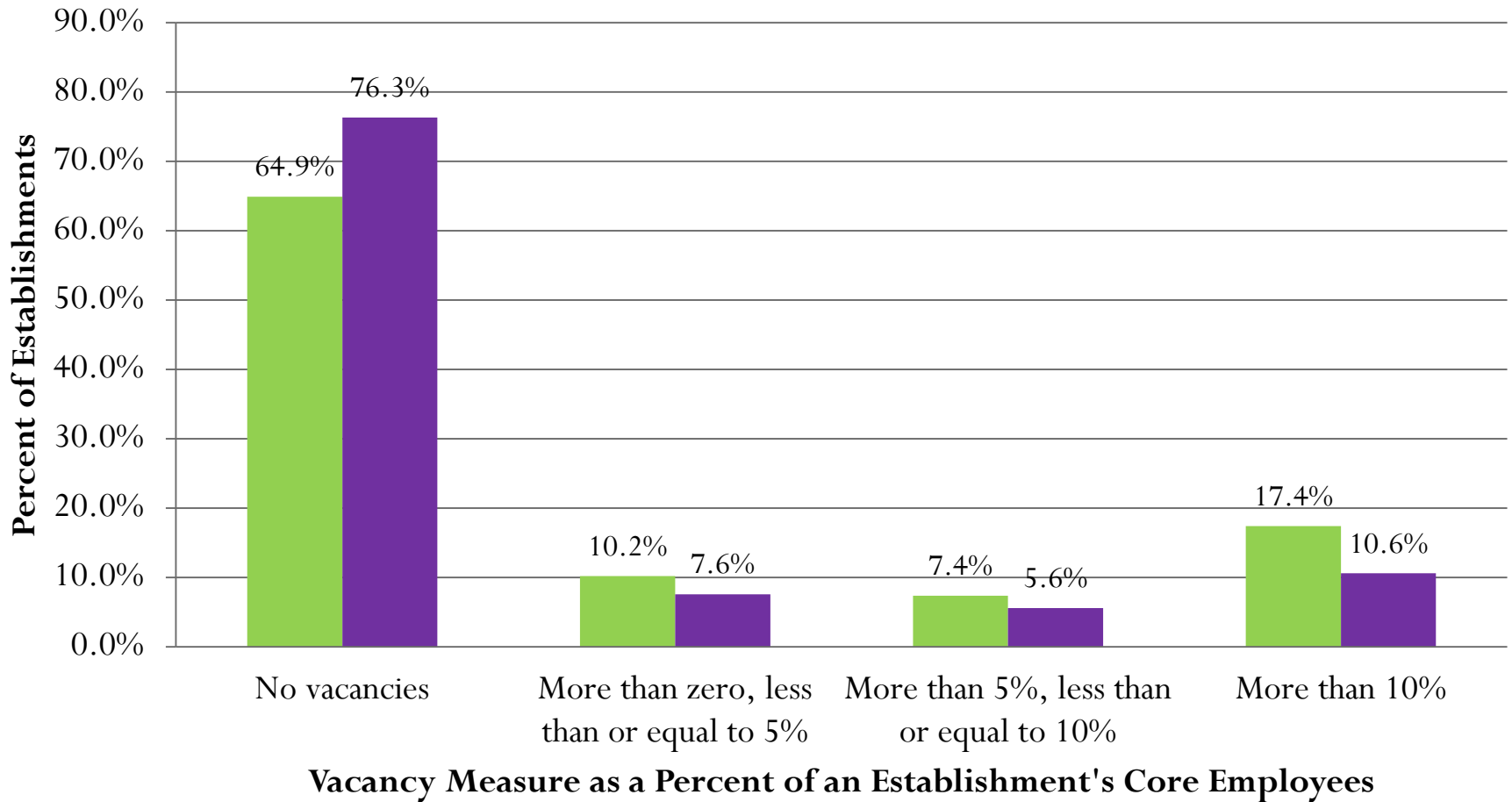
- To answer questions about skill and mismatch, it's necessary to gather direct evidence on skill demands:
  - What skills do employers demand?
  - Which establishments demand high levels of skill?
  - Do establishments, particularly those with high skill demands, have trouble finding workers with these skills?
- To really narrow in on skills, important to focus on industry/industry sector
- Paul Osterman and I designed and administered a nationally representative survey of manufacturing plants to answer these questions
- We conducted extensive fieldwork to identify critical factors relating to institutions, regional eco-system

# Our Survey

- Administered in late 2012, early 2013
- Random sample—Dun & Bradstreet database
- $n=903$
- 36% response rate
- Focus on “core” production workers (Ben-Ner and Urtasun 2013, Osterman 1995)—62% of estab. employment
- Concrete skill questions: does this job require reading complex technical manuals? algebra? geometry? etc.
- Defined skill gaps as prolonged core worker vacancies ( $> 3$  mos.)

