Temporary Workers, Permanent Workers, and International Trade: Evidence from the Japanese Firm-level Data

Toshiyuki Matsuura[1] Hitoshi Sato[2] Ryuhei Wakasugi[3]

[1]Keio University

[2]Research Institute of Economy, Trade and Industry

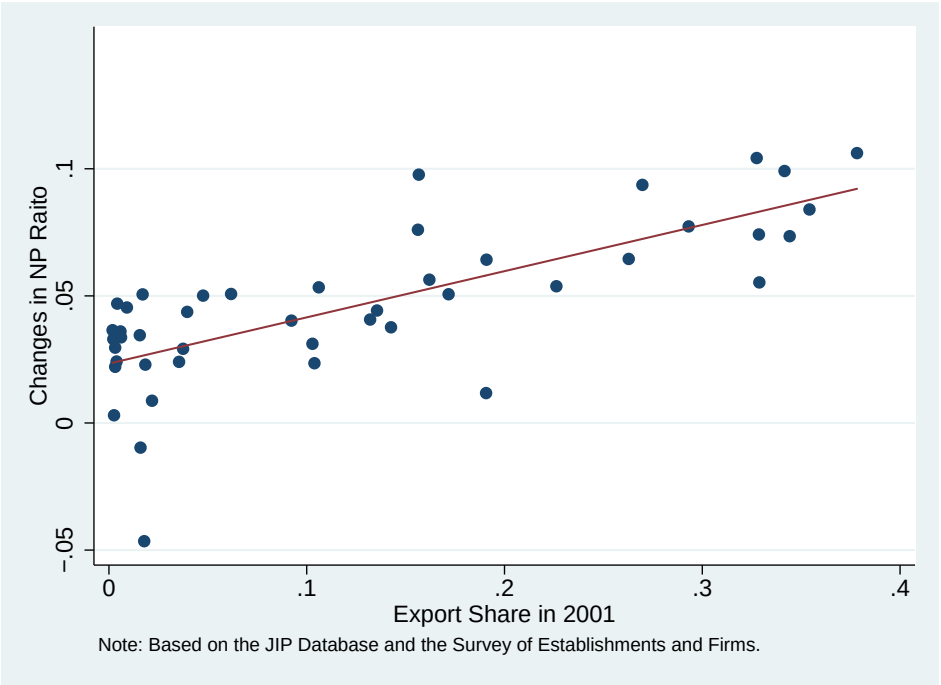
[3]Kyoto University and RIETI

February 4, 2011

Motivation: Shifts to temporary workers, Why?

- According to the Census of Establishments and Firms, during 2001-2006,
  - Total workforce -5.5 %(0.6 million) (*All industries -0.2milliion)
  - Permanent -12.8% (1million)
  - Temporary +62.5% (0.4millioin)
  - About 40% of permanent workers replaced with temporary workers
- Due to deregulations on temp-workers? (e.g. The Worker dispatching Act in 2003)
- The growing dependence on temp-workers started before the late 1990's.
- Economic globalization may encourage a perm to temp shift.
  - Businesses (e.g. Keidanren) repeatedly ask for labor market flexibility for keeping up with global competition.
- How valid is such a claim?

Changes in temp-perm ratios (2001-2006) vs. Export shares in 2001



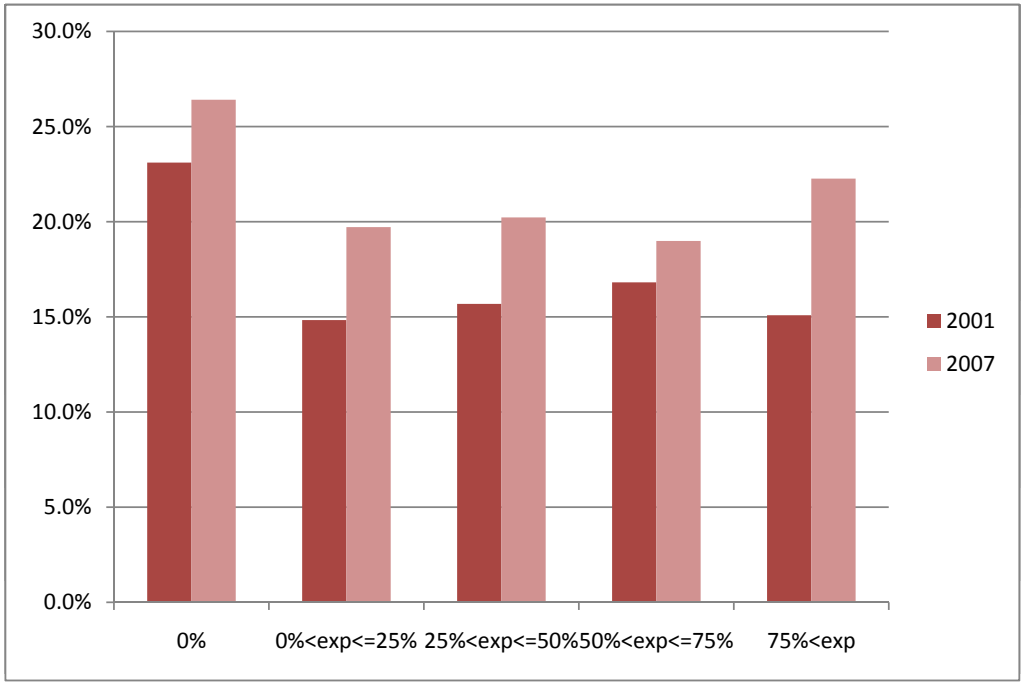
- Aggressive replacement of perm with temp workers in industries more reliant on external demand.

Main goals: Shifts to temporary workers, Why?

- Foreign & local sales volatility matters.
  Morikawa (2010): sales volatility $\Rightarrow$ high non-permanent ratio
- Do firms' revenues become more volatile?
- Cost reduction?
- This study attempts to understand how economic globalization may shift the labor demand from perm to temp workers. For this purpose,
  - Build a theoretical framework in which firms determine the demands for perm and temp workers. See the impact of trade openness.
  - Scrutinize the plant-level micro data. Try to find evidence of the linkage between economic globalization and shifts to temp workers.

A heuristic idea

- Export sales volatility >> Home sales volatility $\Rightarrow$ When firms export more, they face more volatility $\Rightarrow$ More temp workers.
- If so, exporters are supposed to show higher temp-workers ratios than non-exporters $\Rightarrow$ this contradicts with the fact. In general, exporters have lower temp-worker ratios than non-exporters.



Our idea

- Firms prefer less volatile revenues due to adjustment costs for perm workers $\Rightarrow$ Upper bounds for perm workers $\Rightarrow$ Employment gaps filled by temp workers.
- For decreasing revenue volatility, firms increase product-lines (multi-product firms). The scope of products is limited depending on firms' management capability (source of firm heterogeneity).
- Trade openness (decreases in trade costs) causes "tough competition" $\Rightarrow$ lower profits from each product $\Rightarrow$ product lines $\downarrow$ revenue volatility (on product average) $\uparrow\Rightarrow$ less demand for perm workers.
- In sum, Larger firms have lower temp ratios because of they diversify the risk of revenue fluctuations more than smaller firms. Even for them, trade openness raise their demands for temp through product concentration.

The Model

- Quasi-linear preferences for the homogenous good and differentiated goods a la Melitz & Ottabiano (2008).
- Perm and temp are perfect substitutes. The homogenous good sector determined the wage rates: w for permanent and w_s for temporary. No labor adjustment costs in the homogeneous good.
- The basic idea of the demands for perm and temp follows Saiint-Paul (1997). But, we here extend to the case where firms have $n \geq 1$ product lines. Revenue shocks are uncorrelated each other (assumption).

The Model

- In the differentiated good sector, perm workers require a (linear) firing cost. The true unit cost of perm workers is the wage plus the expected adjustment cost Γ.

$$w + \Gamma(l, n), \quad \text{where} \quad \Gamma_1(l, n) > 0, \Gamma_2(l, n) < 0.$$

- When firms use both perm and temp, the unit costs of two types of workers must be equal. This determines the demand for perm,