# Skill Gap Evidence

## Vacancies



■ Any Vacancies ■ Long-Term Vacancies



# What Skill Demands are Associated with Hiring Difficulties?

- Demands for higher level reading, math, and unique skills are significant predictors of long-term vacancies
- Computer and soft skills/problem-solving/initiative skills are not
- So is this relationship between skill demands and hiring problems an automatic/mechanical one?
  - Examine high skill-demanding establishments

# Which Establishments Demand High Skills?

- Establishments that demand extended skills are characterized by:
  - high-tech
  - cluster membership
  - high-performance work organization (TQM/self-managed team)
  - frequent process (not product) innovation
  - more foreign competition
- If the simple skill mismatch story is accurate, these establishments should have significantly higher levels of hiring difficulties

# Long-Term Vacancies: Estab. Characteristics Models

	Pct. LT vac.	LTV--Logit	Pct. LT vac.-- RF	Pct. LT vac.-- RF+wage	LTV--Logit-- RF	LTV--Logit-- RF+wage
High-tech	-0.01 (0.007)	-0.052 (0.038)	-0.014** (0.007)	-0.017** (0.007)	-0.068* (0.037)	-0.072* (0.039)
Above-avg. tech.	-0.001 (0.006)	-0.019 (0.033)	-0.001 (0.006)	-0.001 (0.006)	-0.024 (0.033)	-0.026 (0.034)
TQM pct.	0.000 (0.000)	0.001 (0.000)	0.002 (0.000)	0.003 (0.000)	0.004 (0.000)	0.005 (0.000)
Self team pct.	0.000 (0.000)	0.001 (0.001)	0.002 (0.000)	0.003 (0.000)	0.004 (0.001)	0.005 (0.001)
Product innovation	0.002 (0.007)	0.019 (0.038)	0.001 (0.007)	0.003 (0.007)	0.018 (0.039)	0.022 (0.040)
Process innovation	0 (0.007)	0.005 (0.038)	0.002 (0.007)	0.003 (0.007)	0.013 (0.038)	0.021 (0.039)
Industry cluster	0.017*** (0.006)	0.119*** (0.032)	0.014** (0.006)	0.013** (0.006)	0.117*** (0.032)	0.117*** (0.033)
Part of larger firm	0.003 (0.007)	0.024 (0.037)	0.003 (0.006)	0.001 (0.007)	0.032 (0.037)	0.031 (0.038)
More foreign comp.	0.002 (0.007)	0.019 (0.038)	0.001 (0.007)	0.001 (0.007)	0.027 (0.039)	0.025 (0.039)

## Long-Term Vacancies: Red. Form Cont'd

County pop. density			0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
County unemp. rate (2011)			-0.148	-0.129	-0.795	-0.695
			(0.122)	(0.124)	(0.711)	(0.721)
Pct. change in core emp. last 2 yrs.			-0.011***	-0.012***	0.016	0.016
			(0.004)	(0.004)	(0.024)	(0.025)
Standardized division wage				0.003		0.005
				(0.003)		(0.017)
Low wage				0.121***		0.18
				(0.032)		(0.160)
R-Squared	0.036	0.034	0.050	0.073	0.040	0.038
N	783	784	766	738	766	738

Source: PIE Manufacturing Survey. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

# Summary of Results

- No widespread problem with skill gaps (this does not mean skills are not important)
- It is worth paying attention to the minority of establishments reporting difficulties
- However, there is no simple/mechanical relationship between higher skill demands and hiring problems: other factors mediate relationship

# What's Going On?

- Skills are critical, but skill gap formulation is not necessarily the best way to frame the issue
- American skill production system has been changing
- Mfg. establishment size has declined (Holmes 2011; Henly and Sanchez 2009)
- Small firms provide less internal training (Lynch and Black 1998)
- External training actors like community colleges are more important than they once were
- But system is disaggregated
  - More potential for coordination failures and underinvestment in public goods

# Intermediaries/Institutions are Important

- Rochester story
  - Kodak
  - Monroe Community College
  - Rochester Regional Photonics Cluster (RRPC)
  - Addressed coordination failure
- Intermediaries and institutions are critical for matching supply and demand, as well as coordinating increases in skill demands and supplies

Thank You

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