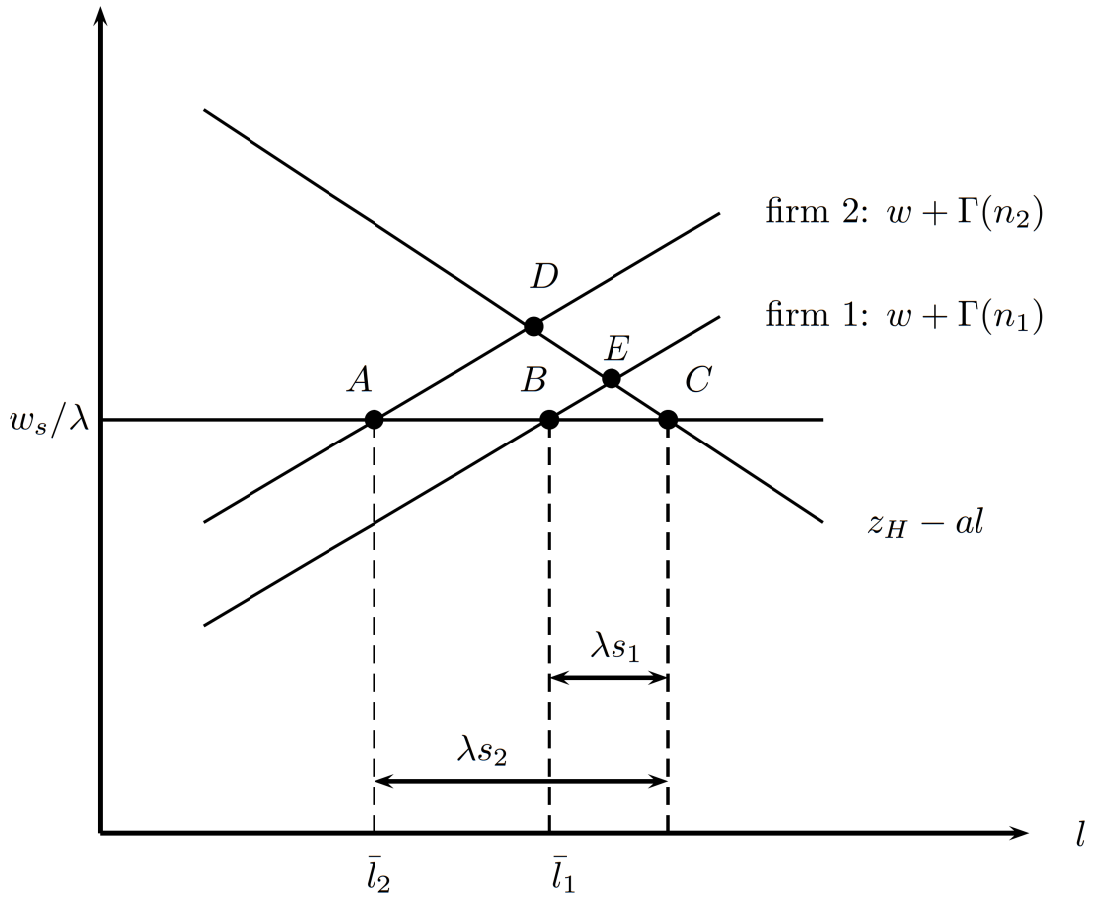
$$w + \Gamma(l, n) = w_s/\lambda$$

where $\lambda < 1$ is the efficiency of temp.
$\Rightarrow$ Firms with greater number of products hire more perm workers per product.

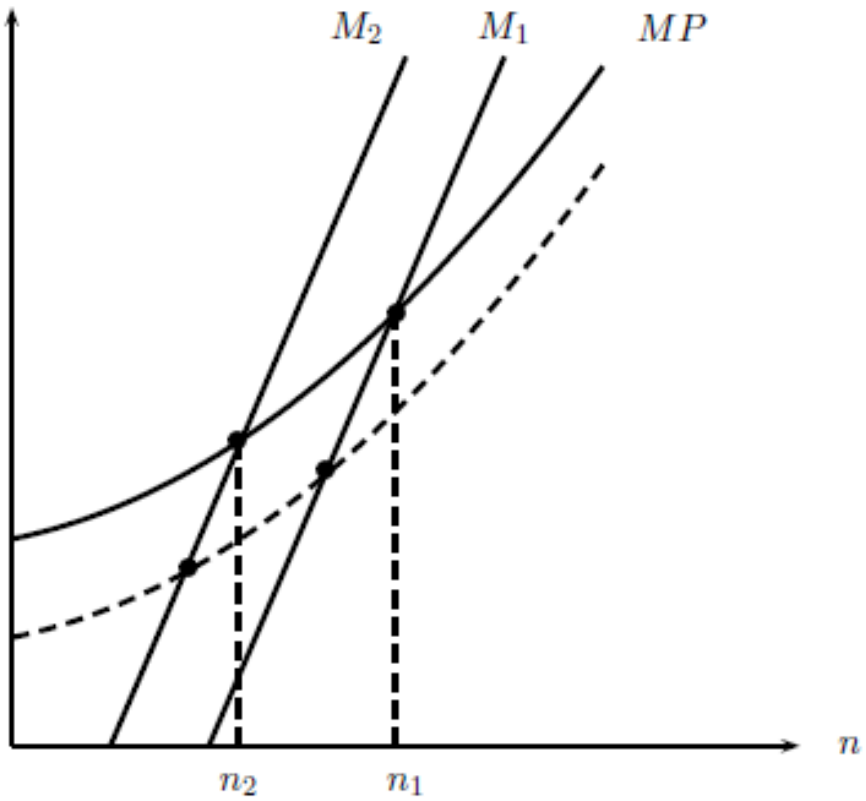
Result (Two testable implications)

i)Firms with large number of products (large firms) have lower ratios of temp to perm;
ii) Given that both perm and temp are used, increases in total employment

Perm-Temp Determination



The number of product lines



- $n \uparrow \Rightarrow$ each product becomes more profitable since each product's revenue fluctuation declines on average (note: when firm receive rather bad shocks, they do not use temp workers)
- Assume that the management cost is sufficiently convex to limit n.
- Firms with better management capability can have greater number of products.

Open Economy

- Follow Melitz & Ottabiano (2008). Starting with the two symmetric countries are engaged in trade with ice-berg trade cost. Consider a decline of the trade cost.
- Each product reduces the profit ("tough competition") $\Rightarrow$ firms decrease the number of product lines as Baldwin & Gu (2006).
- The decline in n raises the true unit labor cost for perm. All firms having lower ns decrease the employment of perm $\Rightarrow$ higher ratios of temp to perm.

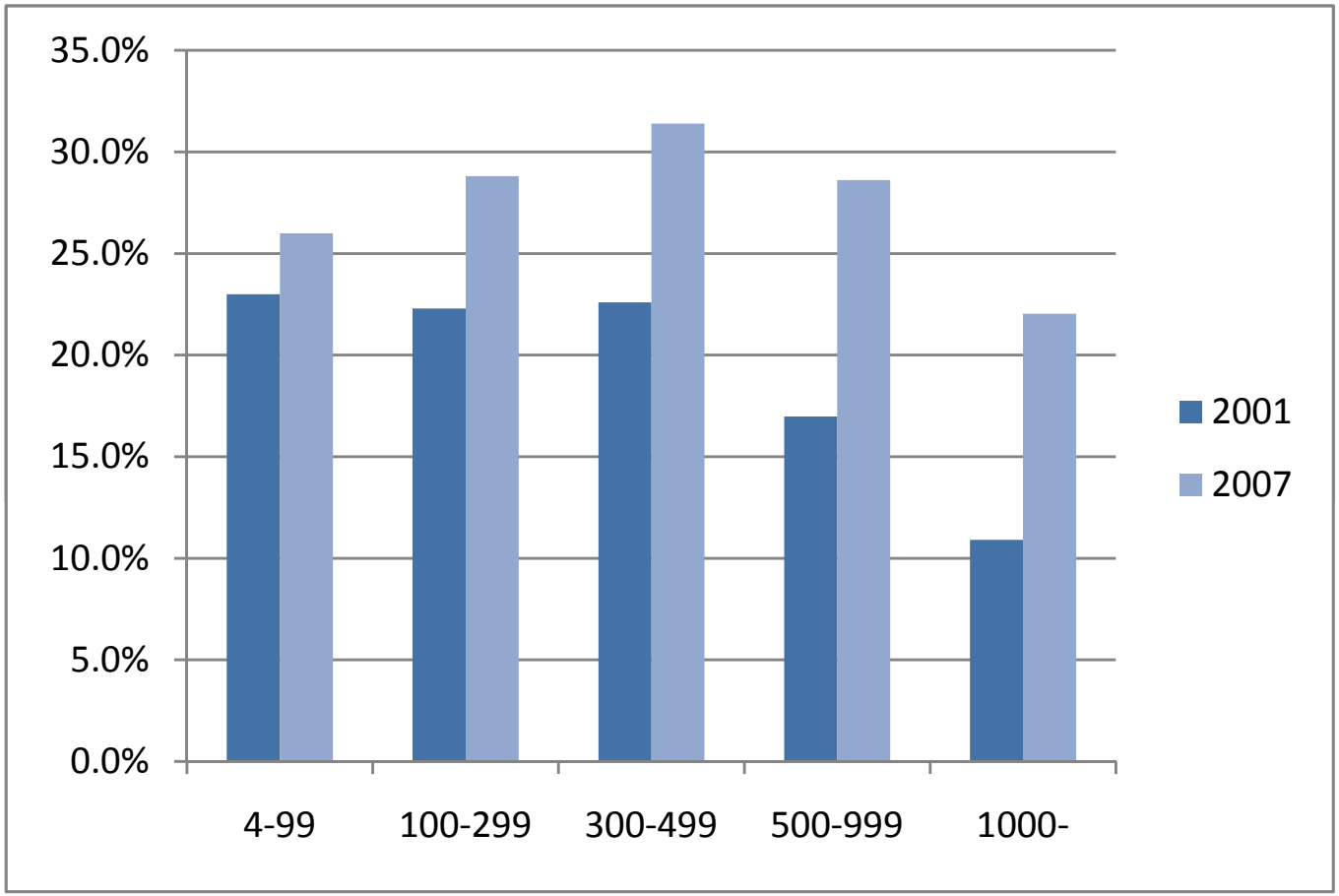
Summary: Empirical Predictions

- Lager firms tend to have more product-lines and lower shares of temp workers in total labor input relative to small firms.
- Firms increase the employment level by hiring more temp. In other words, when total employment increases, the share of temp rises.
- When the trade cost declines, the share of temp in total labor input rises.

Data

- Plant-level Pane Data from the Census of Manufacturers.
  - All firms with employees of 4 or more employees
  - 2001-2007 for plant-level exports data
- Labor categories
  - Temp workers: part-timers, dispatched workers, and other temporary employees (day laborers)
  - The ratio of temporary workers = temporary workers /total employees

Temp-Perm Ratios by year and plant size



Number of products and volatility

Plant size	Number of Products	Volatility
4-99	1.740	0.174
100-299	2.328	0.155
300-499	2.965	0.149
500-999	3.458	0.151
1000-	5.207	0.159

Estimation

- Test the following specification.

$$Tempratio_{it} = \alpha + \beta_1 Volatility_{it} + \beta_2 Dum_{Exp} * Volatility_{it} + \beta_3 Scale_{it} + v_i + \epsilon_i$$

- Volatility index: s.d. of total shipmen growth, time variant index with different ranges (e.g., between 2001 and 2004 and between 2002 and 2005), sample period for regression analysis is 2004-2007
- Plant scale and exporter dummy are both lagged for one year

Temp-perm Ratio & Revenue Volatility

	Model 1	Model 2	Model 3
Volatility	0.0156	0.0127	0.0158
	[8.66]***	[6.48]***	[8.72]***
Volatility*Dum_Exp		-0.0099	
		[-1.55]	
Volatility*(0%<exp_share≤50%)			-0.0081
			[-1.33]
Volatility*(50%<exp_share≤75%)			-0.0237
			[-1.48]
Volatility*(75%<exp_share)			0.0401
			[1.89]*
Scale	0.0059	0.006	0.0059
	[6.52]***	[6.61]***	[6.53]***
_cons	0.2337	0.2341	0.2337
	[94.27]***	[93.95]***	[94.26]***
Estimation Method	Fixed Effect	Fixed Effect	Fixed Effect
R2	0.0019	0.0019	0.0019
N	748,274	748,274	748,274

Temp-perm Ratio & Rev Volatility: Exporting Industries

	model14	model15	model16
Volatility	0.0087	0.0046	0.0088
	[3.06]***	[1.50]	[3.05]***
Volatility*Dum_Exp		-0.0051	
		[-0.68]	
Volatility*(0%<exp_share≤50%)			-0.0049
			[-0.69]
Volatility*(50%<exp_share≤75%)			-0.018
			[-1.04]
Volatility*(75%<exp_share)			0.0522
			[2.36]**
Scale	0.0062	0.0061	0.0062
	[3.90]***	[3.89]***	[3.90]***
_cons	0.2067	0.2076	0.2067
	[44.99]***	[44.97]***	[45.00]***
Estimation Method	Fixed Effect	Fixed Effect	Fixed Effect
R2	0.0025	0.0024	0.0025
N	200,748	200,748	200,748

Note: Chemical products, electric machinery, general machinery, transportation equipment, precision instruments and non-metallic mineral products.

Conclusion

- Our empirical findings are
  - Volatility raises the temp. ratio.
  - In particular, firms with high export shares (more than 75%) are very sensitive to revenue volatility.
  - When total employment size increases, the share of temp workers rises $\Rightarrow$ (temp workers work as a buffer) .